



**Agenda**  
**City of Vernon**  
**Regular City Council Meeting**  
**Tuesday, March 1, 2022, 9:00 AM**  
**City Hall, Council Chamber**  
**4305 Santa Fe Avenue**  
**Vernon, California**

**Melissa Ybarra, Mayor**  
**William Davis, Mayor Pro Tem**  
**Leticia Lopez, Council Member**  
**Crystal Larios, Council Member**  
**Judith Merlo, Council Member**

**MEETING ATTENDANCE PROTOCOLS**

Assembly Bill 361 (AB 361) authorizes public meetings to take place via teleconference because State and Local officials are recommending measures to promote social distancing. Meetings are conducted in a hybrid format that includes both in-person and Zoom public participation.

The public is encouraged to view the meeting at <https://www.cityofvernon.org/webinar-cc> or by calling (408) 638-0968, Meeting ID 833-2389-0758#. You may address the Council via Zoom or submit comments to [PublicComment@ci.vernon.ca.us](mailto:PublicComment@ci.vernon.ca.us) with the meeting date and item number in the subject line.

**CALL TO ORDER**

**FLAG SALUTE**

**ROLL CALL**

**APPROVAL OF THE AGENDA**

**PUBLIC COMMENT**

At this time the public is encouraged to address the City Council on any matter that is within the subject matter jurisdiction of the City Council. The public will also be given a chance to comment on matters which are on the posted agenda during City Council deliberation on those specific matters.

## CONSENT CALENDAR

All matters listed on the Consent Calendar are to be approved with one motion. Items may be removed from the Consent Calendar for individual consideration. Removed items will be considered immediately following the Consent Calendar.

### 1. City Clerk

#### [Approval of Minutes](#)

Recommendation:

Approve the February 15, 2022 Regular City Council meeting minutes.

#### 1. [20220215 City Council Minutes](#)

### 2. Finance/Treasury

#### [Operating Account Warrant Register](#)

Recommendation:

Approve Operating Account Warrant Register No. 82, for the period of January 30 through February 12, 2022, totaling \$2,966,642 and consisting of ratification of electronic payments totaling \$2,713,771.11 and ratification of the issuance of early checks totaling \$252,870.89.

#### 1. [Operating Account Warrant Register No. 82](#)

### 3. Public Works

#### [Public Works Department Monthly Report](#)

Recommendation:

Receive and file the January 2022 Building Report.

#### 1. [Public Works Department January 2022 Building Report](#)

### 4. Public Works

#### [Labor and Materials Contract with West Coast Arborists, Inc. for Urban Forest Management \(Contract CS-1435\)](#)

Recommendation:

A. Find that the proposed action is exempt from California Environmental Quality Act (CEQA) review, in accordance with CEQA Guidelines § 15304, because the project consists of only minor alterations in vegetation that does not involve removal of healthy, mature, scenic trees; and

B. Approve and authorize the City Administrator to execute a three (3) year contract with West Coast Arborists, Inc., in substantially the same form as submitted, for Urban Forest Management Services in an amount not-to-exceed \$325,000, with an effective date of April 1, 2022.

#### 1. [CS-1435 - Urban Forest Management Services 22-25](#)

**5. Public Works**

[Services Agreement with CleanStreet, LLC for Street Sweeping Services \(Contract No. CS-1434\)](#)

Recommendation:

A. Find that the proposed action is categorically exempt from California Environmental Quality Act (CEQA) review, in accordance with CEQA Guidelines § 15301, because the project consists of the maintenance of existing streets and involves no expansion of an existing use; and

B. Approve and authorize the City Administrator to execute a Services Agreement with CleanStreet, LLC, in substantially the same form as submitted, for a three (3) year term in an amount not-to-exceed \$1,001,242.44, with an effective date of April 1, 2022.

[1. CS-1434 - Services Agreement with CleanStreet, LLC](#)

**6. Public Utilities**

[Acceptance of Electrical Easement at 3333 Downey Road \(APN 6303-001-001\)](#)

Recommendation:

Accept the Electrical Easement and authorize the Mayor to execute the Certificate of Acceptance.

[1. Electrical Easement and Certificate of Acceptance - 3333 Downey Road](#)

**7. Public Utilities**

[Gas Enterprise Cost-of-Service Study and Rate Design](#)

Recommendation:

Receive and file the report.

[1. Gas Enterprise Rate Design Presentation for 2-10-22 BIC Meeting](#)

**8. Public Utilities**

[Construction Contract with Cedro Construction, Inc. \(Cedro\) for Well No. 22 Equipment and Site Improvements](#)

Recommendation:

- A. Find that the proposed action is categorically exempt from California Environmental Quality Act (CEQA) review, in accordance with CEQA Guidelines § 15301, because the project consists of the maintenance, repair or minor alteration of existing facilities and involves negligible or no expansion of an existing use; in addition, the extensions of sewer, water, and storm drain mains are exempt in accordance with CEQA Guidelines § 15303, because the project consists of minor extensions of utility services
  - B. Accept the bid from Cedro as the lowest responsive and responsible bidder and reject all other bids;
  - C. Approve and authorize the City Administrator to execute a Construction Contract with Cedro, in substantially the same form as submitted, in an amount not to exceed \$2,507,772, for Well No. 22 equipment and site improvements; and
  - D. Authorize a contingency amount of \$501,000 in the event of unforeseen changes in the project, and grant authority to the City Administrator to issue Change Orders for an amount up to the contingency amount, if necessary.
1. [Construction Contract with Cedro Construction, Inc.](#)

**9. City Administration**

[Ground Lease Re-Assignment and Sublease at 2970 E. 50<sup>th</sup> Street and Related Ground Lessor Estoppel and Consent](#)

Recommendation:

Adopt Resolution No. 2022-03 approving the ground lease re-assignment and sublease at 2970 E. 50<sup>th</sup> Street and authorizing the execution of related Ground Lessor Estoppel and Consent.

1. [Resolution No. 2022-03](#)

**NEW BUSINESS**

**10. Finance/Treasury**

[2022 Pension Obligation Bonds](#)

Recommendation:

Adopt Resolution No. 2022-24 authorizing the issuance of bonds to refund and prepay certain pension obligations of the City; approving the form and authorizing execution of a trust agreement and bond purchase agreement; authorizing judicial validation proceedings relating to the issuance of such bonds; and approving additional actions related thereto.

- 1. [Resolution No. 2022-04](#)
- 2. [Trust Agreement](#)
- 3. [Bond Purchase Agreement](#)

## ORAL REPORTS

City Administrator Reports on Activities and Other Announcements.

City Council Reports on Activities (including AB1234), Announcements, or Directives to Staff.

## CLOSED SESSION

### 11. CONFERENCE WITH LEGAL COUNSEL – EXISTING LITIGATION (2)

Government Code Section 54956.9(d)(1)

Jerry Chavez v. City of Vernon  
Los Angeles Superior Court Case No. 21STCP0413

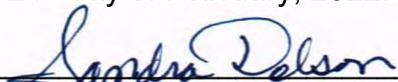
Jerry Chavez v. City of Vernon  
Los Angeles Superior Court Case No. BC719460

## CLOSED SESSION REPORT

## ADJOURNMENT

I hereby certify under penalty of perjury under the laws of the State of California, that the foregoing agenda was posted in accordance with applicable legal requirements. Regular and Adjourned Regular meeting agendas may be amended up to 72 hours prior to the meeting.

Dated this 24<sup>th</sup> day of February, 2022.

By:   
Sandra Dolson, Administrative Secretary

## Guide to City Council Proceedings

**Meetings** of the City Council are held the first and third Tuesday of each month at 9:00 a.m. and are conducted in accordance with Rosenberg's Rules of Order (Vernon Municipal Code Section 2.04.020).

**Copies** of all agenda items and back-up materials are available for review in the City Clerk Department, Vernon City Hall, 4305 Santa Fe Avenue, Vernon, California, and are available for public inspection during regular business hours, Monday through Thursday, 7:00 a.m. to 5:30 p.m. Agenda reports may be reviewed on the City's website at [www.cityofvernon.org](http://www.cityofvernon.org) or copies may be purchased for \$0.10 per page.

**Disability-related services** are available to enable persons with a disability to participate in this meeting, consistent with the Americans with Disabilities Act (ADA). In compliance with ADA, if you need special assistance, please contact the City Clerk department at [CityClerk@ci.vernon.ca.us](mailto:CityClerk@ci.vernon.ca.us) or (323) 583-8811 at least 48 hours prior to the meeting to assure arrangements can be made.

The **Public Comment** portion of the agenda is for members of the public to present items, which are not listed on the agenda but are within the subject matter jurisdiction of the City Council. The City Council cannot take action on any item that is not on the agenda but matters raised under Public Comment may be referred to staff or scheduled on a future agenda. Comments are limited to three minutes per speaker unless a different time limit is announced. Speaker slips are available at the entrance to the Council Chamber.

**Public Hearings** are legally noticed hearings. For hearings involving zoning matters, the applicant and appellant will be given 15 minutes to present their position to the City Council. Time may be set aside for rebuttal. All other testimony shall follow the rules as set for under Public Comment. If you challenge any City action in court, you may be limited to raising only those issues you or someone else raised during the public hearing, or in written correspondence delivered to the City Clerk at or prior to the public hearing.

**Consent Calendar** items may be approved by a single motion. If a Council Member or the public wishes to discuss an item, it may be removed from the calendar for individual consideration. Council Members may indicate a negative or abstaining vote on any individual item by so declaring prior to the vote on the motion to adopt the Consent Calendar. Items excluded from the Consent Calendar will be taken up following action on the Consent Calendar. Public speakers shall follow the guidelines as set forth under Public Comment.

**New Business** items are matters appearing before the Council for the first time for formal action. Those wishing to address the Council on New Business items shall follow the guidelines for Public Comment.

**Closed Session** allows the Council to discuss specific matters pursuant to the Brown Act, Government Code Section 54956.9. Based on the advice of the City Attorney, discussion of these matters in open session would prejudice the position of the City. Following Closed Session, the City Attorney will provide an oral report on any reportable matters discussed and actions taken. At the conclusion of Closed Session, the Council may continue any item listed on the Closed Session agenda to the Open Session agenda for discussion or to take formal action as it deems appropriate.

## City Council Agenda Item Report

Submitted by: Sandra Dolson  
Submitting Department: City Clerk  
Meeting Date: March 1, 2022

### **SUBJECT**

Approval of Minutes

### **Recommendation:**

Approve the February 15, 2022 Regular City Council meeting minutes.

### **Background:**

Staff has prepared and hereby submits the minutes for approval.

### **Fiscal Impact:**

There is no fiscal impact associated with this report.

### **Attachments:**

1. [20220215 City Council Minutes](#)

**MINUTES  
VERNON CITY COUNCIL  
REGULAR MEETING  
TUESDAY, FEBRUARY 15, 2022  
REMOTE LOCATION VIA ZOOM**

**CALL TO ORDER**

Mayor Ybarra called the meeting to order at 9:01 a.m.

**FLAG SALUTE**

Mayor Ybarra led the Flag Salute.

**ROLL CALL**

**PRESENT:**

Melissa Ybarra, Mayor (via remote access)  
William Davis, Mayor Pro Tem (via remote access)  
Leticia Lopez, Council Member (via remote access)  
Crystal Larios, Council Member (via remote access)  
Judith Merlo, Council Member (via remote access – arrived at 9:03 a.m.)

**STAFF PRESENT:**

Carlos Fandino, City Administrator (via remote access)  
Zaynah Moussa, Interim City Attorney (via remote access)  
Lisa Pope, City Clerk (via remote access)  
Scott Williams, Finance Director (via remote access)  
Abraham Alemu, Public Utilities General Manager (via remote access)  
Michael Earl, Human Resources Director (via remote access)  
Fredrick Agyin, Health and Environmental Control Director (via remote access)  
Robert Sousa, Police Chief (via remote access)  
Dan Wall, Public Works Director (via remote access)

**APPROVAL OF THE AGENDA**

**MOTION**

Council Member Larios moved and Council Member Lopez seconded a motion to approve the agenda. The question was called and the motion carried 4-0, Council Member Merlo absent.

Council Member Merlo arrived via remote access at 9:03 a.m.

**PUBLIC COMMENT**

Pat Sprengel, Los Angeles County Fire Department Acting Assistant Fire Chief of Division VI, introduced himself.

## PRESENTATIONS

### 1. **Employee Service Pin Awards for January 2022**

Recommendation: No action required by the City Council. This is a presentation only.

Human Resources Director Earl acknowledged Sylvie De La Riva Gonzalez, Power Resources Settlement Analyst and Norma Rodriguez, Police Dispatcher as the recipients of the Employee Service Pin Awards for January 2022.

### 2. **Presentation on Pension Obligation Bonds - Workshop II**

Recommendation: No action required by City Council. This is a presentation only.

Finance Director Williams and Ira Summer, GovInvest, presented the staff report.

### 3. **City Administrator Report**

Recommendation: Receive presentation on:

- New Business Welcome
- Vernon Business in the News
- Joint Tax Sharing Agreement
- Malburg Generating Station (MGS) Transition
- Community Outreach

City Administrator Fandino presented the report.

## CONSENT CALENDAR

### MOTION

Mayor Pro Tem Davis moved and Council Member Lopez seconded a motion to approve the Consent Calendar. The question was called and the motion carried unanimously.

The Consent Calendar consisted of the following items:

### 4. **Approval of Minutes**

Recommendation: Approve the February 1, 2022 Regular City Council meeting minutes.

### 5. **Conduct of Meetings via Teleconference Pursuant to Assembly Bill 361**

Recommendation: Ratify the findings in Resolution No. 2021-36 authorizing continued conduct of City Council and all other City legislative body meetings via teleconference, in accordance with Assembly Bill 361 (AB 361), due to continued public health and safety concerns caused by COVID-19.

### 6. **Regulations of Sidewalk Vending**

Recommendation: Waive full reading, conduct second reading and adopt Ordinance No. 1276 adding Chapter 12.10 - Sidewalk Vending to Title 12 - Streets, Sidewalks and Public Places of the Municipal Code.

- 7. Claims Against the City**  
Recommendation: Receive and file the claim submitted by the Law Offices of Mabel N. Orue on behalf of Maria Isabel Rodriguez Navarro in an undetermined amount.
- 8. City Payroll Warrant Register**  
Recommendation: Approve City Payroll Warrant Register No. 788, for the period of January 1 through January 31, 2022, totaling \$2,509,060.57 and consisting of ratification of direct deposits, checks and taxes totaling \$1,621,614.09 and ratification of checks and electronic fund transfers (EFT) for payroll related disbursements totaling \$887,446.48 paid through operating bank account.
- 9. Operating Account Warrant Register**  
Recommendation: Approve Operating Account Warrant Register No. 81, for the period of January 16 through January 29, 2022, totaling \$10,430,957.65 and consisting of ratification of electronic payments totaling \$10,136,246.26, ratification of the issuance of early checks totaling \$294,711.39 and voided Check No. 608639 totaling \$3,549.22.
- 10. Fire Department Activity Report**  
Recommendation: Receive and file the December 2021 Fire Department Activity Report.
- 11. Police Department Activity Report**  
Recommendation: Receive and file the December 2021 Police Department Activity Report.
- 12. Acceptance of Work and Notice of Completion for Contract No. LP-0586 – 50th Street Water Main Replacement**  
Recommendation: A. Accept the Work by Cedro Construction, Inc. with regard to the 50th Street Water Main Replacement, Contract No. LP-0586; and B. Authorize the General Manager of Public Utilities to submit the Notice of Completion for the 50th Street Water Main Replacement for recordation to the Los Angeles County Registrar-Recorder/County Clerk (County Clerk).
- 13. Purchase Order with D&R Office Works, Inc.**  
Recommendation: Approve the issuance of a Purchase Order with D&R Office Works, Inc. for the purchase, delivery and installation of office furniture for the Vernon Police Department Detective Bureau and Sergeant's Office, in an amount not to exceed \$57,260.49.
- 14. Award of City Contract No. CS-1204 Pacific Boulevard, Santa Fe and Vernon Avenue Street Improvements**  
Recommendation: A. Find that the proposed action is categorically exempt under the California Environmentally Quality Act (CEQA) in accordance with CEQA Guidelines Section 15301 (Existing Facilities), part (c) (existing highways, streets and sidewalks), because the project consists of repairs to existing streets and involves no expansion of existing use; B. Accept the bid proposal from All American Asphalt as the lowest responsive and responsible bidder for the Pacific Blvd., Santa Fe & Vernon Ave. Street Improvements project and reject all other bids; C. Approve and authorize the City Administrator to execute Contract No. CS-1204 in the amount of \$878,606 for the Pacific Blvd., Santa Fe & Vernon Ave. Street Improvements project, for a period not to exceed 45 calendar days; and D. Authorize a contingency of \$85,000 in the event of an unexpected changed

condition in the project and grant authority to the City Administrator to issue a change order(s) for an amount up to the contingency amount if necessary.

**15. Amendment No. 1 to the License and Software Services Agreement with Power Settlements Consulting and Software, LLC**

Recommendation: Approve and authorize the City Administrator to execute Amendment No. 1 to the License and Software Services Agreement with Power Settlements Consulting and Software, LLC (Power Settlements), in substantially the same form as submitted, to amend the agreement to remove the automatic renewal language, and extend the agreement by an additional three-year period, effective February 1, 2022, for an additional \$262,542, for a grand total not-to-exceed amount of \$589,360.

**16. Amendment No. 2 to Services Agreement with S&S Labor Force Inc., dba JRM for Unarmed Security Guard Services**

Recommendation: Approve and authorize the City Administrator to execute Amendment No. 2 to the Services Agreement with S&S Labor Force Inc., dba JRM, in substantially the same form as submitted, for continued unarmed security guard services for a not-to-exceed amount of \$992,000.

**NEW BUSINESS**

**17. Appointment of Stifel, Nicolaus & Company, Inc. for Underwriting Services**

Recommendation: A. Approve issuance of Pension Obligation Bonds (POBs); and B. Appoint Stifel, Nicolaus & Company, Inc. (Stifel) to serve as underwriters on the proposed POBs for a cost not-to-exceed \$296,000 to be paid from bond proceeds upon transaction completion and authorize the City Administrator to execute the related Engagement Letter with Stifel.

Finance Director Williams presented the staff report.

Thomas Jacob, Stifel, Nicolaus & Company, Inc., introduced members of the firm, John Kim and Jordan Keny-Guyer, and provided an overview of Stifel, Nicolaus & Company, Inc.

**MOTION**

Council Member Lopez moved and Council Member Larios seconded a motion to: A. Approve issuance of Pension Obligation Bonds (POBs); and B. Appoint Stifel, Nicolaus & Company, Inc. (Stifel) to serve as underwriters on the proposed POBs for a cost not-to-exceed \$296,000 to be paid from bond proceeds upon transaction completion and authorize the City Administrator to execute the related Engagement Letter with Stifel. The question was called and the motion carried unanimously.

**18. Daggett Solar Power 2 Project Power Sales Agreement**

Recommendation: A. Find that approval of the proposed action is exempt from California Environmental Quality Act (CEQA) review, because it is an administrative and fiscal activity that will not result in direct or indirect physical changes in the environment, and therefore does not constitute a "project" as

defined by CEQA Guidelines section 15378; with regard to the underlying project and pursuant to the Power Purchase Agreement between SCPPA and Daggett Solar Power 2 LLC, the lead agencies have obtained all CEQA determinations required for the construction, operation, and maintenance of the facility, or such determinations are reasonably expected to be timely obtained; and B. Approve and authorize the City Administrator to execute a Power Sales Agreement (PSA) with Southern California Public Power Authority (SCPPA), in substantially the same form as submitted, for the purpose of purchasing 60 megawatts of solar power and 30 megawatts of battery storage with associated green attributes through the Daggett Solar Power 2 Project for a projected annual amount of \$7,100,000 over a 20-year term.

Public Utilities General Manager Alemu presented the staff report.

In response to Council questions, Public Utilities General Manager Alemu discussed the status of renewable resources.

## **MOTION**

Council Member Lopez moved and Council Member Larios seconded a motion to: A. Find that approval of the proposed action is exempt from California Environmental Quality Act (CEQA) review, because it is an administrative and fiscal activity that will not result in direct or indirect physical changes in the environment, and therefore does not constitute a “project” as defined by CEQA Guidelines section 15378; with regard to the underlying project and pursuant to the Power Purchase Agreement between SCPPA and Daggett Solar Power 2 LLC, the lead agencies have obtained all CEQA determinations required for the construction, operation, and maintenance of the facility, or such determinations are reasonably expected to be timely obtained; and B. Approve and authorize the City Administrator to execute a Power Sales Agreement (PSA) with Southern California Public Power Authority (SCPPA), in substantially the same form as submitted, for the purpose of purchasing 60 megawatts of solar power and 30 megawatts of battery storage with associated green attributes through the Daggett Solar Power 2 Project for a projected annual amount of \$7,100,000 over a 20-year term. The question was called and the motion carried unanimously.

## **ORAL REPORTS**

### **City Administrator Reports on Activities and other Announcements.**

City Administrator Fandino discussed his attendance at the League of California Cities Annual City Managers Conference on February 2 and 3 and announced upcoming events including the New Business Welcome on March 9, and Spring Egg-Stravaganza Community Event on March 24. He summarized the recent Malburg Generating Station Town Hall Meeting.

**City Council Reports on Activities (including AB1234), Announcements, or Directives to Staff.**

None.

**RECESS**

Mayor Ybarra recessed the meeting to Closed Session at 9:42 a.m.

**CLOSED SESSION**

**19. CONFERENCE WITH LABOR NEGOTIATORS**

Government Code Section 54957.6

Agency Designated Representative: Carlos Fandino, City Administrator Employee Organizations:

Teamsters Local 911,

International Brotherhood of Electrical Workers Local 47, Vernon Police Management Association,

Vernon Police Officers Benefit Association, and

Employees designated as Management, Confidential and Executive

**20. CONFERENCE WITH LEGAL COUNSEL – ANTICIPATED LITIGATION**

Significant exposure to litigation

Government Code Section 54956.9(d)(2) Number of potential cases: 1

**RECONVENE**

At 10:58 a.m., Mayor Ybarra adjourned Closed Session and reconvened the regular meeting.

**CLOSED SESSION REPORT**

Interim City Attorney Moussa reported that the Council met in Closed Session, discussed the items on the agenda, and took no reportable action.

**ADJOURNMENT**

Mayor Ybarra adjourned the meeting at 10:59 a.m.

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MELISSA YBARRA, Mayor

ATTEST:

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LISA POPE, City Clerk  
(seal)

# City Council Agenda Item Report

Submitted by: Efren Peregrina  
Submitting Department: Finance/Treasury  
Meeting Date: March 1, 2022

## **SUBJECT**

Operating Account Warrant Register

### **Recommendation:**

Approve Operating Account Warrant Register No. 82, for the period of January 30 through February 12, 2022, totaling \$2,966,642 and consisting of ratification of electronic payments totaling \$2,713,771.11 and ratification of the issuance of early checks totaling \$252,870.89.

### **Background:**

Section 2.32.060 of the Vernon Municipal Code indicates the City Treasurer, or an authorized designee, shall prepare warrants covering claims or demands against the City which are to be presented to City Council for its audit and approval. Pursuant to the aforementioned code section, the City Treasurer has prepared Operating Account Warrant Register No. 82 covering claims and demands presented during the period of January 30 through February 12, 2022, drawn, or to be drawn, from East West Bank for City Council approval.

### **Fiscal Impact:**

The fiscal impact of approving Operating Account Warrant Register No. 82, totals \$2,966,642. The Finance Department has determined that sufficient funds to pay such claims/demands, are available in the respective accounts referenced on Operating Account Warrant Register No. 82.

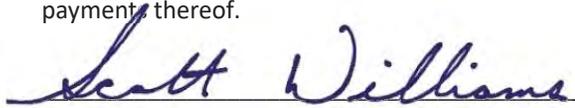
### **Attachments:**

1. [Operating Account Warrant Register No. 82](#)



**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

I hereby certify that claims and/or demands included in above listed warrant register have been audited for accuracy and availability of funds for payments and that said claims and/or demands are accurate and that the funds are available for payment thereof.

  
\_\_\_\_\_

Scott Williams  
Director of Finance / City Treasurer

Date: 2/22/2022

This is to certify that the claims or demands covered by the above listed warrants have been audited by the City Council of the City of Vernon and that all of said warrants are approved for payments except Warrant Numbers:

\_\_\_\_\_  
  
\_\_\_\_\_

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**ELECTRONIC**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
002412 - CALIFORNIA ISO	055.9200.500150	\$ 33,725.19	RC Services Charge	202112283252509				
	055.9200.500150	\$ -3,504.20	Recalculation Charges 10/21	657 202201253152899				
	055.9200.500190	\$ -1,213.31	Recalculation Charges 10/21	746 202201253152899				
	055.9200.500210	\$ -7.40	Recalculation Charges 10/21	746 202201253152899				
	055.9200.500170	\$ 40.62	Recalculation Charges 10/21	746 202201253152899				
	055.9200.500150	\$ 334,607.78	Initial Charges 01/22	746 202201253152899				
	055.9200.500210	\$ 14,479.62	Initial Charges 01/22	746 202201253152899				
	055.9200.500170	\$ -7,171.65	Initial Charges 01/22	746 202201253152899				
	055.9200.500190	\$ -1,473.22	Initial Charges 01/22	746 202201253152899				
						01/31/2022	12427	\$ 369,483.43
001581 - THE GAS COMPANY	055.9200.500160	\$ 146,575.00	Natural Gas 12/21	202112GS019				
						01/31/2022	12428	\$ 146,575.00
005034 - KRONOS INCORPORATED	011.9019.860000	\$ 9,120.00	Workforce Central Software	11792276				
						02/01/2022	12429	\$ 9,120.00

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**ELECTRONIC**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
005034 - KRONOS INCORPORATED	011.9019.590110	\$ 794.04	Software Usage Fees	11826862				
	011.9019.590110	\$ 833.11	Software Usage Fees	11840082				
	011.9019.590110	\$ 844.06	Software Usage Fees	11852831				
	011.9019.590110	\$ 936.21	Software Usage Fees	11863794				
						02/01/2022	12430	\$ 3,407.42
001401 - CENTRAL BASIN MWD	020.1084.500130	\$ 35,278.79	Potable & Recycled Water	VERDEC21				
						02/02/2022	12431	\$ 35,278.79
005490 - CINTAS CORPORATION	011.1043.540000	\$ 211.02	Uniforms	4098067838				
	011.1049.540000	\$ 313.39	Uniforms	4100072401				
	011.1047.540000	\$ 228.67	Uniforms	4103505154				
	011.1043.540000	\$ 233.30	Uniforms	4104182234				
	011.1047.540000	\$ 226.47	Uniforms	4104890216				
	011.1046.540000	\$ 218.60	Uniforms	4105496841				
	011.1043.540000	\$ 217.57	Uniforms	4106138474				
	011.1049.540000	\$ 217.57	Uniforms	4106904151				
	011.1047.540000	\$ 217.57	Uniforms	4107558063				
						02/02/2022	12432	\$ 2,084.16
006115 - JOHN LAU	011.1004.520000	\$ 55.81	Purchase of 1099 NEC Envelopes	012722				
						02/02/2022	12433	\$ 55.81

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**ELECTRONIC**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
003900 - RICHARDS, WATSON & GERSHON	011.1024.593200	\$ 87.00	Re: Los Angeles MS4 Permit Petition	233271				
	011.1024.593200	\$ 30.85	Re: Los Angeles MS4 Permit Petition	233649				
	011.1024.593200	\$ 63.70	Re: Los Angeles MS4 Permit Petition	235055				
	011.1024.593200	\$ 229.65	Re: Los Angeles MS4 Permit Petition	235355				
						02/02/2022	12434	\$ 411.20
001658 - WATER REPLENISHMENT DISTRICT	020.1084.500110	\$ 198,331.72	Groundwater Production & Assessment	020822				
						02/02/2022	12435	\$ 198,331.72
007110 - WATERLINE TECHNOLOGIES, INC	020.1084.500140	\$ 371.10	Sodium Hypochlorite Solution	5562243				
	020.1084.500140	\$ 251.37	Sodium Hypochlorite Solution	5562856				
	020.1084.500140	\$ 184.34	Sodium Hypochlorite Solution	5562857				
	020.1084.500140	\$ 226.23	Sodium Hypochlorite Solution	5562858				
	020.1084.500140	\$ 209.48	Sodium Hypochlorite Solution	5562859				
	020.1084.500140	\$ 242.99	Sodium Hypochlorite Solution	5562860				
	020.1084.500140	\$ 175.96	Sodium Hypochlorite Solution	5562861				
						02/02/2022	12436	\$ 1,661.47
005506 - BEST BEST & KRIEGER, LLP	011.1024.593200	\$ 2,705.50	Re: 5122 S. Atlantic Boulevard	924021				
						02/04/2022	12437	\$ 2,705.50

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**ELECTRONIC**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
003975 - CNS ENGINEERS, INC	011.2043.900000	\$ 8,046.82	Consulting Services~	801764				
	011.1043.900000	\$ 2,011.71	Consulting Services~	801764				
						02/04/2022	12438	\$ 10,058.53
002468 - DEPARTMENT OF WATER & POWER	055.9200.500170	\$ 21,870.00	Electric Energy Transactions	GA200860				
	055.9200.500260	\$ 575.00	Electric Energy Transactions	GA200860				
						02/04/2022	12439	\$ 22,445.00
003902 - EDWIN OCHOA	011.1026.596500	\$ 1,107.42	Tuition Reimbursement	101921				
						02/04/2022	12440	\$ 1,107.42
003902 - EDWIN OCHOA	055.8100.596700	\$ 46.80	Meals / Station Outage ~	020122				
						02/04/2022	12441	\$ 46.80
000059 - SO CAL EDISON	055.9200.500170	\$ 24,669.00	Laguna Bell 01/22	7501331583				
	055.9200.500170	\$ 187,200.00	Mead Laguna Bell 01/22	7501332139				
	055.9200.500170	\$ 79,200.00	Victorville Lugo Vernon 01/22	7501332141				
						02/04/2022	12442	\$ 291,069.00
000403 - VELASQUEZ, RICHARD	011.1031.540000	\$ 1,800.00	Reserve Officer Stipend 07/21 - 12/21	020222				
						02/04/2022	12443	\$ 1,800.00

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
007110 - WATERLINE TECHNOLOGIES, INC	020.1084.500140	\$ 209.48	Sodium Hypochlorite Solution	5561513				
	020.1084.500140	\$ 167.58	Sodium Hypochlorite Solution	5561514				
	020.1084.500140	\$ 167.58	Sodium Hypochlorite Solution	5561515				
	020.1084.500140	\$ 167.58	Sodium Hypochlorite Solution	5561516				
	020.1084.500140	\$ 167.58	Sodium Hypochlorite Solution	5561518				
	020.1084.500140	\$ 201.10	Sodium Hypochlorite Solution	5561519				
	020.1084.500140	\$ 2,276.06	Sodium Hypochlorite Solution	5563537				
	020.1084.500140	\$ 147.47	Sodium Hypochlorite Solution	5564011				
	020.1084.500140	\$ 108.93	Sodium Hypochlorite Solution	5564012				
	020.1084.500140	\$ 167.58	Sodium Hypochlorite Solution	5564013				
	020.1084.500140	\$ 157.53	Sodium Hypochlorite Solution	5564014				
	020.1084.500140	\$ 134.06	Sodium Hypochlorite Solution	5564015				
	020.1084.500140	\$ 251.37	Sodium Hypochlorite Solution	5564016				
						02/04/2022	12444	\$ 4,323.90

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
002412 - CALIFORNIA ISO	055.9200.500150	\$ -10,247.40	Recalculation Charges 10/21	202202013153082				
				515				
	055.9200.500190	\$ -462.78	Recalculation Charges 10/21	202202013153082				
				515				
	055.9200.500210	\$ -2.94	Recalculation Charges 10/21	202202013153082				
				515				
	055.9200.500170	\$ 332.18	Recalculation Charges 10/21	202202013153082				
				515				
	055.9200.500150	\$ -763.21	Recalculation Charges 02/21	202202013153082				
				515				
	055.9200.500180	\$ -11.77	Recalculation Charges 02/21	202202013153082				
				515				
	055.9200.500170	\$ 819.27	Recalculation Charges 02/21	202202013153082				
				515				
	055.9200.500190	\$ 96.22	Recalculation Charges 02/21	202202013153082				
				515				
	055.9200.500150	\$ 3,867.98	Recalculation Charges 04/19	202202013153082				
				515				
	055.9200.500170	\$ -0.63	Recalculation Charges 04/19	202202013153082				
				515				
	055.9200.500150	\$ 495,149.63	Initial Charges 01/22	202202013153082				
				515				
	055.9200.500190	\$ 2,518.09	Initial Charges 01/22	202202013153082				
				515				
	055.9200.500210	\$ 15,515.18	Initial Charges 01/22	202202013153082				
				515				
	055.9200.500170	\$ -4,751.11	Initial Charges 01/22	202202013153082				
				515				

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
						02/07/2022	12445	\$ 502,058.71
005182 - ANTHEM BLUE CROSS	011.1026.502031	\$ 14,182.77	Medical Retirees~	220272919		02/09/2022	12446	\$ 14,182.77
005490 - CINTAS CORPORATION	011.1043.540000	\$ 217.57	Uniforms	4108929278		02/09/2022	12447	\$ 436.17
	011.1047.540000	\$ 218.60	Uniforms	4109621444				
000947 - DAILY JOURNAL CORPORATION	020.1084.550000	\$ 125.00	Publication Services	B3540920		02/09/2022	12448	\$ 125.00
004438 - FLEMING ENVIRONMENTAL, INC	011.1049.590000	\$ 390.00	UST Compliance Services	18224		02/09/2022	12449	\$ 390.00
006422 - MARIPOSA LANDSCAPES, INC	011.1049.590000	\$ 240.00	Landscape Maintenance 10/21~	95145		02/09/2022	12450	\$ 3,965.28
	011.1049.590000	\$ 3,725.28	Landscape Maintenance 10/21	95270				
000629 - OPEN ACCESS TECHNOLOGY INTL, I	055.9200.596200	\$ 893.01	Electronic Tagging~	167781	055.0002891	02/09/2022	12451	\$ 893.01
005699 - WEBCO LB, LLC	011.1043.520000	\$ 10,250.00	Street Sweeping Services 01/22	LB6209		02/09/2022	12452	\$ 10,250.00

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
006120 - WESTERN ALLIED CORPORATION	011.1049.590000	\$ 1,469.12	Air Conditioner Maintenance	628460				
	011.1049.590000	\$ 407.00	Air Conditioner Maintenance	629026				
						02/09/2022	12453	\$ 1,876.12
006571 - NATIONAL READY MIXED CONCRETE	011.1004.401250	\$ 82,965.60	Sales Tax Sharing Agreement~	020822				
						02/09/2022	12454	\$ 82,965.60
006140 - ALZHEIMER'S GREATER LA	011.1021.797000	\$ 20,000.00	CommUNITY Fund Grant	012722				
						02/11/2022	12455	\$ 20,000.00
005506 - BEST BEST & KRIEGER, LLP	011.1024.593200	\$ 2,469.50	Re: 5122 S. Atlantic Boulevard	922507				
						02/11/2022	12456	\$ 2,469.50
000267 - BROADBAND, LLC	057.1057.500173	\$ 4,139.00	Internet Access Services	BBUS00032968				
	057.1057.500173	\$ 4,139.00	Internet Access Services	BBUS00033014				
						02/11/2022	12457	\$ 8,278.00

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**ELECTRONIC**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
002412 - CALIFORNIA ISO	055.9200.500150	\$ 0.16	Initial Charges 01/22	202202083153319				
				591				
	055.9200.450340	\$ 16.78	Recalculation Charges 07/20	202202083153319				
				591				
	055.9200.500170	\$ -172.41	Recalculation Charges 01/19	202202083153319				
				695				
	055.9200.500170	\$ -6,163.72	Initial Charges 01/22	202202083153319				
				695				
	055.9200.500150	\$ 336,847.89	Initial Charges 01/22	202202083153319				
				695				
	055.9200.500190	\$ 294.09	Initial Charges 01/22	202202083153319				
				695				
	055.9200.500210	\$ 14,651.00	Initial Charges 01/22	202202083153319				
				695				
	055.9200.500150	\$ -64.37	Recalculation Charges 07/20	202202083153319				
				695				
	055.9200.500170	\$ -1,147.08	Recalculation Charges 07/20	202202083153319				
				695				
	055.9200.500190	\$ -724.79	Recalculation Charges 07/20	202202083153319				
				695				
	055.9200.500170	\$ 8,541.65	Recalculation Charges 10/21	202202083153319				
				695				
	055.9200.500150	\$ -4,496.24	Recalculation Charges 10/21	202202083153319				
				695				
	055.9200.500190	\$ -252.32	Recalculation Charges 10/21	202202083153319				
				695				
						02/11/2022	12458	\$ 347,330.64

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007288 - CENTINELA YOUTH SERVICES, INC	011.1021.797000	\$ 15,000.00	CommUNITY Fund Grant	012722		02/11/2022	12459	\$ 15,000.00
006977 - CHICAS ROCKERAS SOUTH EAST LA	011.1021.797000	\$ 25,000.00	CommUNITY Fund Grant	012722		02/11/2022	12460	\$ 25,000.00
006360 - COMMUNITY PARTNERS	011.1021.797000	\$ 20,000.00	CommUNITY Fund Grant	012722		02/11/2022	12461	\$ 20,000.00
005447 - EAST LOS ANGELES WOMENS CENTER	011.1021.797000	\$ 50,000.00	CommUNITY Fund Grant	012722		02/11/2022	12462	\$ 50,000.00
000147 - GENERAL PUMP COMPANY, INC	020.1084.900000	\$ 88,300.00	Well & Booster Pump Maintenance	29015		02/11/2022	12463	\$ 243,500.00
	020.1084.900000	\$ 155,200.00	Well & Booster Pump Maintenance	29016				
005806 - GIRL SCOUTS OF GREATER LA	011.1021.797000	\$ 20,000.00	CommUNITY Fund Grant	012722		02/11/2022	12464	\$ 20,000.00
003911 - HUMAN SERVICES ASSOCIATION	011.1021.797000	\$ 40,000.00	CommUNITY Fund Grant	012722		02/11/2022	12465	\$ 40,000.00
002169 - KONECRANES, INC	055.8400.590000	\$ 740.00	Quarterly Inspection 12/21	154586903		02/11/2022	12466	\$ 740.00

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**ELECTRONIC**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
006497 - LA DERBY DOLLS	011.1021.797000	\$ 15,000.00	CommUNITY Fund Grant	012722		02/11/2022	12467	\$ 15,000.00
005955 - LA FAMILY HOUSING CORP.	011.1021.797000	\$ 50,000.00	CommUNITY Fund Grant	012722		02/11/2022	12468	\$ 50,000.00
003053 - LEVEL 3 COMMUNICATIONS, LLC	057.1057.500173	\$ 4,330.50	Internet Access Services	276190173		02/11/2022	12469	\$ 4,330.50
007221 - RICHARD WARREN OLSEN	055.9190.595200	\$ 4,874.56	Expense Reimbursement~	010322		02/11/2022	12470	\$ 4,874.56
005502 - SOUTHEAST CHURCHES SERVICE CEN	011.1021.797000	\$ 50,000.00	CommUNITY Fund Grant	012722		02/11/2022	12471	\$ 50,000.00
003253 - SOUTHEAST COMMUNITY DEVELOPMEN	011.1021.797000	\$ 23,325.00	CommUNITY Fund Grant	012722		02/11/2022	12472	\$ 23,325.00
006975 - THE ARROYO GROUP	011.1041.595200	\$ 53,042.00	West-Side Project Specific Plan	997313		02/11/2022	12473	\$ 53,042.00
005396 - LISA UMEDA	055.9000.596500	\$ 393.05	American Public Power Association -	122121		02/11/2022	12474	\$ 393.05
000059 - SO CAL EDISON	055.8100.560010	\$ 26.45	Period: 11/30/21 - 12/28/21	122921		02/02/2022	12475	\$ 26.45

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
001581 - THE GAS COMPANY	056.5600.560000	\$ 130.97	Period: 12/31/21 - 01/12/22	011422		02/03/2022	12476	\$ 130.97
001617 - UPS	011.1041.520000	\$ 36.00	Period: 01/22	933312032(2)				
	011.1041.520000	\$ 40.30	Period: 01/22	933312042(2)		02/03/2022	12477	\$ 76.30
001552 - HOME DEPOT CREDIT SERVICES	020.1084.900000	\$ 53.17	Small Tools & Plumbing Hardware~	020822_MULTIPLE	011.0014876			
	020.1084.520000	\$ 233.98	Small Tools & Plumbing Hardware~	020822_MULTIPLE	011.0014876			
	056.5600.520000	\$ 1,261.66	Small Tools & Plumbing Hardware~	020822_MULTIPLE(2)	056.0000640	02/08/2022	12478	\$ 1,548.81
001552 - HOME DEPOT CREDIT SERVICES	055.8400.590000	\$ 408.06	Small Tools & Plumbing Hardware~	021022_MULTIPLE	055.0002902			
	055.8400.590000	\$ 304.95	Small Tools & Plumbing Hardware~	021022_MULTIPLE	055.0002902			
	020.1084.900000	\$ 77.94	Small Tools & Plumbing Hardware~	021022_MULTIPLE(2)	011.0014876	02/10/2022	12479	\$ 790.95
000059 - SO CAL EDISON	055.9200.560010	\$ 556.68	Period: 12/21	010322				
	055.8100.560010	\$ 29.28	Period: 12/29/21 - 01/27/22	012922				
	011.1043.560000	\$ 65.09	Period: 12/29/21 - 01/27/22	012922(2)				
	011.1049.560000	\$ 93.57	Period: 11/15/21 - 12/14/21	121521				
	011.1043.560000	\$ 61.95	Period: 11/30/21 - 12/28/21	122921(2)		02/11/2022	12480	\$ 806.57

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	PAYMENT NUMBER	PAYMENT AMOUNT
<b>TOTAL ELECTRONIC</b>								<b><u>\$ 2,713,771.11</u></b>

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
000834 - SOUSA, ROBERTO	011.1031.596500	\$ 208.00	CPCA 45th Annual Training Symposium	011322		02/03/2022	608665	\$ 208.00
007297 - 591 N BRONSON LLC	011.1040.400900	\$ 3,589.22	Partial Warehouse Special Parcel Tax	010522		02/03/2022	608666	\$ 3,589.22
007029 - ALISTO ENGINEERING GROUP, INC	020.1084.595200	\$ 14,529.82	Risk & Resilience Assessment Services	12024010117382		02/03/2022	608667	\$ 14,529.82
002308 - ASBURY ENVIRONMENTAL SERVICES	055.8400.590000	\$ 493.97	Disposal Services	150000784697		02/03/2022	608668	\$ 548.97
	055.8400.590000	\$ 55.00	Disposal Services	150000785034				
007305 - CALIFORNIA COAST PLUMBERS, INC	020.110010	\$ 675.92	Ref. Temp Fire Hydrant #FH45 Acct# 7140	012422		02/03/2022	608669	\$ 675.92
000159 - FRED PRYOR SEMINARS & CAREERTR	055.9190.596700	\$ 3,580.00	Pryor + Renewal~	283331		02/03/2022	608670	\$ 3,580.00
006584 - GT'S LIVING FOODS	055.7200.596702	\$ 2,028.50	Customer Incentive Program	012622		02/03/2022	608671	\$ 2,028.50
000280 - HARPER & ASSOCIATES ENGINEERIN	020.1084.900000	\$ 5,332.00	Coating Inspection Services	ENG7567		02/03/2022	608672	\$ 5,332.00

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007306 - J & J COMPANY	055.110010	\$ 295.03	Ref. Closed Acct# 925	012422		02/03/2022	608673	\$ 295.03
007303 - JALISCO FRESH PRODUCE	055.7200.596702	\$ 4,136.75	Customer Incentive Program	012622		02/03/2022	608674	\$ 4,136.75
004122 - KIMBALL MIDWEST	011.1046.520000	\$ 1,124.21	Assorted Hardened Nuts & Bolts	9519782	011.0015077	02/03/2022	608675	\$ 1,239.46
	011.1046.520000	\$ 115.25	Sales Tax 10.25	9519782				
000804 - LB JOHNSON HARDWARE CO #1	011.1049.520000	\$ 35.00	Small Tools, Plumbing & Building	118830	011.0014915	02/03/2022	608676	\$ 45.02
	011.1049.520000	\$ 10.02	Small Tools, Plumbing & Building	118910	011.0014915			
006961 - BRIAN MARTINEZ	055.110010	\$ 121.20	Ref. Closed Acct# 1229	012422		02/03/2022	608677	\$ 121.20
003231 - MARX BROS FIRE EXTINGUISHER CO	011.1049.590000	\$ 2,158.31	Fire Extinguisher Service	A10402		02/03/2022	608678	\$ 2,483.31
	011.1049.590000	\$ 325.00	Fire Extinguisher Service	A10426				
007307 - MARY & RUFAS DISCOUNT OUTLET	055.110010	\$ 339.54	Ref. Closed Acct# 1444	012422		02/03/2022	608679	\$ 339.54

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007308 - NEW CENTURY INTERNATIONAL	055.110010	\$ 85.39	Ref. Closed Acct# 1116	012422		02/03/2022	608680	\$ 85.39
007302 - NEW MILANI GROUP LLC	055.7200.596702	\$ 6,961.38	Customer Incentive Program	012622		02/03/2022	608681	\$ 6,961.38
006586 - OCCUPATIONAL HEALTH CENTERS OF	011.1026.597000	\$ 147.00	Medical Services	74121292		02/03/2022	608682	\$ 147.00
001943 - PLUMBING & INDUSTRIAL SUPPLY	011.1049.520000	\$ 3,505.00	Water Heater~	S1257525001	011.0015051			
	011.1049.520000	\$ 359.26	Sales Tax 10.25	S1257525001				
	011.1049.520000	\$ 284.70	Plumbing Supplies & Building Hardware~	S1258013001	011.0014917			
	011.1049.520000	\$ 29.64	Plumbing Supplies & Building Hardware~	S1258028001	011.0014917			
	011.1049.520000	\$ 48.45	Plumbing Supplies & Building Hardware~	S1258276001	011.0014917			
	011.1049.520000	\$ 7.66	Plumbing Supplies & Building Hardware~	S1258298001	011.0014917			
						02/03/2022	608683	\$ 4,234.71
007309 - PREMIER PIPE, INC	020.110010	\$ 656.89	Ref. Temp Fire Hydrant #FH94 Acct# 7145	012422				
	020.110010	\$ 721.19	Ref. Temp Fire Hydrant #FH93 Acct# 7138	012422(2)				
						02/03/2022	608684	\$ 1,378.08
006612 - QUALIFIED MOBILE, INC	011.1046.590000	\$ 765.00	Car Wash Services	291940				
						02/03/2022	608685	\$ 765.00

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006420 - NAVDEEP SINGH SACHDEVA	055.7200.596702	\$ 998.52	Customer Incentive Program	012622		02/03/2022	608686	\$ 998.52
007057 - SDI PRESENCE, LLC	011.9019.595210	\$ 19,425.00	Professional Services Rendered~	8018		02/03/2022	608687	\$ 19,425.00
005998 - SOUTHEAST POLICE CHIEFS GROUP	011.1031.596550	\$ 600.00	ANNUAL DUES 2022	012722		02/03/2022	608688	\$ 600.00
000380 - STACY MEDICAL CENTER	011.1026.597000	\$ 1,200.00	Medical Services	1028045636		02/03/2022	608689	\$ 1,200.00
005419 - SUPERIOR CT OF CAL OF LA	011.1031.594200	\$ 1,381.50	Parking Citations 10/21	110521		02/03/2022	608690	\$ 1,381.50
007310 - TINTYPE INC	055.110010	\$ 500.00	Ref. Closed Acct# 1370	012422		02/03/2022	608691	\$ 500.00
006132 - THYSSENKRUPP ELEVATOR CORPORAT	055.8400.596200	\$ 459.00	Elevator Service & Maintenance	3006175870		02/03/2022	608692	\$ 459.00

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VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
000449 - UNDERGROUND SERVICE ALERT	020.1084.596200	\$ 112.30	New Ticket Charges	1020210782				
	055.8300.596200	\$ 115.60	New Ticket Charges	1220210774				
	020.1084.596200	\$ 50.92	CA State Fee for Regulatory Costs	DSB20205703				
	055.8300.596200	\$ 50.92	CA State Fee for Regulatory Costs	DSB20206795				
						02/03/2022	608693	\$ 329.74
005466 - VIKING DEMOLITION CONTRACTORS	020.110010	\$ 555.81	Ref. Temp Fire Hydrant #FH539 Acct# 7139	012422				
						02/03/2022	608694	\$ 555.81
001628 - WECK LABORATORIES, INC	020.1084.900000	\$ 45.00	Water Quality Testing & Reporting	W1L0060COVERNO N				
	020.1084.900000	\$ 45.00	Water Quality Testing & Reporting	W1L0165COVERNO N				
						02/03/2022	608695	\$ 90.00
007276 - ALLIED UNIVERSAL JANITORIAL	011.1049.590000	\$ 10,656.18	Janitorial Services 01/22	12249712				
						02/10/2022	608696	\$ 10,656.18
006308 - ANAYA SERVICE CENTER	011.1046.520000	\$ 1,165.57	EGR & Coolant Repairs~	35759	011.0015079			
	011.1046.590000	\$ 1,260.00	Labor to Repair Vehicle	35759	011.0015079			
	011.1046.520000	\$ 119.47	Sales Tax 10.25	35759				
						02/10/2022	608697	\$ 2,545.04

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**EARLY CHECKS**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT																																																
004448 - BATTERY SYSTEMS, INC	011.1046.520000	\$ 162.15	Vehicle Batteries~	7285661	011.0014856	02/10/2022	608698	\$ 491.58																																																
	011.1046.520000	\$ 329.43	Vehicle Batteries~	7335827	011.0014856				001752 - BENNETT-BOWEN & LIGHTHOUSE	011.1046.520000	\$ 3,310.00	Light Bar~	3016061	011.0015062	02/10/2022	608699	\$ 4,305.56	011.1046.520000	\$ 622.00	Switch Controller~	3016061	011.0015062	011.1046.520000	\$ 373.56	Sales Tax 9.5%	3016061		006397 - BUILT RITE FENCE COMPANY	011.1048.590000	\$ 49,870.00	New Fence Installation	7544		02/10/2022	608700	\$ 49,870.00	005078 - BURKE, WILLIAMS & SORENSEN, LL	011.1024.593200	\$ 93.00	Re: Martines, Ismael v. City of Vernon,	279038		02/10/2022	608701	\$ 2,666.00	011.1024.593200	\$ 1,581.00	Re: Sanchez, Christina v. State of	279041		011.1024.593200	\$ 930.00	Re: General~	279042		011.1024.593200
001752 - BENNETT-BOWEN & LIGHTHOUSE	011.1046.520000	\$ 3,310.00	Light Bar~	3016061	011.0015062	02/10/2022	608699	\$ 4,305.56																																																
	011.1046.520000	\$ 622.00	Switch Controller~	3016061	011.0015062																																																			
	011.1046.520000	\$ 373.56	Sales Tax 9.5%	3016061																																																				
006397 - BUILT RITE FENCE COMPANY	011.1048.590000	\$ 49,870.00	New Fence Installation	7544		02/10/2022	608700	\$ 49,870.00																																																
005078 - BURKE, WILLIAMS & SORENSEN, LL	011.1024.593200	\$ 93.00	Re: Martines, Ismael v. City of Vernon,	279038		02/10/2022	608701	\$ 2,666.00																																																
	011.1024.593200	\$ 1,581.00	Re: Sanchez, Christina v. State of	279041																																																				
	011.1024.593200	\$ 930.00	Re: General~	279042																																																				
	011.1024.593200	\$ 62.00	Re: Lopez, Reina v. City of Vernon~	279065																																																				

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**EARLY CHECKS**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
004163 - CENTRAL FORD	011.1046.520000	\$ 523.30	Auto Parts~	383496	011.0014859			
	011.1046.520000	\$ 112.05	Auto Parts~	383591	011.0014859			
	011.1046.520000	\$ 110.07	Auto Parts~	383601	011.0014859			
	011.1046.520000	\$ 36.08	Auto Parts~	383883	011.0014859			
	011.1046.520000	\$ 454.14	Auto Parts~	383901	011.0014859			
	011.1046.520000	\$ 79.64	Auto Parts~	384531	011.0014859			
	011.1046.520000	\$ 410.39	Auto Parts~	384902	011.0014859			
						02/10/2022	608702	\$ 1,725.67
003088 - CLINICAL LAB OF SAN BERNARDINO	020.1084.500140	\$ 741.00	Water Quality Testing & Reporting	2101203VER01				
	020.1084.500140	\$ 883.50	Water Quality Testing & Reporting	2200075VER01				
						02/10/2022	608703	\$ 1,624.50
001336 - CURRENT WHOLESALE ELECTRIC SUP	055.8200.590000	\$ 274.35	Electrical & Hardware Supplies~	270512	055.0002892			
	011.1049.520000	\$ 83.61	Electrical & Hardware Supplies~	270520	011.0014898			
	011.1049.520000	\$ 255.78	Electrical & Hardware Supplies~	270552	011.0014898			
	055.8400.590000	\$ 30.87	Electrical & Hardware Supplies~	270755	055.0002892			
	011.1049.520000	\$ 52.53	Electrical & Hardware Supplies~	271131	011.0014898			
						02/10/2022	608704	\$ 697.14

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**EARLY CHECKS**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
000524 - FERGUSON WATERWORKS	020.1084.520000	\$ 569.73	Supplies~	7712831	011.0014996			
	020.1084.520000	\$ 58.40	Sales Tax 10.25	7712831				
	020.1084.520000	\$ 497.20	LF 1-1/2 CTS COMP X MIP COUP~	778248	011.0015048			
	020.1084.520000	\$ 50.96	Sales Tax 10.25	778248				
						02/10/2022	608705	\$ 1,176.29
000399 - GARVEY EQUIPMENT COMPANY	011.1046.520000	\$ 153.69	Auto Parts & Accessories~	143474	011.0014858			
						02/10/2022	608706	\$ 153.69
007289 - HELPING HANDS SOCIETY OF LA	011.1021.797000	\$ 15,000.00	CommUNITY Fund Grant	012722				
						02/10/2022	608707	\$ 15,000.00
006399 - JOE MAR POLYGRAPH & INV SVC	011.1031.596200	\$ 200.00	Pre-Employment Polygraph Exam	202201031VPD				
						02/10/2022	608708	\$ 200.00
001085 - LA COUNTY SANITATION DISTRICTS	011.1048.560000	\$ 501.80	Wastewater Services~	DB1630327900021				
						02/10/2022	608709	\$ 501.80
003272 - LANGUAGE LINE SERVICES, INC	011.1031.594200	\$ 99.86	Interpretation Services	10446193				
						02/10/2022	608710	\$ 99.86

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**EARLY CHECKS**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
003342 - LIBERTY MANUFACTURING, INC	011.1031.590000	\$ 490.00	Range Maintenance	436				
	011.1031.590000	\$ 508.00	Range Maintenance	445				
						02/10/2022	608711	\$ 998.00
003908 - LOPEZ & LOPEZ TIRE SERVICE	011.1046.520000	\$ 421.13	Tires, Accessories & Repairs~	4897	011.0014863			
	011.1046.520000	\$ 231.70	Tires, Accessories & Repairs~	4908	011.0014863			
	011.1046.520000	\$ 50.00	Labor	4908	011.0014863			
						02/10/2022	608712	\$ 702.83
000870 - MAYWOOD CAR WASH	055.8100.570000	\$ 40.00	Car & Truck Wash Services ~	1160	055.0002904			
						02/10/2022	608713	\$ 40.00
000304 - MCAVOY & MARKHAM ENGINEERING A	055.8000.900000	\$ 8,875.00	Electric Meters~	16707				
	055.8000.900000	\$ 909.69	Sales Tax 10.25	16707				
						02/10/2022	608714	\$ 9,784.69
000309 - NAPA AUTO PARTS	011.1046.520000	\$ 20.81	Auto Parts & Accessories~	121386	011.0014864			
	011.1046.520000	\$ 156.57	Auto Parts & Accessories~	121937	011.0014864			
	011.1046.520000	\$ 39.00	Auto Parts & Accessories~	122015	011.0014864			
	011.1046.520000	\$ 116.81	Auto Parts & Accessories~	122057	011.0014864			
	011.1046.520000	\$ 79.72	Auto Parts & Accessories~	122153	011.0014864			
	011.1046.520000	\$ 201.47	Auto Parts & Accessories~	122156	011.0014864			
						02/10/2022	608715	\$ 614.38

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**EARLY CHECKS**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
006586 - OCCUPATIONAL HEALTH CENTERS OF	011.1026.597000	\$ 147.00	Medical Services	74188808		02/10/2022	608716	\$ 147.00
003106 - OCEAN BLUE ENVIRONMENTAL SERVI	011.1060.595200	\$ 15,093.27	Area Cleanup	35805		02/10/2022	608717	\$ 15,093.27
005934 - O'REILLY AUTO PARTS	011.1046.520000	\$ 61.83	Auto Parts & Accessories~	3049381153	011.0014860	02/10/2022	608718	\$ 61.83
001361 - PLUMBERS DEPOT, INC	011.1046.590000	\$ 260.00	Labor to Repair Wiring on PTO	PD50168	011.0015063	02/10/2022	608719	\$ 260.00
001943 - PLUMBING & INDUSTRIAL SUPPLY	011.1049.520000	\$ 1,700.00	Plumbing Supplies & Building Hardware~	S1259841001	011.0014917	02/10/2022	608720	\$ 3,336.65
	011.1049.520000	\$ 488.90	Plumbing Supplies & Building Hardware~	S1259841002	011.0014917			
	011.1049.520000	\$ 8.93	Plumbing Supplies & Building Hardware~	S1260183001	011.0014917			
	011.1049.520000	\$ 1,138.82	Plumbing Supplies & Building Hardware~	S1261049001	011.0014917			
006612 - QUALIFIED MOBILE, INC	011.1046.590000	\$ 810.00	Car Wash Services	292429		02/10/2022	608721	\$ 810.00
006956 - QUANTUM QUALITY CONSULTING, IN	011.1043.595200	\$ 8,700.00	Traffic Engineering Services	VE22001		02/10/2022	608722	\$ 9,174.00
	011.1043.596200	\$ 474.00	Traffic Engineering Services	VE22002				

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**EARLY CHECKS**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
000191 - STATE STREET LAUNDRY	011.1031.520000	\$ 6.30	Laundry Services~	11283	011.0014922	02/10/2022	608723	\$ 27.00
	011.1031.520000	\$ 11.70	Laundry Services~	11284	011.0014922			
	011.1031.520000	\$ 9.00	Laundry Services~	11285	011.0014922			
000287 - STATE WATER RESOURCES CONTROL	011.1043.593200	\$ 3,535.00	Annual Permit Fee	SW0223029		02/10/2022	608724	\$ 6,861.00
	011.1043.593200	\$ 3,326.00	Annual Permit Fee	WD0191488				
001159 - SUSAN SAXE-CLIFFORD, PH.D.	011.1026.597000	\$ 800.00	Psychological Evaluations	2201244		02/10/2022	608725	\$ 800.00
006985 - TERMINIX COMMERCIAL	011.1049.590000	\$ 65.00	Pest Control 11/21~	414545261		02/10/2022	608726	\$ 694.00
	011.1049.590000	\$ 65.00	Pest Control 11/21~	414545405				
	011.1048.590000	\$ 65.00	Pest Control 11/21~	414545497				
	011.1048.590000	\$ 75.00	Pest Control 12/21~	415599836				
	011.1048.590000	\$ 65.00	Pest Control 12/21~	415599896				
	011.1049.590000	\$ 84.00	Pest Control 12/21~	415599972				
	011.1049.590000	\$ 65.00	Pest Control 12/21~	415600022				
	011.1048.590000	\$ 80.00	Pest Control 12/21~	415600088				
	011.1049.590000	\$ 130.00	Pest Control 12/21~	415716220				

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**EARLY CHECKS**

VENDOR NAME AND NUMBER	ACCOUNT NUMBER	INVOICE AMOUNT	DESCRIPTION	INVOICE	P.O.#	PAYMENT DATE	CHECK NUMBER	PAYMENT AMOUNT
007004 - UMETECH, INC	011.9019.595210	\$ 1,200.00	Solid Waste Data Management Website	8869		02/10/2022	608727	\$ 1,200.00
000986 - WAXIE SANITARY SUPPLY	011.1049.520000	\$ 415.25	611702, 23GL SUSTAIN MIXED RECYCLING	80437471	011.0015011			
	011.1049.520000	\$ 42.56	Sales Tax 10.25	80437471				
	011.1049.520000	\$ 1,661.00	611703, 23GL SUSTAIN LANDFILL	80514546	011.0015011			
	011.1049.520000	\$ 170.25	Sales Tax 10.25	80514546		02/10/2022	608728	\$ 2,289.06
005721 - WOODCRAFT RANGERS	011.1021.797000	\$ 30,000.00	CommUNITY Fund Grant	012722		02/10/2022	608729	\$ 30,000.00
<b>TOTAL EARLY CHECKS</b>								<b>\$ 252,870.89</b>

**CITY OF VERNON  
OPERATING ACCOUNT  
WARRANT REGISTER NO. 82  
MARCH 1, 2022**

**RECAP BY FUND**

<u>FUND</u>	<u>ELECTRONIC TOTAL</u>	<u>EARLY CHECK TOTAL</u>	<u>WARRANT TOTAL</u>	<u>GRAND TOTALS</u>
011 - GENERAL	\$ 528,949.39	\$ 196,994.54	\$ 0.00	\$ 725,943.93
020 - WATER	483,585.97	25,525.64	0.00	509,111.61
055 - LIGHT & POWER	1,687,234.62	30,350.71	0.00	1,717,585.33
056 - NATURAL GAS	1,392.63	0.00	0.00	1,392.63
057 - FIBER OPTIC	12,608.50	0.00	0.00	12,608.50
<b>GRAND TOTAL</b>	<b>\$ 2,713,771.11</b>	<b>\$ 252,870.89</b>	<b>\$ 0.00</b>	<b>\$ 2,966,642.00</b>

**TOTAL CHECKS TO BE PRINTED 0**

# City Council Agenda Item Report

Submitted by: Cynthia Cano  
Submitting Department: Public Works  
Meeting Date: March 1, 2022

## **SUBJECT**

Public Works Department Monthly Report

## **Recommendation:**

Receive and file the January 2022 Building Report.

## **Background:**

The attached building report consists of total issued permits, major projects, demolition permits, new building permits, and certificate of occupancy status reports for the month of January 2022.

## **Fiscal Impact:**

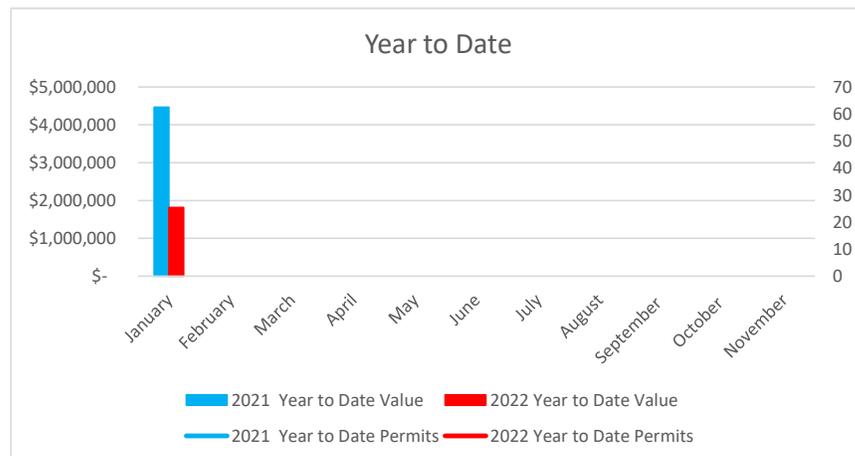
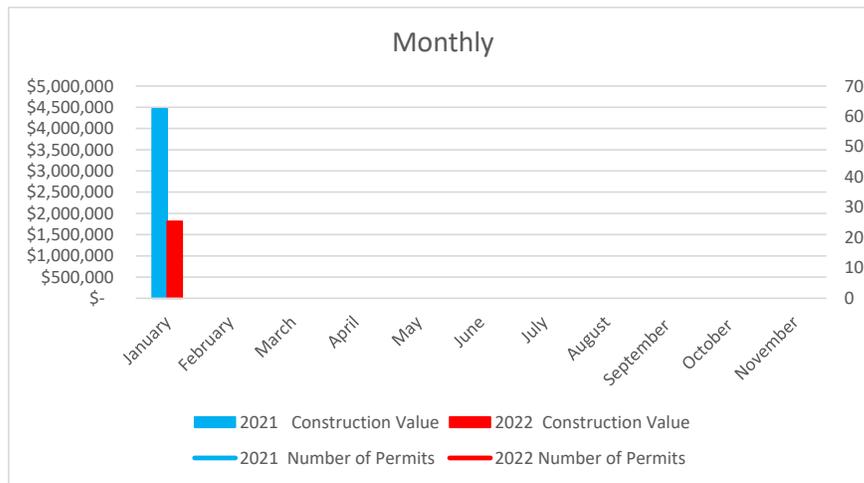
There is no fiscal impact associated with this report.

## **Attachments:**

1. [Public Works Department January 2022 Building Report](#)

**City of Vernon  
Building Division  
Monthly Report Summary**

	2021				2022				Year to Date	
	Construction Value	Number of Permits	Year to Date Value	Year to Date Permits	Construction Value	Number of Permits	Year to Date Value	Year to Date Permits	Permit Difference	Valuation Difference
January	\$ 4,464,611	62	\$ 4,464,611	62	\$ 1,813,324	29	\$ 1,813,324	29	-53%	-59%
February										
March										
April										
May										
June										
July										
August										
September										
October										
November										
December										





**City of Vernon**  
**Building Department**  
**Monthly Report from 1/1/2022 to 1/31/2022**

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<b>Type</b>	<b>Value</b>	<b># of Permits</b>
Demolition	\$66,400.00	1
Electrical	\$186,152.25	6
Grading	\$120,000.00	1
Industrial - Remodel	\$340,000.00	2
Mechanical	\$489,200.00	4
Miscellaneous	\$575,771.25	11
Plumbing	\$35,800.00	4
<hr/>		
January 2022 TOTALS PERMITS:	\$1,813,323.50	29
PREVIOUS MONTHS TOTAL	\$0.00	0
<hr/>		
YEAR TO DATE TOTAL	\$1,813,323.50	29
January 2021 TOTALS PERMITS:	\$4,464,611.00	62
PREVIOUS MONTHS TOTAL	\$0.00	0
<hr/>		
PRIOR YEAR TO DATE TOTAL	\$4,464,611.00	62



City of Vernon  
Building Department  
Demolition Report - January 2022

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4501 Downey Road  
PAPAZIAN, MARGARET TR  
4,600 sf.



**City of Vernon  
Building Department  
New Buildings Report - January 2022**

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None



**City of Vernon  
Building Department  
Major Projects from 1/1/2022 to 1/31/2022  
Valuations > 20,000**

<b>Permit No.</b>	<b>Project Address</b>	<b>Tenant</b>	<b>Description</b>	<b>Job Value</b>
<b>Demolition</b>				
B-2021-5098	4501 DOWNEY RD APN 6303017017		Demolition of structure. Slabs to remain in place. Referencing addresses 4505 and 4507 Downey Road. Diversion (weight) totals shall be submitted to the city prior to final inspection.	66400
<b>1</b>	<b>Record(s)</b>			<b>\$66,400.00</b>
<b>Electrical</b>				
B-2021-4875	3100 44TH ST APN 6303016005		Elec: roof mount solar: 654 PV modules and 4 inverters. 291.030 kw dc/272.277 kw cec ac)	134322.25
<b>1</b>	<b>Record(s)</b>			<b>\$134,322.25</b>
<b>Grading</b>				
B-2022-5149	4501 49TH ST APN 6304018018		Remove asphalt and replace with concrete. The line and grade to remain the same. The drain patterns will be maintained the same.	120000
<b>1</b>	<b>Record(s)</b>			<b>\$120,000.00</b>
<b>Industrial - Remodel</b>				
B-2021-5055	6043 MALBURG WAY APN 6310027044		Installation of new 2,131 SQ FT insulated panel cooler in existing warehouse	335000
<b>1</b>	<b>Record(s)</b>			<b>\$335,000.00</b>
<b>Mechanical</b>				
B-2021-4819	5300 BOYLE AVE APN 6310008020		Nitrogen generation equipment mechanical installation	150000
B-2021-5096	4305 SANTA FE AVE APN 6302017901		(1) AHU and (2) Condensing Units City hall basement cooling system update	275200
B-2021-4929	2801 46TH ST APN 6303014016		(2) new 10 ton package units for print room.	50000
<b>3</b>	<b>Record(s)</b>			<b>\$475,200.00</b>
<b>Miscellaneous</b>				
B-2021-5050	2651 45TH ST APN 6308005021		Installation of 405 storage racks	200000
B-2021-4886	5601 BICKETT ST APN 6310015036		Tenant Improvement (1- S Grain, 2 - Framework, 3 - Ventilator Installation)	40000
B-2021-5121	3751 SEVILLE AVE APN 6302020040	Fashion Nova	Install storage racks in warehouse area	65000
B-2022-5128	4900 DISTRICT BLVD		Replace existing gate	25000

	APN 6304014007			
B-2021-4876	3100 44TH ST APN 6303016005		Bldg: proof mount solar: 654 pv modules and 4 inverters. (20,375 sq ft) 13% roof coverage. *ballast system*	134322.25
B-2019-3525	1925 VERNON AVE APN 6302017052	Sprint	Sprint will remove (3) radios and swap (3) existing antennas with (3) new antennas and associated cabling. Install (2) Amob units on top of existing BBU cabinet and install (1) top hat on existing MMBTS cabinet.	24500
B-2022-5132	2250 52ND ST APN 6308016048		Install of 44 storage racks	35000
<b>7</b>	<b>Record(s)</b>			<b>\$523,822.25</b>
<b>14</b>	<b>Permit(s)</b>		<b>Total</b>	<b>\$1,654,744.50</b>



**City of Vernon  
Building Department  
Status of Certificates of Occupancy Requests  
Month of January 2022**

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Request for Inspection	<b>17</b>
Approved	<b>5</b>
Pending	<b>560</b>
Temporary Occupancies	<b>16</b>

**City of Vernon  
Certificate of Occupancy  
Applications Date From 1/1/2022 to 1/31/2022**

<b>Issued</b>	<b>Permit No.</b>	<b>Project Address</b>	<b>Tenant</b>	<b>Description</b>	<b>Fees Paid</b>	<b>Square Feet</b>
	C-2022-1844	4515 48TH ST APN 6304019010	John R Russo Trucking Inc.	Screenprinting of garments	885.00	8000
	C-2022-1845	3287 SLAUSON AVE APN 6310006007	Green Day Produce Inc.	Prouduce distributor/ wholesale	885.00	23963
	C-2022-1846	5111 HAMPTON ST APN 6308010032	Final Finishing Apparel	Garment Manufacturing	885.00	10836
	C-2022-1847	3817 SANTA FE AVE APN 6302015016	JS Duo International, Inc.	Manufcature and wholesales, cutting and manufacturing wholesale (women's clothing)	885.00	13200
	C-2022-1848	4559 MAYWOOD AVE APN 6304028033	Lamonica's Pizza Dough International, Inc.	pizza dough manufacturer	885.00	26497
	C-2022-1849	3706 26TH ST APN 5192030004	Lamonica's Pizza Dough International, Inc.	pizza dough manufacturer	885.00	34819
	C-2022-1850	3021 BANDINI BLVD. APN 6303002014	LA Cash and Carry Inc	General merchandise. Dollar store and discount store. General merchandise wholesaler.	885.00	10738
	C-2022-1851	2390 48TH ST APN 6308015043	Pinky's Iron Doors	Warehousing and distribution of metal windows and door.s Door window manufcaturing.	885.00	14458
	C-2022-1852	2555 CHAMBERS ST APN 6308008030	Rainfield Marketing Group, Inc	Wholesale produce	885.00	9000
	C-2022-1853	4535 48TH ST APN 6304019010	A Fresh Trading LLC	produce wholesale, sales, office misc works, loading, unloading	885.00	10000
	C-2022-1854	2833 LEONIS BLVD. APN 6303022004	Most Fabric, Inc.	Office. Fabric company that is selling fabric.	385.00	1500
	C-2022-1855	4120 BANDINI BLVD APN 6304003008	Southwest Processors Inc.	Treatment and disposal of non-hazardous waste water and grease	1,770.00	40453
	C-2022-1856	2003 VERNON AVE APN 6302017043	Bee Cool, LLC	General merchandise warehouse	885.00	47505
	C-2022-1857	4340 DISTRICT BLVD APN 6304023023	Moka Wholesale LLC	General merchandise	385.00	5000

<b>Issued</b>	<b>Permit No.</b>	<b>Project Address</b>	<b>Tenant</b>	<b>Description</b>	<b>Fees Paid</b>	<b>Square Feet</b>
	C-2022-1858	2101 38TH ST APN 6302013029	Complete Garment Inc	Industrial waste	0.00	
	C-2022-1859	2312 38TH ST APN 6302015013	Hannibal Industries	Locker room and meeting space	885.00	5050
	C-2022-1860	2306 38TH ST APN 6302015014	Hannibal Industries	Locker room and meeting space	885.00	5059
<b>Total for Certificate of Occupancy:</b>					<b>14,045.00</b>	<b>266,078.00</b>
<b>17 Permits(s)</b>					<b>Total Fees Paid</b>	14,045.00

**City of Vernon  
Certificate of Occupancy  
Issued Date From 1/1/2022 to 1/31/2022**

<b>Issued</b>	<b>Permit No.</b>	<b>Project Address</b>	<b>Tenant</b>	<b>Description</b>	<b>Fees Paid</b>	<b>Square Feet</b>
1/4/2022	C-2021-1820	3310 FRUITLAND AVE APN 6310002018	Love N Peace USA	Embroidery	385.00	600
1/25/2022	C-2021-1782	4355 FRUITLAND AVE APN 6304023025	Wiper Central USA, Inc.	Manufacture of industrial wiping rags	885.00	39120
1/26/2022	C-2021-1724	5304 ALCOA AVE APN 6310002023	Jobbers Meat Packing Co. Inc.	Manufacturing packaging storage	885.00	16000
1/26/2022	C-2021-1836	5151 HELITROPE AVE APN 6314002015	Hands Craft US, Inc.	Accessory/Offsite warehouse to manufacturing Warehousing and distribution of toys	885.00	16540
1/26/2022	C-2021-1772	2140 25TH ST APN 6302008007	DHNW, LLC	Warehouse and distribution of apparel	885.00	31677
<b>Total for Certificate of Occupancy:</b>					<b>3,925.00</b>	<b>103,937.00</b>
<b>5 Permits(s)</b>					<b>Total Fees Paid</b>	<b>3,925.00</b>

# City Council Agenda Item Report

Submitted by: Lissette Melendez  
Submitting Department: Public Works  
Meeting Date: March 1, 2022

## **SUBJECT**

Labor and Materials Contract with West Coast Arborists, Inc. for Urban Forest Management (Contract CS-1435)

## **Recommendation:**

- A. Find that the proposed action is exempt from California Environmental Quality Act (CEQA) review, in accordance with CEQA Guidelines § 15304, because the project consists of only minor alterations in vegetation that does not involve removal of healthy, mature, scenic trees; and
- B. Approve and authorize the City Administrator to execute a three (3) year contract with West Coast Arborists, Inc., in substantially the same form as submitted, for Urban Forest Management Services in an amount not-to-exceed \$325,000, with an effective date of April 1, 2022.

## **Background:**

The Urban Forest Management Project (Contract No. CS-1435) consists of providing annual services for maintenance, removal, and replacement of trees, as required, within the City's urban forest. The City has approximately 1,361 trees that comprise its urban forest.

As part of this project, the entire grid inventory of parkway trees will be scheduled for trimming. Additionally, the scope of work will include the trimming of all trees located at City government facilities, City-owned housing (front and back yards), and City-owned apartments on an annual basis.

For this contract, the City intends to piggyback on a current contract between the City of Bradbury (Bradbury) and West Coast Arborists, Inc. (West Coast) from Anaheim, California. Piggybacking is expressly authorized by Vernon Municipal Code § 3.32.110(A)(5), which exempts a contract from competitive bidding and competitive selection so long as services can be purchased from a vendor offering the same prices, terms and conditions as in a previous award from another public agency by competitive bid. Bradbury used a competitive bid process to obtain labor and material costs from West Coast which are at reasonable rates. By leveraging the West Coast negotiated terms and prices through piggybacking, Vernon will save time and resources that would otherwise be used in preparation for and during a vendor selection process. The agreement between Bradbury and West Coast includes set costs for pruning, and for the removal and replacement of trees within the City's urban forest. As authorized by the Vernon Municipal Code, the Finance Director has determined that it is to the advantage of the City to proceed with establishing a contract with West Coast that piggybacks upon the Bradbury contract. The City Attorney's Office has reviewed and approved the contract as to form.

Furthermore, West Coast recently completed Urban Forest Management Contract No. CS-1022 for the City with favorable results.

**Fiscal Impact:**

Funds in the amount of \$100,000 for urban forest management were included in the FY 2021-22 Repairs and Maintenance, Public Works Department/Street Operations budget, Account No. 011.1043.590000. Sufficient funds will be budgeted accordingly in subsequent years.

**Attachments:**

1. [CS-1435 - Urban Forest Management Services 22-25](#)

LABOR AND MATERIALS CONTRACT BETWEEN THE CITY OF VERNON AND WEST  
COAST ARBORISTS, INC., FOR URBAN FOREST MANAGEMENT SERVICES CONTRACT  
NO. CS-1435

COVER PAGE

Contractor:	West Coast Arborists, Inc.
Responsible Principal of Contractor:	Patrick Mahoney, President
Notice Information - Contractor:	West Coast Arborists, Inc. 2200 E. Via Burton Street Anaheim, CA 92806 Attention: Patrick Mahoney, President Phone: (714) 991-1900
Notice Information - City:	City of Vernon 4305 Santa Fe Avenue Vernon, CA 90058 Attention: Daniel Wall, Director of Public Works Telephone: (323) 583-8811 ext. 305
Commencement Date:	April 1, 2022
Termination Date:	March 31, 2025
Consideration:	Total not to exceed \$325,000.00 (includes all applicable sales tax); and more particularly described in Exhibit "F"
Records Retention Period	Three (3) years, pursuant to Section 8.3

LABOR AND MATERIALS CONTRACT BETWEEN THE CITY OF VERNON AND WEST  
COAST ARBORISTS, INC., FOR URBAN FOREST MANAGEMENT SERVICES CONTRACT  
NO. CS-1435

This Contract is made between the City of Vernon ("City"), a California charter City and California municipal corporation, and West Coast Arborists, Inc., a California corporation, with headquarters located at 2200 E. Via Burton Street, Anaheim, CA 92806 ("Contractor").

The City and Contractor agree as follows:

1.0 Contractor shall furnish all necessary and incidental labor, material, equipment, transportation and services as described in, and strictly in accordance with, and subject to all terms and conditions set forth in Specifications for Urban Forest Management Services, attached hereto and incorporated herein by reference as Exhibit "A", and set forth in Special Provisions for Urban Forest Management Services, attached hereto and incorporated herein by reference as Exhibit "B".

Contractor and the City of Bradbury (hereinafter, "Bradbury") previously entered into a competitively bid contract, which is set to commence on February 1, 2022 and terminate on January 31, 2024 (the "Bradbury Contract"). A copy of the Bradbury Contract is attached hereto and incorporated herein by this reference as Exhibit "C". The Vernon Municipal Code §3.32.110(A)(5), expressly authorizes piggybacking on an existing public agency contract as a template to form its own contract directly from a vendor offering the same prices, terms, and conditions as in a previous award from the City or another public agency by competitive bid.

2.0 All work shall be done in a manner satisfactory to the City's Director of Public Works (the "Director"), or the Director's designee, in writing, and shall be of highest quality with respect to the contract specifications.

In the event Contractor fails to perform satisfactorily the City shall advise Contractor in writing, and Contractor shall have thirty (30) days to cure such failure to satisfactorily perform. If Contractor fails to so cure its performance within said 30 days, the City may, at its option, terminate this Contract for default without further liability, other than payment to Contractor for work performed satisfactorily prior to the date of termination.

3.0 Contractor shall commence work upon the execution of this contract and shall perform work requested in writing by Director.

4.0 In consideration of satisfactory and timely Performance of requested work pursuant to the Schedule set forth in Exhibit "E", which is attached hereto and incorporated herein by reference, the City shall pay Contractor as follows:

The bid amounts, according to the requested and accepted price set forth in the Contractor's bid proposal, attached hereto and incorporated herein by reference as Exhibit "F". The total amount to be paid to Contractor during the term of this contract shall not exceed Three Hundred Twenty-Five Thousand Dollars (\$325,000.00) without the prior approval of the City Council and without a written amendment of this contract.

5.0 GENERAL TERMS AND CONDITIONS.

## 5.1 INDEPENDENT CONTRACTOR.

5.1.1 It is understood that in the performance of the services herein provided for, Contractor shall be, and is, an independent contractor, and is not an agent or employee of City and shall furnish such services in its own manner and method except as required by this Contract. Further, Contractor has and shall retain the right to exercise full control over the employment, direction, compensation and discharge of all persons employed by Contractor in the performance of the services hereunder. Contractor shall be solely responsible for, and shall indemnify, defend and save City harmless from all matters relating to the payment of its employees, including compliance with social security, withholding and all other wages, salaries, benefits, taxes, exactions, and regulations of any nature whatsoever.

5.1.2 Contractor acknowledges that Contractor and any subcontractors, agents or employees employed by Contractor shall not, under any circumstances, be considered employees of the City, and that they shall not be entitled to any of the benefits or rights afforded employees of City, including, but not limited to, sick leave, vacation leave, holiday pay, Public Employees Retirement System benefits, or health, life, dental, long-term disability or workers' compensation insurance benefits.

5.2 CONTRACTOR NOT AGENT. Except as the City may authorize in writing, Contractor and its subcontractors, if any, shall have no authority, express or implied, to act on behalf of or bind the City in any capacity whatsoever as agents or otherwise.

5.3 OWNERSHIP OF WORK. All reports, drawings, plans, specifications, computer tapes, floppy disks and printouts, studies, memoranda, computation sheets and other documents prepared by Contractor in furtherance of the work shall be the sole property of City and shall be delivered to City whenever requested. Contractor shall keep such documents and materials on file and available for audit by the City for at least three (3) years after completion or earlier termination of this Contract. Contractor may make duplicate copies of such materials and documents for its own files or for such other purposes as may be authorized in writing by the City.

5.4 CORRECTION OF WORK. Contractor shall promptly correct any defective, inaccurate or incomplete tasks, deliverables, goods, services and other work, without additional cost to the City. The performance or acceptance of services furnished by Contractor shall not relieve the Contractor from the obligation to correct subsequently discovered defects, inaccuracy or incompleteness.

5.5 WAIVER. The City's waiver of any term, condition, breach or default of this Contract shall not be considered to be a waiver of any other term, condition, default or breach, nor of a subsequent breach of the one waived.

5.6 SUCCESSORS. This Contract shall inure to the benefit of, and shall be binding upon, the parties hereto and their respective heirs, successors and/or assigns.

5.7 NO ASSIGNMENT. Contractor shall not assign or transfer this Contract or any rights hereunder without the prior written consent of the City and approval by the City Attorney, which may be withheld in the City's sole discretion. Any unauthorized assignment or transfer shall be null and void and shall constitute a material breach by the Contractor of its

obligations under this Contract. No assignment shall release the original parties or otherwise constitute a novation.

5.8 COMPLIANCE WITH LAWS. Contractor shall comply with all Federal, State, County and City laws, ordinances, resolutions, rules and regulations, which are, as amended from time to time, incorporated herein and applicable to the performance hereof.

5.9 ATTORNEY'S FEES. If any action at law or in equity is brought to enforce or interpret the terms of this Contract, the prevailing party shall be entitled to reasonable attorney's fees, costs and necessary disbursements in addition to any other relief to which such party may be entitled.

#### 6.0 INTERPRETATION.

6.1 APPLICABLE LAW. This Contract, and the rights and duties of the parties hereunder (both procedural and substantive), shall be governed by and construed according to the laws of the State of California, without regards to its conflict of laws rules.

6.2 ENTIRE CONTRACT. This Contract, including any Exhibits attached hereto, constitutes the entire contract and understanding between the parties regarding its subject matter and supersedes all prior or contemporaneous negotiations, representations, understandings, correspondence, documentation and agreements (written or oral).

6.3 WRITTEN AMENDMENT. This Contract may only be changed by written amendment executed by Contractor and the City Administrator or other authorized representative of the City, subject to any requisite authorization by the City Council. Any oral representations or modifications concerning this Contract shall be of no force or effect.

6.4 SEVERABILITY. If any provision in this Contract is held by any court of competent jurisdiction to be invalid, illegal, void, or unenforceable, such portion shall be deemed severed from this Contract, and the remaining provisions shall nevertheless continue in full force and effect as fully as though such invalid, illegal, or unenforceable portion had never been part of this Contract.

6.5 ORDER OF PRECEDENCE. In case of conflict between the terms of this Contract and the terms contained in any document attached as an Exhibit or otherwise incorporated by reference, the terms of this Contract shall strictly prevail. The terms of the City's Specifications shall control over the Contractor's bid.

6.6 CHOICE OF FORUM. The parties hereby agree that this Contract is to be enforced in accordance with the laws of the State of California, is entered into in the City of Vernon and that all claims or controversies arising out of or related to performance under this Contract shall be submitted to and resolved in a forum within the County of Los Angeles at a place to be determined by the rules of the forum.

6.7 TIME OF ESSENCE. Time is strictly of the essence of this Contract and each and every covenant, term and provision hereof.

6.8 AUTHORITY OF CONTRACTOR. The Contractor hereby represents and warrants to the City that the Contractor has the right, power, legal capacity and authority to

enter into and perform its obligations under this Contract, and its execution of this Contract has been duly authorized.

6.9 ARBITRATION OF DISPUTES. Any dispute for under \$25,000 arising out of or relating to the negotiation, construction, performance, non-performance, breach or any other aspect of this Contract, shall be settled by binding arbitration in accordance with the Commercial Rules of the American Arbitration Association at Los Angeles, California and judgment upon the award rendered by the Arbitrators may be entered in any court having jurisdiction thereof. This clause shall not preclude the Parties from seeking provisional remedies in aid of arbitration from a court of appropriate jurisdiction. The City does not waive its right to object to the timeliness or sufficiency of any claim filed or required to be filed against the City and reserves the right to conduct full discovery.

6.10 INDEMNITY.

6.10.1 Contractor agrees to indemnify, hold harmless and defend (even if the allegations are false, fraudulent or groundless), to the maximum extent permitted by law, the City, its City Council and each member thereof, and its officers, employees, commission members and representatives, from any and all liability, loss, suits, claims, damages, costs, judgments and expenses (including attorney's fees and costs of litigation) which in whole or in part result from, or arise out of, or are claimed to result from or to arise out of:

- A. any activity on or use of City's premises or facilities or any performance under this Contract; or
- B. any acts, errors or omissions (including, without limitation, professional negligence) of Contractor, its employees, representatives, subcontractors, or agents in connection with the performance of this Contract.

6.10.2 This contract to indemnify includes, but is not limited to, personal injury (including death at any time) and property or other damage (including, but without limitation, contract or tort or patent, copyright, trade secret or trademark infringement) sustained by any person or persons (including, but not limited to, companies, or corporations, Contractor and its employees or agents, and members of the general public). The sole negligence or willful misconduct of City, its employees or agents other than Contractor or Contractor's subcontractors are excluded from this indemnity contract.

6.11 RELEASE. Contractor agrees to release and covenants not to sue the City, its City Council and each member thereof, and its officers, employees, commission members and representatives for any damage or injury (including death) to itself, its officers, employees, agents and independent contractors damaged or claiming to be damaged from any performance under this Contract.

6.12 INSURANCE. Contractor shall, at its own expense, procure and maintain policies of insurance of the types and in the amounts set forth below, for the duration of the Contract, including any extensions thereto. The policies shall state that they afford primary coverage.

6.12.1 Automobile Liability with minimum limits of at least \$1,000,000 combined single limit including owned, hired, and non-owned liability coverage.

(1) Contractor agrees to subrogate automobile liability resulting from performance under this contract by agreeing to defend, indemnify and hold harmless, the City, and its respective employees, agents, and City Council from and against all claims, liabilities, suits, losses, damages, injuries and expenses, including all costs and reasonable attorney's fees ("Claims"), which are attributable to any act or omission by the City under the performance of the services.

6.12.2 General Liability with minimum limits of at least \$1,000,000 per occurrence and \$2,000,000 in aggregate written on an Insurance Services Office (ISO) Comprehensive General Liability "occurrence" form or its equivalent for coverage on an occurrence basis.

Premises/Operations and Personal Injury coverage is required. The City of Vernon, its directors, commissioners, officers, employees, agents and volunteers must be endorsed on the policy as additional insureds as respects liability arising out of the Contractor's performance of this Contract.

A. If Contractor employs other contractors as part of the services rendered, Contractor's Protective Coverage is required. Contractor may include all subcontractors as insureds under its own policy or shall furnish separate insurance for each subcontractor, meeting the requirements set forth herein.

B. Blanket Contractual Coverage.

C. Products/Completed Operations coverage.

D. Contractor agrees to subrogate General Liability resulting from performance under this contract by agreeing to defend, indemnify and hold harmless, the City, and its respective employees, agents, and City Council from and against all claims, liabilities, suits, losses, damages, injuries and expenses, including all costs and reasonable attorney's fees ("Claims"), which are attributable to any act or omission by the City under the performance of the services.

6.12.3 Errors and Omissions coverage in a sum of at least \$1,000,000, where such risk is applicable. Applicable aggregates must be identified and claims history provided to determine amounts remaining under the aggregate. Contractor shall maintain such coverage for at least one (1) year after the termination of this Contract.

- 6.12.4 Contractor shall comply with the applicable sections of the California Labor Code concerning workers' compensation for injuries on the job. Compliance is accomplished in one of the following manners:
- A. Provide copy of permissive self-insurance certificate approved by the State of California; or
  - B. Secure and maintain in force a policy of workers' compensation insurance with statutory limits and Employer's Liability Insurance with a minimal limit of \$1,000,000 per accident. The policy shall be endorsed to waive all rights of subrogation against City, its directors, commissioners, officers, employees, and volunteers for losses arising from performance of this Contract; or
  - C. Provide a "waiver" form certifying that no employees subject to the Labor Code's Workers' Compensation provision will be used in performance of this Contract.

6.12.5 Each insurance policy included in this clause shall be endorsed to state that coverage shall not be cancelled except after thirty (30) days' prior written notice to City.

6.12.6 Insurance shall be placed with insurers with a Best's rating of no less than AVIII.

6.12.7 Prior to commencement of performance, Contractor shall furnish City with a certificate of insurance for each policy. Each certificate is to be executed by a person authorized by that insurer to bind coverage on its behalf. The certificate(s) must be in a form approved by City. City may require complete, certified copies of any or all policies at any time.

6.12.8 Failure to maintain required insurance at all times shall constitute a default and material breach. In such event, Contractor shall immediately notify City and cease all performance under this Contract until further directed by the City. In the absence of satisfactory insurance coverage, City may, at its option: (a) procure insurance with collection rights for premiums, attorney's fees and costs against Contractor by way of set-off or recoupment from sums due Contractor, at City's option; (b) immediately terminate this Contract; or (c) self insure the risk, with all damages and costs incurred, by judgment, settlement or otherwise, including attorney's fees and costs, being collectible from Contractor, by way of set-off or recoupment from any sums due Contractor.

6.13 NOTICES. Any notice or demand to be given by one party to the other shall be given in writing and by personal delivery or prepaid first-class, registered or certified mail, addressed as follows. Notice simply to the City of Vernon or any other City department is not adequate notice.

If to the City: City of Vernon  
Attn: Daniel Wall, Director of Public Works  
4305 Santa Fe Avenue  
Vernon, CA 90058

With a Copy to: Carlos R. Fandino, Jr.  
City Administrator  
City of Vernon  
4305 Santa Fe Avenue  
Vernon, CA 90058

If to the Contractor: West Coast Arborists, Inc.  
Attn: Patrick Mahoney, President  
2200 E. Via Burton Street  
Anaheim, CA 92806

Any such notice shall be deemed to have been given upon delivery, if personally delivered, or, if mailed, upon receipt or upon expiration of three (3) business days from the date of posting, whichever is earlier. Either party may change the address at which it desires to receive notice upon giving written notice of such request to the other party.

6.14 TERMINATION FOR CONVENIENCE (Without Cause). City may terminate this Contract in whole or in part at any time, for any cause or without cause, upon fifteen (15) calendar days' written notice to Contractor. If the Contract is thus terminated by City for reasons other than Contractor's failure to perform its obligations, City shall pay Contractor a prorated amount based on the services satisfactorily completed and accepted prior to the effective date of termination. Such payment shall be Contractor's exclusive remedy for termination without cause.

6.15 DEFAULT. In the event either party materially defaults in its obligations hereunder, the other party may declare a default and terminate this Contract by written notice to the defaulting party. The notice shall specify the basis for the default. The Contract shall terminate unless such default is cured before the effective date of termination stated in such notice, which date shall be no sooner than ten (10) days after the date of the notice.

Termination for cause shall relieve the terminating party of further liability or responsibility under this Contract, including the payment of money, except for payment for services satisfactorily and timely performed prior to the service of the notice of termination, and except for reimbursement of (1) any payments made by the City for service not subsequently performed in a timely and satisfactory manner, and (2) costs incurred by the City in obtaining substitute performance.

6.16 ASSIGNMENT OF ANTITRUST CAUSES OF ACTION. Contractor hereby agrees to assign to the City all rights, title and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. § 15) or under Chapter 2 of the Cartwright Act (commencing with Section 16700) or part 2 of Division 7 of the California Business and Professions Code, or any similar or successor provisions of Federal or State law, arising from purchases of goods, services or materials pursuant to this Contract or any

subcontract. This assignment shall be made and become effective at the time the City tenders final payment to the Contractor, without further acknowledgment by the parties.

#### 7.0 ADDITIONAL ASSURANCES

7.1 EQUAL EMPLOYMENT OPPORTUNITY PRACTICES. Contractor certifies and represents that, during the performance of this Contract, the Contractor and any other parties with whom it may subcontract shall adhere to equal opportunity employment practices to assure that applicants and employees are treated equally and are not discriminated against because of their race, religion, color, national origin, ancestry, disability, sex, age, medical condition, marital status. Contractor further certifies that it will not maintain any segregated facilities. Contractor further agrees to comply with The Equal Employment Opportunity Practices provisions as set forth in Exhibit "D".

7.2 VERNON BUSINESS LICENSE. Contractor shall obtain, and pay any and all costs associated therewith, any Vernon Business License which may be required by the Vernon Municipal Code.

#### 7.3 MAINTENANCE AND INSPECTION OF RECORDS.

The City, or its authorized auditors or representatives, shall have access to and the right to audit and reproduce any of the Contractor's records to the extent the City deems necessary to insure it is receiving all money to which it is entitled under the Contract and/or is paying only the amounts to which Contractor is properly entitled under the Contract or for other purposes relating to the Contract.

The Contractor shall maintain and preserve all such records for a period of at least 3 years after termination of the Contract.

The Contractor shall maintain all such records in the City of Vernon. If not, the Contractor shall, upon request, promptly deliver the records to the City of Vernon or reimburse the City for all reasonable and extra costs incurred in conducting the audit at a location other than the City of Vernon, including, but not limited to, such additional (out of the City) expenses for personnel, salaries, private auditors, travel, lodging, meals and overhead.

7.4 CONFLICT. Contractor hereby represents, warrants and certifies that no member, officer or employee of the Contractor is a director, officer or employee of the City of Vernon, or a member of any of its boards, commissions or committees, except to the extent permitted by law.

7.5 ENFORCEMENT OF WAGE AND HOUR LAWS. Eight hours labor constitutes a legal day's work. The Contractor, or subcontractor, if any, shall forfeit twenty-five dollars (\$25) for each worker employed in the execution of this Contract by the respective Contractor or subcontractor for each calendar day during which the worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of Sections 1810 through 1815 of the California Labor Code as a penalty paid to the City; provided, however, work performed by employees of contractors in excess of 8 hours per day, and 40 hours during any one week, shall be permitted upon compensation for all hours worked in excess of 8 hours per day at not less than 1½ times the basic rate of pay.

7.6 PREVAILING WAGES. The provisions of California Labor Code 1770, et seq., regarding the payment of prevailing wages on public works, and related regulations, apply to all City contracts. In addition, the selected consultant and/or any subcontractor must be currently registered and qualified (including payment of any required fee) with the State Department of Industrial Relations pursuant to Labor Code section 1725.5. This project is subject to compliance monitoring and enforcement by the State Department of Industrial Relations.

[Signatures Begin on Next Page].

IN WITNESS WHEREOF, the Parties have executed this Contract as of the  
Commencement Date stated on the cover page.

City of Vernon, a California charter City  
and California municipal corporation

West Coast Arborists, Inc., a California  
corporation

By: \_\_\_\_\_  
Carlos Fandino, City Administrator

By: \_\_\_\_\_  
Name: Patrick Mahoney  
Title: President

ATTEST:

\_\_\_\_\_  
Lisa Pope, City Clerk

By: \_\_\_\_\_  
Name: Richard Mahoney  
Title: Secretary

APPROVED AS TO FORM:

\_\_\_\_\_  
Zaynah N. Moussa,  
Interim City Attorney

EXHIBIT A  
SPECIFICATIONS

# CS-1435: URBAN FOREST MANAGEMENT

## SPECIFICATIONS

### 1-1 GENERAL

#### 1-1.01 Contractor Must Make Thorough Investigation

It is the Contractor's responsibility to examine the location of the proposed work, to fully acquaint itself with the Specifications and the nature of the work to be done. Contractor shall have no claim against the City based upon ignorance of the nature and requirements of the project, misapprehension of site conditions, or misunderstanding of the Specifications or contract provisions.

#### 1-1.02 Ineligibility to Contract

If Contractor has been found by the State Labor Commissioner to be in violation of Sections 1777.1 and 1777.7 of the Labor Code Sections entitled "Public Works" Contractor shall be ineligible to be awarded a contract for this project. The period of debarment shall be not less than one year and up to three years as determined pursuant to Section 1777.7 of the Labor Code. The Contractor certifies that it is aware of these provisions and is eligible to bid on this contract.

The Contractor shall also be prohibited from performing work on this project with a subcontractor who is ineligible to perform work on a public works project pursuant to Section 1777.1 or 1777.7 of the Labor Code. The Contractor certifies that it has investigated the eligibility of each and every subcontractor it intends to use on this project and has determined that none is ineligible to perform work pursuant to the above provisions of law.

#### 1-1.03 Patent Fees: Patent, Copyright, Trade Secret and Trademark Fees

The Contractor cost shall include in the price bid any patent fees, royalties and charges on any patented article or process to be furnished or used in the prosecution of the Work.

#### 1-1.04 Taxes

Costs shall include all federal, state, local, and other taxes.

### 1-2 SPECIAL CITY REQUIREMENTS

#### 1-2.01 Equal Employment Opportunity in Contracting

##### 1-2.01.1 Policy

The City of Vernon is committed to a policy of Equal Opportunity Contracting. Contractor expressly agrees to comply with the City's ordinances and regulations regarding Equal Opportunity Employment as well as regulations that may be mandated by the source of the funds supporting this contract.

##### 1-2.01.2 Compliance

To the extent permitted by law, the Contractor expressly agrees to establish compliance with the Equal Employment Opportunity Practices Provisions of federal and state law.

### 1-3 GENERAL SPECIFICATIONS

#### 1-3.01 Quantities

The quantities contained in the contract documents are approximate only. The City may, in accordance with the Standard Specifications, order more or less work or material as necessary in the City's sole discretion. Payment will be made for the amount of work or material actually provided as determined by the City and accepted at the unit prices noted in Exhibit F.

#### 1-3.02 Registration and Qualifications of Contractors

Contractor shall be licensed to the extent required by Business and Professions Code Section 7000 et seq.

#### 1-3.03 Standard Specifications

For the purpose of this contract and except as otherwise provided below, all work shall be done in accordance with the provisions of the 2018 edition of "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" (commonly known as the "GREENBOOK"), including Supplements, prepared and promulgated by Public Works Standards, Inc., a mutual benefit corporation.

#### 1-3.04 Subcontracts

Pursuant to California Labor Code §1021.5, the Contractor must not willingly and knowingly enter into any agreement with any person, as an independent contractor, to provide any services in connection with the Work where the services provided or to be provided requires that such person hold a valid contractor's license issued pursuant to California Business and Professions Code §§7000 et seq. and such person does not meet the burden of proof of his/her independent contractor status pursuant to California Labor Code §2750.5. In the event that the Contractor shall employ any person in violation of the foregoing, the Contractor shall be subject to the civil penalties under California Labor Code §1021.5 and any other penalty provided by law. In addition to the penalties provided under California Labor Code §1021.5, the Contractor's violation of this Paragraph or the provisions of California Labor Code §1021.5 shall be deemed an event of the Contractor's default. The Contractor must require any Subcontractor of any tier performing or providing any portion of the Work to adhere to and comply with the foregoing provisions.

Pursuant to the provisions of Labor Code Section 1777.1, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations website at: <http://www.dir.ca.gov/dlse/debar.html>. The Contractor must not employ, hire, use or subcontract with any of the listed debarred contractors.

#### 1-3.07 Contract Bonds

Bonds of a surety shall not be required as part of this contract.

#### 1-3.08 Termination of Contract

Section 6-5, entitled "Termination of Contract", of the Standard Specifications is modified to read: "The City may terminate this contract in whole or in part at any time, for any cause or without cause, upon fifteen (15) calendar days written notice to the Contractor". If the contract is thus terminated by the City for reasons other than the Contractor's failure to perform its obligations, the City shall pay the Contractor a prorated amount based on the services satisfactorily completed and accepted prior to the effective date of

termination. Such payment shall be the Contractor's exclusive remedy for termination without cause.

1-3.10 Partial Payment

Payment shall be due the Contractor within thirty (30) calendar days after receipt of an itemized statement for work performed during the progress payment period.

1-3.12 Worker's Compensation Certification

California Labor Code §1860 and §3700 provide that every Contractor will be required to secure the payment of compensation to its employees. In accordance with the provisions of California Labor Code §1861, the Contractor, hereby certifies as follows:

"I am aware of the provisions of California Labor Code §3700 which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract."

EXHIBIT B  
SPECIAL PROVISIONS

## CS-1435: URBAN FOREST MANAGEMENT SERVICES

### SPECIAL PROVISIONS

#### I. GENERAL

##### SCOPE OF WORK

West Coast Arborists (West Coast) shall furnish all labor, materials, equipment, and transportation to do all work required to complete the work in accordance with the said Scope of Services for the unit prices named on Exhibit "F", with specific work determined by the City Public Works Director:

Urban forestry services include complete responsibility for proper care of all trees including tree trimming, tree removal, tree planting, tree health care, emergency response, and supervision to perform maintenance services for City trees as described herein including, but not limited to, the following:

- a. Tree Pruning
- b. Tree Removal
- c. Stump Removal
- d. Root Pruning
- e. Tree Planting
- f. Tree Staking
- g. Removal of Hazardous Branches
- h. Removal of tree debris and/or tree trimmings
  1. Worksite Cleanup
- J. Repair of Damaged Sprinklers
- k. Repair or Replacement of Damaged Fences or Walls
  1. Soil Replacement
- m. Damaged Tree and /or Shrub Replacement
- n. Collection of Tree Inventory Data
- o. Distribution of No Parking Signs and Door hangers
- p. Contact with the Public
- q. Employee Uniforms with Company Logo or Designation
- r. Vehicles and Equipment with Company Logos or Designation.
- s. Traffic Control.
- t. Other Services Set Forth in this Agreement

West Coast shall prune the entire grid inventory of Indian Laurel trees and one-half of the remaining grid inventory on an annual basis. In addition, West Coast shall prune all City government facilities and City owned housing trees on an annual basis. City government facilities include City Hall, Public Works Building, Petrelli Building, Gas and Electric Building, and Fire Station No. 2. City owned housing are located on Fruitland Avenue, Furlong Place, and Vernon Avenue. The work at the City Housing locations shall include the pruning of trees in the front and back yards. The City reserves the right to make changes or modifications to the pruning cycles at its discretion.

Government Facilities

Vernon City Hall: 4305 Santa Fe Avenue  
Public Works Building: 4305 Santa Fe Avenue  
Gas and Electric Building: 4990 Seville Avenue  
Petrelli Electric Building: 2323 East Vernon Avenue  
Fire Station No. 2: 4301 Santa Fe Avenue

City-Owned Housing

Fruitland Avenue: 3345 through 3365  
Vernon Avenue: 3550 through 3560  
Furlong Place: 4321 through 4330

City-Owned Apartments

50th Street: 3376 through 3390

**SPECIFICATIONS**

All work shall conform to the latest edition of Pruning Standards of the Western Chapter ISA and these specifications. In all cases the Director of Public Works, or their designee, shall have complete and sole discretion in determining conformance and acceptability of the trees trimmed by West Coast. West Coast must hold a valid, in good standing California D-49 and C-27 Contractor's License through the duration of the contract term.

**COORDINATION**

**West Coast shall coordinate the work with the City of Vernon's Public Work's Department per an approved schedule.**

**CONSTRUCTION SCHEDULE**

West Coast shall provide the City with a proposed schedule two (2) weeks in advance of performing services. West Coast shall notify City representative when they arrive on site to perform services within the City. West Coast shall keep the Public Works Department informed of their progress at all times.

**CONSTRUCTION HOURS**

**The proposed tree trimming shall be between the hours of 7:00 a.m. to 4:00 p.m. Monday thru Friday except on the City of Vernon's arterial streets. Arterial Street workhours shall be between 9:00 a.m. to 2:30 p.m. Monday thru Friday.**

**DELAYS AND EXTENSIONS OF TIME**

The Provisions of Section 6-4 entitled "Delays and Extensions of Time" of the Standard Specifications shall apply except as modified and supplemented below.

The second paragraph of subsection 6-4.1 is hereby deleted and the following paragraph shall be inserted in its place:

No extension of time will be granted for a delay caused by the inability of the Contractor to obtain materials, equipment and labor, except as authorized by the Engineer. The length of the contact time stipulated includes any time which may be required to obtain materials, equipment, and labor. The Contractor shall be deemed to have ascertained the availability of materials, equipment and labor and considered same in its construction schedule.

### **CLASSIFICATIONS AND TASKS**

The provisions of Section 4-1 entitled "Control of Materials" of the Standard Specifications shall apply. In addition, any work deemed unacceptable by the Public Works Director, whether a cause is determined or not shall be repaired or replaced by the Contractor at his expense.

### **LIQUIDATED DAMAGES**

In accordance with Section 6-9 of the Standard Specifications, for each consecutive calendar day required to complete the work in excess of the time specified herein for its completion, as adjusted in accordance with Section 6-4 of the Standard Specifications, the Contractor shall pay to the City, or have withheld from monies due it, the sum of **\$500**. The parties agree that damages are difficult to estimate, and that this sum is a fair calculation of damages that does not constitute a penalty.

### **COMPLIANCE WITH LAWS, REGULATIONS, AND SAFE PRACTICES**

The Contractor shall perform all work in a safe, competent manner and in accordance with all federal, state, and local statutes, regulations, ordinances, rules, and governmental orders.

The Contractor will be solely and completely responsible for the conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

Inspection of the Contractor's performance by the City, its agents, or employees is not intended to include review of the adequacy of the Contractor's safety measures in or near the jobsite.

### **CONSTRUCTION ORDER OF WORK**

Work within certain commercial areas of the various districts shall be scheduled so as to lessen the impact upon businesses and dining establishments.

#### **Requirements - General:**

1. All construction shall conform to Sections 6-1 and 6-2 of the Standard Specifications and shall proceed in a smooth, efficient, timely and continuous manner. As such, once construction is started in a work area, the Contractor will be required to work continuously in that work area until construction has been completed and the work area is open and

accessible to both vehicular and pedestrian traffic in a manner approved by the Public Works Street Supervisor before the next stage of work will be allowed to begin.

2. Once construction is started in a work area, the Contractor shall not withdraw manpower or equipment from that work area in order to allow the start of construction in another work area if doing so, in the opinion of the Public Works Street Supervisor, delays the completion of the work presently under construction.
3. Unless otherwise stated, the Contractor shall maintain continuous access to all commercial developments and businesses within the project limits, including store and restaurant entrances, and drive approaches, unless the Contractor has obtained the approval of the Public Works Street Supervisor to close either such access or drive approach.
4. No stockpiling of material and construction equipment in or on public streets or sidewalks will be permitted on this project. Material and equipment placed in or on public streets or sidewalks and in the construction, areas shall be used the same day.

### **CHARACTER OF WORKERS**

If any subcontractor or person employed by the Contractor shall appear to the Public Works Street Supervisor to be incompetent, intemperate, troublesome, or acts in a disorderly or otherwise objectionable manner, he shall be immediately discharge from the project on the requisition of the Engineer, and such person shall not be reemployed on the work. If said individual has an ownership interest in the contracting entity, the Public Works Street Supervisor will serve written notice upon the Contractor, in accordance with Section 6-7, "Termination of Contract for Default", of the Standard Specifications, demanding complete and satisfactory compliance with the Contract.

### **PROTECTION OF THE PUBLIC**

West Coast shall take such steps and precautions as his/her operations warrant to protect the public from danger, loss of life, loss of property or interruption of public services. Unforeseen conditions may arise which will require that immediate provisions be made to protect the public from danger or loss, or damage to life and property, due directly or indirectly to prosecution of work under this contract. Whenever, in the opinion for the Public Works Street Supervisor, a condition exists which West Coast has not taken sufficient precaution of public safety, protection of utilities and/or protection of adjacent structures or property, the Public Works Street Supervisor will order West Coast to provide a remedy for the condition. If West Coast fails to act on the situation within a reasonable time period as determined by the Street Supervisor, or in the event of an emergency situation, the Street Supervisor may provide suitable protection by causing such work to be done and material to be furnished as, in the opinion of the Street Supervisor, may seem reasonable and necessary. The cost and expense of all repairs (including labor and materials) as are deemed necessary, shall be borne by West Coast. All expenses incurred by the City for emergency repairs will be deducted from the final payment due to West Coast.

### **MOBILIZATION**

The cost of all preparatory work and operations for the multiple movements of personnel, equipment, supplies, and incidentals to the various project sites will be included in the Contract, and no extra

compensation will be paid to West Coast.

### **QUALITY OF WORK**

The provisions of Section 4-1.1 entitled "Control of Materials" of the Standard Specifications shall apply. In addition, any work deemed unacceptable by the Public Works Director, whether a cause is determined or not shall be repaired or replaced by the Contractor at his expense.

- a. West Coast will be held responsible for the preservation of all public and private property along and adjacent to the work being done, and will be required to exercise due precaution to avoid and prevent any damage or injury thereto as a consequence of their operation. All trees, shrubs, ground covers, fences, warning signals, street signs, walks, walls, structures, stairways, sprinklers or any other property, shall be adequately protected and should not be removed or disturbed without permission from the City. Any damages resulting from West Coast's neglect shall be repaired and/or replaced at their own expense.
- b. Such repairs and/or replacement shall be performed by West Coast at no cost to the City, and shall be accomplished as directed by the Director of Public Works or their representative. Repairs shall be made immediately after damage or alteration occurs. Deductions shall be made from West Coast's payment in the amount necessary to compensate the City for such repairs in the event such repair work is done by City forces or another source.
- c. Any physical damages incurred by West Coast to private or public property shall be corrected in a manner and within a time period dictated by the Public Works Department. Failure by West Coast to make such corrections may result in the City causing said corrections to be made and deducting the cost for the same from payments due the contractor for work performed. An additional 20% penalty charge shall be added as compensation to the City of overhead cost incurred in causing said corrections to be made.
- d. Damage to ground cover shall be repaired by replacement with the appropriate variety of plant material. Size and spacing shall be determined by the Director.
- e. Damage to shrubs may be corrected by appropriate pruning; however, if in the opinion of the Director the damage is severe, the shrub shall be removed and replaced with the same variety and size.
- f. Damage to trees shall be addressed in the following manner:
  1. Trees in the contract area may be checked before contract work begins, and random checks may be carried out during the contract period.
  2. The Contractor should inspect all trees for existing damages prior to conducting any work activity in the assigned project area. Observed tree damage shall be documented by memo to the assigned area inspector.
- g. Any damage to public or private property shall be reported to the City within one (1) hour.

- h. All work shall be inspected, verified, and completed to the satisfaction of the Director, or their authorized representative.
- i. Contractor shall maintain good public relations at all times. The work shall be conducted in a manner that will cause the least possible interference or annoyance to the public.

**PROHIBITED PARKING IN WORK AREA**

- a. The Contractor shall provide 72 hours' notice for parking restrictions that will be posted in the work area during construction. All traffic and parking signs are to be provided and posted by West Coast.
- b. The Contractor's vehicles and equipment shall not be parked or set in such a manner that they block pedestrian access or vehicular right-of-way except as required to comply with all safety standards of OSHA or CAL-OSHA.
- c. The City of Vernon will not allow West Coast to park or store any equipment or materials, used in the performance of this contract, in the City right-of-way or on City property unless approved by the Public Works Director or his representative. If necessary, West Coast shall submit the proposed staging areas to the City for review and approval before the construction.

**MATERIAL SUBMITTALS**

No additional material submittals will be necessary as part of this contract unless otherwise stated in these provisions.

**PUBLIC CONVENIENCE**

West Coast shall conduct operations to minimize the obstruction of access and inconvenience to the public and the City of Vernon's emergency personnel.

**SANITARY FACILITIES**

West Coast shall furnish and maintain sanitary (toilet) facilities by the worksites for the entire construction period.

**EQUIPMENT**

Prior to the contract, West Coast shall allow inspection, by City personnel, of the vehicles designated for the project. Those vehicles that pass inspection will have their 1.0. numbers recorded and will be the only vehicles allowed to work on the project. All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working order at all times.

**AREAS TO BE MAINTAINED**

Work sites will include City trees within the Public right-of-way. Worksites will also include City Government Buildings, City Apartments (50<sup>th</sup> Street) and City Housing. Trees to be serviced will be provided

on a **grid basis** and may consist of individual trees located throughout the City. It should be understood that this project may not be solely "section" or "block" type tree trimming.

## **TREE TRIMMING CLASSIFICATIONS AND TASKS**

### **A. Trim:**

1. Full Trim shall consist of: Removal of all dead, dying, diseased, crossing or rubbing, and weak limbs or branches within the canopy; Clearing limbs from all wires, lights, buildings, and/or traffic signal devices; Raising the canopy to a minimum of 14-feet above the curb; Restructuring the crown to provide thinning out of, reduction of, and/or restoration of; Removal of trunk sprouts, water sprouts and suckers; Balancing of the crown; Removal of "v" crotches and establishing scaffold branches of young trees while maintaining clearance for vehicle and pedestrian traffic in public rights-of-way.
2. A Clearance Trim shall consist of: Removing branches to provide a 14-foot clearance from the top of the curb, clearing limbs or branches away from wires, lights, buildings, and/or traffic signal devices; removal of trunk sprouts, water sprouts and suckers; clearing limbs or branches to provide for pedestrian travel.
3. A Palm Trim shall consist of: Removing all dead or drooping fronds and fruiting clusters as close to the trunk as possible without cutting into outer trunk line, leaving approximately five to seven healthy fronds evenly spaced no more than 45 degrees above horizontal.

### **B. Removals:**

1. Trees identified for removal are to be cut back and lowered to the ground in sections. Sections shall be no larger than can be safely controlled. Extreme care must be taken to prevent unsafe working or other hazardous conditions to individuals, landscape, structures, obstacles, or private property.
2. Trees shall not be stump cut and felled. Tree stumps to be removed shall be completely ground a minimum of eighteen inches (18") below soil surface unless utilities prevent an 18" depth. All surface roots within a depth of eight inches (8") in a twelve-foot (12') zone around the tree shall be removed by grinding. Grinding of stump shall be completed within 48 hours of tree removal.
3. All excavation as a result of this process shall be back filled exactly level with surrounding soil, compacted and fine graded. Excess debris, trimmings, branches, and wood shall be removed from the worksite and shall follow as closely as possible to the removal operation. All debris shall be properly removed off site and at the contractor's expense. However, twigs, branches, leaves, and large wood shall be removed from the site prior to the crew vacating the worksite.

### **C. Root Pruning:**

1. Root pruning consists of cutting the roots vertically along a straight, linear plane, usually along the curb and sidewalk to an 18" depth. Root pruning is done to prevent further damage to infrastructure and/or private property caused by surface roots of City trees. Root pruning is also done to accommodate repairs of sidewalk, curbs, asphalt, and other infrastructure.

2. Root pruning shall be done with a power stump grinder or power root cutter, unless the Director of Public Works gives prior approval. Extreme care should be taken to prevent damage to landscape, irrigation, structures, obstacles, individuals, or private property.

**D. Stump Grinding:**

1. Stumping consists of grinding tree stumps to a minimum of eighteen inches (18”) below soil surface unless utilities prevent a 18" depth. All surface roots within a depth of a 12 ft. zone around the tree shall be removed by grinding. Extreme care should be taken to prevent damage to landscape, irrigation, structures, obstacles, individuals, utilities, or private property. West Coast shall notify Dig Alert two working days prior to stump grinding at 1-800-227-2600.

**E. Tree Planting:**

1. The City shall prepare a work order of tree planting locations throughout the City.
2. West Coast shall follow the ANSI Planting Standards and ISA Best Management Practices for Tree Planting.
3. West Coast shall provide a ninety (90) day warranty for all tree plantings. West Coast is responsible for tree watering and maintenance during the warranty period. Any trees that die or do not establish during the warranty period shall be replaced at West Coats sole expense. The warranty period will start over for any trees that require replacement.

**INFORMATION TECHNOLOGY AND SYSTEMS REQUIREMENTS**

1. West Coast is required to provide and operate an electronic tree inventory and work order system that is geographical information system (GIS) based so the City can view the tree inventory on a map, submit work orders, update tree history, generate reports about work history within the City, and view the maintenance records for each City tree.
2. West Coast is responsible for providing the City representative and their Staff with login and password information for the system.
3. West Coast is required to maintain the system through the entire contract term and issue any system updates needed.
4. West Coast currently has the City of Vernon's existing City tree inventory. West Coast will provide the City with an Excel and Shape file format so it can be uploaded into our system. The existing City's tree inventory contains the following information: Inventory Identification, District, Address, Tree Location (example: park, median, side, front), Tree Number, Tree Species (both common and botanical name), diameter at breast height (DBH) expressed in a range, height expressed in a range, tree condition, parkway width, location information, and past work history.
5. Maintaining and Updating City Tree Inventory:
  - a. During any services performed by West Coast, the tree inventory shall be updated including

maintenance performed, updated condition, updated DBH, and updated height.

- b. If the City requests additional trees to be planted in the City, then West Coast shall create new planting sites at the City requested location.
- c. The City tree inventory including any updates or revisions shall belong to the City. West Coast shall supply the City with an updated Excel file of the tree inventory at the end of the contract term.
- d. The City will own all final documents and data developed during the services.

### **EMERGENCY CALLS FOR TREE SERVICES**

The Contractor is required to respond on an on-call basis for emergency work such as downed trees and branches. Emergency work may occur twenty-four (24) hours a day, seven (7) days a week including weekdays, weekends, and holidays.

- 1. West Coast shall have the capability to receive and to respond immediately to a call of an emergency nature during normal working hours and during hours outside of normal working hours. Calls of an emergency nature received by the City shall be referred to the Contractor for immediate disposition.
- 2. West Coast shall have the duty to respond to emergency calls within two (2) hours from time of notification.
- 3. West Coast must designate a person within their company who will respond to emergency calls twenty-four (24) hours a day.
- 4. West Coast shall submit telephone number(s) to the City that can be used to obtain emergency service on a twenty-four (24) hour basis. West Coast's name and telephone number will also be listed with the Police Department.
- 5. Upon arriving at any emergency, it shall be the responsibility of West Coast to eliminate all unsafe conditions that would adversely affect the health, safety or welfare of the public.
- 6. Failure to respond within two (2) hours of attempt to contact may result in a **\$200** penalty per incident. Failure to respond to an emergency at any level will subject West Coast to any primary or secondary cost arising from said emergencies.

### **EMERGENCY WORK CHARGES**

Emergency work charges shall include all personnel, equipment and materials used in completing work in an emergency situation. This includes night work and work on weekends and holidays. Contractor shall respond to emergency calls within two (2) hours from time of notification.

## **HOURLY CHARGES**

Regular hourly work charges shall include trimming and cleanup of broken limbs, thinning, re-staking and/or removal of young trees, and other services generally as a result of storm damage. This work shall occur during normal working hours.

EXHIBIT C  
PROFESSIONAL SERVICES AGREEMENT  
(CITY OF BRADBURY / WEST COAST ARBORISTS, INC.)

**PROFESSIONAL SERVICES AGREEMENT**  
(City of Bradbury / West Coast Arborists, Inc.)

**1. IDENTIFICATION**

THIS PROFESSIONAL SERVICES AGREEMENT (“Agreement”) is entered into by and between the City of Bradbury, a municipal corporation (“City”), and West Coast Arborists, Inc., a California Corporation (“WCA” or “Consultant”).

**2. RECITALS**

- 2.1 City has determined that it requires the following professional services from a consultant: tree maintenance services as described in the Request for Proposals issued by the City, including services proposed in the Consultant’s proposal dated January 10, 2022;
- 2.2 Consultant represents that it is fully qualified to perform such professional services by virtue of its experience and the training, education and expertise of its principals and employees. Consultant further represents that it is willing to accept responsibility for performing such services in accordance with the terms and conditions set forth in this Agreement.

**NOW, THEREFORE**, for and in consideration of the mutual covenants and conditions herein contained, City and Consultant agree as follows:

**3. DEFINITIONS**

- 3.1 “Scope of Services”: Such professional services as are set forth in the Request for Proposals issued by the City, including services proposed in Consultant’s proposal dated January 10, 2022, a copy of which is attached hereto as Exhibit A and incorporated herein by this reference.
- 3.2 “Approved Fee Schedule”: Such compensation rates as are set forth in Consultant’s Bid Schedule, which is a part of Exhibit “A” with a total not to exceed the sum of \$15,000 per year. Any extras will be submitted to City and approved by City prior to commencement of work.
- 3.3 “Commencement Date”: February 1, 2022.
- 3.4 “Expiration Date”: January 31, 2024.

**4. TERM**

The term of this Agreement shall commence at 12:00 a.m. as of the Commencement Date and shall expire at 11:59 p.m. on the Expiration Date unless extended by written agreement of the parties or terminated earlier in accordance with Section 17 (“Termination”) below.

**5. CONSULTANT'S SERVICES**

- 5.1 Consultant shall perform the services identified in the Scope of Services. City shall have the right to request, in writing, changes in the Scope of Services. Any such changes mutually agreed upon by the parties, and any corresponding increase or decrease in compensation, shall be incorporated by written amendment to this Agreement. In the absence of written amendment, the total compensation and costs payable to Consultant under this Agreement shall not exceed the sum of fifteen thousand dollars (\$15,000) per year, unless a higher amount is specifically approved in advance and in writing by City.
- 5.2 Consultant shall perform all work to the highest professional standards of Consultant's profession and in a manner satisfactory to City. Consultant shall comply with all applicable federal, state and local laws and regulations, including the conflict of interest provisions of Government Code Section 1090 and the Political Reform Act (Government Code Section 81000 *et seq.*) to the extent applicable.
- 5.3 During the term of this Agreement, Consultant shall not perform any work for another person or entity for whom Consultant was not working at the Commencement Date if both (i) such work would require Consultant to abstain from a decision under this Agreement pursuant to a conflict of interest statute and (ii) City has not consented in writing to Consultant's performance of such work.
- 5.4 Consultant represents that it has, or will secure at its own expense, all personnel required to perform the services identified in the Scope of Services. All such services shall be performed by Consultant or under its supervision, and all personnel engaged in the work shall be qualified to perform such services. Herminio Padilla, Area Manager, shall be Consultant's project administrator and shall have direct responsibility for management of Consultant's performance under this Agreement. No change shall be made in Consultant's project administrator without City's prior written consent.

**6. COMPENSATION**

- 6.1 City agrees to compensate Consultant for the services provided under this Agreement, and Consultant agrees to accept in full satisfaction for such services, payment in accordance with the Approved Fee Schedule and Section 5.1 of this Agreement above.
- 6.2 Consultant shall submit to City an invoice, on a monthly basis, for the services performed pursuant to this Agreement. The invoice shall itemize the services rendered during the billing period and the amount due. Within ten business days of receipt of the invoice, City shall notify Consultant in writing of any disputed

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amounts included on the invoice. Within thirty calendar days of receipt of the invoice, City shall pay all undisputed amounts included on the invoice. City shall not withhold applicable taxes or other payroll deductions from payments made to Consultant unless otherwise required by law.

- 6.3 Payments for any services requested by City and not included in the Scope of Services shall be made to Consultant by City on a time-and-materials basis using Consultant's standard fee schedule. Fees for such additional services shall be paid within sixty days of the date Consultant issues an invoice to City for such services

**7. OWNERSHIP OF WRITTEN PRODUCT**

All reports, documents or other written material ("written product" herein) developed by Consultant in the performance of this Agreement shall be and remain the property of City without restriction or limitation upon use or dissemination by City. Consultant may take and retain copies of such written product as desired, but no such written product shall be the subject of a copyright application by Consultant.

**8. RELATIONSHIP OF PARTIES**

Consultant is, and shall at all times remain as to City, a wholly independent contractor. Consultant shall have no power to incur any debt, obligation, or liability on behalf of City or otherwise to act on behalf of City as an agent. Neither City nor any of its agents shall have control over the conduct of Consultant or any of Consultant's employees, except as set forth in this Agreement. Consultant shall not represent that it is, or that any of its agents or employees are, in any manner employees of City.

Under no circumstances shall Consultant look to City as its employer. Consultant shall not be entitled to any benefits. City makes no representation as to the effect of this independent contractor relationship on Consultant's (or its personnels') previously earned PERS retirement benefits, if any, and Consultant specifically assumes the responsibility for making such a determination. Consultant shall be responsible for all reports and obligations including, but not limited to: social security taxes, income tax withholding, unemployment insurance, disability insurance, and workers' compensation.

**9. CONFIDENTIALITY**

All data, documents, discussion, or other information developed or received by Consultant or provided for performance of this Agreement are deemed confidential and shall not be disclosed by Consultant without prior written consent by City. City shall grant such consent if disclosure is legally required. Upon request, all City data shall be returned to City upon the termination or expiration of this Agreement.

Consultant shall not be restricted from releasing information, including confidential

information, in response to a subpoena, court order, or other legal process. Consultant shall not be required to resist such subpoena, court order, or legal process, but shall promptly notify City in writing of the demand for information before Consultant responds to such demand.

## **10. INDEMNIFICATION**

- 10.1 The parties agree that City, its officers, agents, employees and volunteers should, to the fullest extent permitted by law, be protected from any and all loss, injury, damage, claim, lawsuit, cost, expense, attorneys' fees, litigation costs, taxes, or any other cost arising out of or in any way related to the performance of this Agreement. Accordingly, the provisions of this indemnity provision are intended by the parties to be interpreted and construed to provide City with the fullest protection possible under the law. Consultant acknowledges that City would not enter into this Agreement in the absence of Consultant's commitment to indemnify and protect City as set forth herein.
- 10.2 To the fullest extent permitted by law, Consultant shall indemnify, hold harmless, and defend City, its officers, agents, employees and volunteers from and against any and all claims and losses, costs or expenses for any damage due to death or injury to any person, whether physical, emotional, consequential or otherwise, and injury to any property arising out of or in connection with Consultant's negligence, recklessness or willful misconduct or other wrongful acts, errors or omissions of Consultant or any of its officers, employees, servants, agents, or subcontractors, or anyone directly or indirectly employed by either Consultant or its subcontractors, in the performance of this Agreement or its failure to comply with any of its obligations contained in this Agreement, except such loss or damage which is caused by the sole negligence or willful misconduct of City. Such costs and expenses shall include reasonable attorneys' fees due to counsel of City's choice, expert fees and all other costs and expenses of litigation.
- 10.3 City shall have the right to offset against any compensation due Consultant under this Agreement any amount due City from Consultant as a result of Consultant's failure to pay City promptly, any indemnification arising under this Section 10 and any amount due City from Consultant arising from Consultant's failure to (i) pay taxes on amounts received pursuant to this Agreement; (ii) satisfy obligations to any governmental entity, or (iii) comply with applicable workers' compensation laws.
- 10.4 The obligations of Consultant under this Section 10 are not limited by the provisions of any workers' compensation statute or similar act. Consultant expressly waives its statutory immunity under such statutes or laws as to City, its officers, agents, employees and volunteers.

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City of Bradbury / West Coast Arborists, Inc.

- 10.5 Consultant agrees to obtain executed indemnity agreements with provisions identical to those set forth in this Section 10 from each and every subcontractor or any other person or entity involved by, for, with or on behalf of Consultant in the performance of this Agreement. If Consultant fails to obtain such indemnity obligations from others as required herein, or if such agreements prove to be inadequate to protect City for any reason, Consultant agrees to be fully responsible and to indemnify, hold harmless and defend City, its officers, agents, employees and volunteers from and against any and all claims and losses, costs or expenses for any damage due to death or injury to any person and injury to any property resulting from any alleged intentional, reckless, negligent, or otherwise wrongful acts, errors or omissions of Consultant's subcontractors or any other person or entity involved by, for, with or on behalf of Consultant in the performance of this Agreement. Such costs and expenses shall include reasonable attorneys' fees incurred by counsel of City's choice.
- 10.6 City does not, and shall not, waive any rights that it may possess against Consultant because of the acceptance by City, or the deposit with City, of any insurance policy or certificate required pursuant to this Agreement. This hold harmless and indemnification provision shall apply regardless of whether or not any insurance policies apply to the claim, demand, damage, liability, loss, cost or expense.

**11. INSURANCE**

- 11.1 During the term of this Agreement, Consultant shall carry, maintain, and keep in full force and effect insurance against claims for death or injuries to persons or damages to property that may arise from or in connection with Consultant's performance of this Agreement. Such insurance shall be of the types and in the amounts as set forth below:

11.1.1 General liability insurance. Consultant shall maintain commercial general liability insurance with coverage at least as broad as Insurance Services Office form CG 00 01, in an amount not less than \$5,000,000 per occurrence, \$5,000,000 general aggregate, for bodily injury, personal injury, and property damage. The policy must include contractual liability that has not been amended. Any endorsement restricting standard ISO "insured contract" language will not be accepted.

Automobile liability insurance. Consultant shall maintain automobile insurance at least as broad as Insurance Services Office form CA 00 01 covering bodily injury and property damage for all activities of the Consultant arising out of or in connection with Work to be performed under this Agreement, including coverage for any owned, hired, non-owned or rented vehicles, in an amount not less than \$2,000,000 combined single limit for each accident.

Professional Services Agreement  
*City of Bradbury / West Coast Arborists, Inc.*

Workers' compensation insurance. Consultant shall maintain Workers' Compensation Insurance (Statutory Limits) and Employer's Liability Insurance (with limits of at least \$1,000,000).

Consultant shall submit to Agency, along with the certificate of insurance, a Waiver of Subrogation endorsement in favor of Agency, its officers, agents, employees and volunteers.

Umbrella or excess liability insurance. Consultant shall obtain and maintain an umbrella or excess liability insurance policy with limits that will provide bodily injury, personal injury and property damage liability coverage at least as broad as the primary coverages set forth above, including commercial general liability and employer's liability. Such policy or policies shall include the following terms and conditions:

- A drop down feature requiring the policy to respond if any primary insurance that would otherwise have applied proves to be uncollectible in whole or in part for any reason;
- Pay on behalf of wording as opposed to reimbursement;
- Concurrency of effective dates with primary policies; and
- Policies shall "follow form" to the underlying primary policies.
- Insureds under primary policies shall also be insureds under the umbrella or excess policies.

11.1.2 Professional liability (errors & omissions) insurance. Consultant shall maintain professional liability insurance that covers the Services to be performed in connection with this Agreement, in the minimum amount of \$1,000,000 per claim and in the aggregate. Any policy inception date, continuity date, or retroactive date must be before the effective date of this agreement and Consultant agrees to maintain continuous coverage through a period no less than three years after completion of the services required by this agreement.

11.1.3 Consultant shall procure and maintain Sexual Abuse/Molestation Liability coverage with limits of not less than \$1,000,000 per occurrence and \$2,000,000 general aggregate. Coverage may be provided as part of Commercial General Liability coverage, Professional Liability coverage, or as a separate policy.

11.1.4 Requirements not limiting. Requirements of specific coverage features or

Professional Services Agreement  
*City of Bradbury / West Coast Arborists, Inc.*

limits contained in this Section are not intended as a limitation on coverage, limits or other requirements, or a waiver of any coverage normally provided by any insurance. Specific reference to a given coverage feature is for purposes of clarification only as it pertains to a given issue and is not intended by any party or insured to be all inclusive, or to the exclusion of other coverage, or a waiver of any type. If the Consultant maintains higher limits than the minimums shown above, the City requires and shall be entitled to coverage for the higher limits maintained by the Consultant. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City.

- 11.2 Consultant shall require each of its subcontractors to maintain insurance coverages that meet all of the requirements of this Agreement.
- 11.3 The policy or policies required by this Agreement shall be issued by an insurer admitted in the State of California and with a rating of at least A:VII in the latest edition of Best's Insurance Guide.
- 11.4 Consultant agrees that if it does not keep the aforesaid insurance in full force and effect, City may either (i) immediately terminate this Agreement; or (ii) take out the necessary insurance and pay the premium(s) thereon at Consultant's expense.
- 11.5 At all times during the term of this Agreement, Consultant shall maintain on file with City's Risk Manager a certificate or certificates of insurance showing that the policies required by this Agreement are in effect in the required amounts and naming City and its officers, employees, agents and volunteers as additional insureds. Consultant shall file with City's Risk Manager such certificate(s) prior to commencement of work under this Agreement.
- 11.6 Consultant shall provide proof to City's Risk Manager that policies of insurance required herein expiring during the term of this Agreement have been renewed or replaced with other policies providing at least the same coverage at least two weeks prior to the expiration of the coverages.
- 11.7 The general liability and automobile policies of insurance required by this Agreement shall contain endorsements naming City and its officers, employees, agents and volunteers as additional insureds. All of the policies required under this Agreement shall contain an endorsement providing that the policies cannot be canceled or reduced except on thirty days' prior written notice to City. Consultant agrees to require its insurer to modify the certificates of insurance to delete any exculpatory wording stating that failure of the insurer to mail written notice of cancellation imposes no obligation, and to delete the word "endeavor" with regard to any notice provisions.
- 11.8 The insurance provided by Consultant shall be primary to any other coverage

Professional Services Agreement  
*City of Bradbury / West Coast Arborists, Inc.*

available to City. Any insurance or self-insurance maintained by City and/or its officers, employees, agents or volunteers, shall be in excess of Consultant's insurance and shall not contribute with it.

11.9 All insurance coverage provided pursuant to this Agreement shall not prohibit Consultant, and Consultant's employees, agents or subcontractors, from waiving the right of subrogation prior to a loss. Consultant hereby waives all rights of subrogation against City.

11.10 Any deductibles or self-insured retentions must be declared to and approved by City. At the option of City, Consultant shall either reduce or eliminate the deductibles or self-insured retentions with respect to City, or Consultant shall procure a bond guaranteeing payment of losses and expenses.

11.11 Procurement of insurance by Consultant shall not be construed as a limitation of Consultant's liability or as full performance of Consultant's duties to indemnify, hold harmless and defend under Section 10 of this Agreement.

**12. MUTUAL COOPERATION**

12.1 City shall provide Consultant with all pertinent data, documents and other requested information as is reasonably available for the proper performance of Consultant's services under this Agreement.

12.2 If any claim or action is brought against City relating to Consultant's performance in connection with this Agreement, Consultant shall render any reasonable assistance that City may require in the defense of that claim or action.

**13. RECORDS AND INSPECTIONS**

Consultant shall maintain full and accurate records with respect to all matters covered under this Agreement for a period of three years after the expiration or termination of this Agreement. City shall have the right to access and examine such records, without charge, during normal business hours. City shall further have the right to audit such records, to make transcripts therefrom and to inspect all program data, documents, proceedings, and activities.

**14. PERMITS AND APPROVALS**

Consultant shall obtain, at its sole cost and expense, all permits and regulatory approvals necessary for Consultant's performance of this Agreement. This includes, but shall not be limited to, professional licenses, encroachment permits and building and safety permits and inspections.

**15. NOTICES**

Any notices, bills, invoices, or reports required by this Agreement shall be deemed received on: (i) the day of delivery if delivered by hand, facsimile or overnight courier service during Consultant's and City's regular business hours; or (ii) on the third business day following deposit in the United States mail if delivered by mail, postage prepaid, to the addresses listed below (or to such other addresses as the parties may, from time to time, designate in writing).

If to City:  
City of Bradbury  
600 Winston Avenue  
Bradbury, CA 91008  
Attn: Sophia Musa  
Management Analyst  
Telephone: (626) 358-3218  
Facsimile: (626) 303-5154

If to Consultant:  
West Coast Arborists, Inc.  
2200 E. Via Burton Street  
Anaheim, CA 92806  
Attn: Victor Gonzalez  
Vice President  
Telephone: (714) 991-1900  
Cell Phone: (714) 412-4225  
Facsimile: (714) 956-3745

With courtesy copy to:

Cary S. Reisman, City Attorney  
Jones Mayer  
37777 North Harbor Boulevard  
Fullerton, CA 92835  
Telephone: (714) 446-1400  
Facsimile: (714) 446-1448

**16. SURVIVING COVENANTS**

The parties agree that the covenants contained in Section 9, Section 10, Paragraph 12.2 and Section 13 of this Agreement shall survive the expiration or termination of this Agreement.

**17. TERMINATION**

17.1. City may terminate this Agreement for any reason on five calendar days' written notice to Consultant. Consultant may terminate this Agreement for any reason on thirty calendar days' written notice to City. Consultant agrees to cease all work

Professional Services Agreement  
City of Bradbury / West Coast Arborists, Inc.

under this Agreement on or before the effective date of any notice of termination. All City data, documents, objects, materials or other tangible things shall be returned to City upon the termination or expiration of this Agreement.

- 17.2 If City terminates this Agreement due to no fault or failure of performance by Consultant, then Consultant shall be paid based on the work satisfactorily performed at the time of termination. In no event shall Consultant be entitled to receive more than the amount that would be paid to Consultant for the full performance of the services required by this Agreement.

**18. PREVAILING WAGE LAW**

Consultant is aware of the requirements of California Labor Code Section 1720, et seq., and 1770, et seq., as well as California Code of Regulations, Title 8, Section 16000, et seq., (“Prevailing Wage Laws”), which require the payment of prevailing wage rates and the performance of other requirements on certain “public works” and “maintenance” projects. If the services under this Agreement are being performed as part of an applicable “public works” or “maintenance” project, as defined by the Prevailing Wage Laws, and if the total compensation is \$1,000 or more, Consultant agrees to fully comply with such Prevailing Wage Laws. Consultant shall defend, indemnify, and hold City, its elected officials, officers, employees, and agents free and harmless from any claim or liability arising out of any failure or alleged failure of Consultant to comply with the Prevailing Wage Laws.

**19. GENERAL PROVISIONS**

- 19.1 Consultant shall not delegate, transfer, subcontract or assign its duties or rights hereunder, either in whole or in part, without City’s prior written consent, and any attempt to do so shall be void and of no effect. City shall not be obligated or liable under this Agreement to any party other than Consultant.
- 19.2 In the performance of this Agreement, Consultant shall not discriminate against any employee, subcontractor, or applicant for employment because of race, color, creed, religion, sex, marital status, sexual orientation, national origin, ancestry, age, physical or mental disability medical condition or any other unlawful basis.
- 19.3 The captions appearing at the commencement of the sections hereof, and in any sub-paragraph thereof, are descriptive only and for convenience in reference to this Agreement. Should there be any conflict between such heading, and the section or paragraph at the head of which it appears, the section or paragraph, and not such heading, shall govern construction of this Agreement. Masculine or feminine pronouns shall be substituted for the neuter form and vice versa, and the plural shall

Professional Services Agreement  
*City of Bradbury / West Coast Arborists, Inc.*

be substituted for the singular and vice versa, in any place or places herein in which the context requires such substitution(s).

- 19.4 The waiver by City or Consultant of any breach of any term, covenant or condition of this Agreement shall not be deemed to be a waiver of such term, covenant or condition or of any subsequent breach of the same or any other term, covenant or condition of this Agreement. No term, covenant or condition of this Agreement shall be deemed to have been waived by City or Consultant unless in a writing signed by one authorized to bind the party asserted to have consented to the waiver.
- 19.5 Each right, power and remedy provided for herein or now or hereafter existing at law, in equity, by statute, or otherwise shall be cumulative and in addition to every other right, power, or remedy provided for herein or now or hereafter existing at law, in equity, by statute, or otherwise. The exercise, the commencement of the exercise, or the forbearance from the exercise by any party of any one or more of such rights, powers or remedies shall not preclude the simultaneous or later exercise by such party of any of all of such other rights, powers or remedies. If legal action shall be necessary to enforce any term, covenant or condition herein contained, the party prevailing in such action, whether or not reduced to judgment, shall be entitled to its reasonable court costs, including any accountants' and attorneys' fees incurred in such action. The venue for any litigation shall be Los Angeles County, California and Consultant hereby consents to jurisdiction in Los Angeles County for purposes of resolving any dispute or enforcing any obligation arising under this Agreement.
- 19.6 If any term or provision of this Agreement or the application thereof to any person or circumstance shall, to any extent, be invalid or unenforceable, then such term or provision shall be amended to, and solely to, the extent necessary to cure such invalidity or unenforceability, and in its amended form shall be enforceable. In such event, the remainder of this Agreement, or the application of such term or provision to persons or circumstances other than those as to which it is held invalid or unenforceable, shall not be affected thereby, and each term and provision of this Agreement shall be valid and enforced to the fullest extent permitted by law.
- 19.7 This Agreement shall be governed and construed in accordance with the laws of the State of California.
- 19.8 All documents referenced as exhibits in this Agreement are hereby incorporated into this Agreement. In the event of any material discrepancy between the express provisions of this Agreement and the provisions of any document incorporated herein by reference, the provisions of this Agreement shall prevail. This instrument contains the entire Agreement between the parties with respect to the transactions contemplated herein. No prior oral or written agreements are binding upon the parties. Amendments hereto or deviations herefrom shall be effective and binding

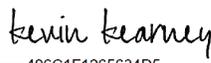
Professional Services Agreement  
City of Bradbury / West Coast Arborists, Inc.

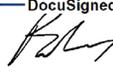
only if made in writing and executed by City and Consultant.

**TO EFFECTUATE THIS AGREEMENT**, the parties have caused their duly authorized representatives to execute this Agreement on the dates set forth below.

**“City”**  
**City of Bradbury**

**“Consultant”**  
**West Coast Arborists, Inc., a CA Corporation**

DocuSigned by:  
B  \_\_\_\_\_  
496C1F1265634D5...  
Kevin Kearney, City Manager

DocuSigned by:  
By:  \_\_\_\_\_  
324C79FBEE1F4FC...  
Patrick Mahoney, President

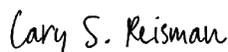
Date: 2/3/2022

Date: 2/3/2022

Attest:

Approved as to form:

DocuSigned by:  
 \_\_\_\_\_  
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Claudia Saldana, City Clerk

DocuSigned by:  
 \_\_\_\_\_  
EE42B31405E64BE...  
Cary S. Reisman, City Attorney

**EXHIBIT A**  
**TREE MAINTENANCE SERVICE PROPOSAL**



Tree Care Professionals Serving Communities Who Care About Trees

www.WCAINC.com

January 10, 2022

City of Bradbury  
**Attn: Sophia Musa**  
600 Winston Avenue  
Bradbury, CA 91008

**RE: RFP: Tree Maintenance Services**  
**Due: Tuesday, January 11, 2022 at 05:00PM**

To whom it may concern;

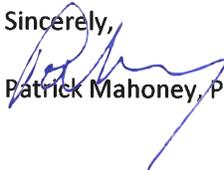
Thank you for allowing West Coast Arborists, Inc. (WCA) the opportunity to submit a proposal for tree maintenance services for the City of Bradbury. WCA is a family-owned and operated company employing over 1,000 full-time employees providing various tasks to achieve one goal: serving communities who care about trees. We have reviewed, understand, and agree to the terms and conditions described in this RFP. We also hereby acknowledge that we meet the minimum requirements and responded to each of these requirements to the best of our ability. Our proposal is valid for a minimum of 90 days.

WCA's corporate values include listening to customers and employees to help improve services offered. By establishing clear goals and expectations for the organization, supporting its diverse teams, and exchanging frequent feedback from customers and employees, we are able to provide 'gold standard' tree care services. WCA's top management team has created a culture where employees become accountable for actions and results. Our Tree Care Industry Association (TCIA) company-wide accreditation is evidence of the commitment WCA has to our safety and training programs, customer satisfaction and our capacity to maintain industry standards.

WCA has a 49-year track record of working for more than 330 California and Arizona municipalities as well as other various agencies. Our company has been in business since 1972 and is licensed by the California State Contractors License Board under license #366764. We have held this license in good standing since 1978. The license specializes in Class C61 (Tree Service), Class C27 (Landscaping) and Class C31(Traffic Control). We currently employ over 80 Certified Arborists and over 150 Certified Tree workers, as recognized by the International Society of Arboriculture. WCA is also registered with the Department of Industrial Relations (DIR) for Public Works projects, our registration number is 1000000956. All work will be performed in-house; no subcontractors will be used.

Our employees will operate from our Anaheim Office located at 2200 East Via Burton, Anaheim, CA 92806. For questions related to this proposal and who has the authority to negotiate/present please contact Victor Gonzalez, V.P. Business Development, at (714) 991-1900 or at [vgonzalez@wcainc.com](mailto:vgonzalez@wcainc.com). Herminio Padilla, Area Manager, will be assigned to this project should WCA be awarded a contract. He can be reached at (714) 412-7577 or [hpadilla@wcainc.com](mailto:hpadilla@wcainc.com).

Sincerely,

  
Patrick Mahoney, President

**West Coast Arborists, Inc.**

2200 E. Via Burton Street • Anaheim, CA 92806 • 714.991.1900 • 800.521.3714 • Fax 714.956.3745

**BID PROPOSAL  
TREE MAINTENANCE AND REMOVAL  
CITY OF BRADBURY, CALIFORNIA**

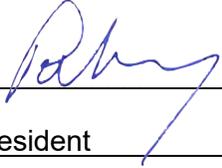
The cost of all labor, services, material, equipment and installation necessary for the completion of the work itemized under this schedule, even though not shown or specified, shall be included in the unit price for the various items shown herein. For a description of the work associated with each bid item, see **Bid Item Descriptions** above.

This proposal does not list quantities for the Base Bid. Following the award of a tree maintenance and removal contract, the base bid will be utilized by City staff to design a grid trimming system that will maximize the use of existing City tree maintenance budget amounts. Thus, the total number of trees to be trimmed under the initial year of an annual grid trimming program is not known at this time. It is estimated that current budgeting will allow for the removal and replacement of the trees listed in the Additive Alternate Bid below and for grid trimming of as many as 200 trees. However, these quantities listed in this Bid Schedule are intended only as a guide for the Contractor as to the anticipated order of magnitude of work.

The City of Bradbury reserves the right to increase or decrease the quantity of any item or omit items as may be necessary, and the same shall in no way affect or void the contract, except that appropriate additions or deductions from the contract total price will be made at the stipulated unit price in accordance with these Contract Documents.

The City of Bradbury reserves the right to reject any and all bids, to waive any informality in a bid, and to make awards in the interest of the City of Bradbury.

The Contractor will not be reimbursed for work performed for his convenience, or as required to adapt to field conditions, or for unauthorized work performed outside of that required by the Contract Documents. The proposal schedule shall include all costs for labor, services, material, equipment, and installation associated with completing the work in place per this request for proposals.

AUTHORIZED SIGNATURE:  \_\_\_\_\_

TITLE: Patrick Mahoney, President \_\_\_\_\_

DATE: 1/10/22 \_\_\_\_\_

CONTRACTOR'S LICENSE NUMBER: 366764 \_\_\_\_\_

CONTRACTOR'S LICENSE CLASSIFICATION(S): C27,C31,C61/D49 \_\_\_\_\_

**BID PROPOSAL  
TREE MAINTENANCE AND REMOVAL  
CITY OF BRADBURY, CALIFORNIA**

The undersigned, as bidder, declares that he/she has examined all of the documents and requirements contained in this request for proposals for the above referenced project, and that he/she will contract with the City of Bradbury on the form of contract provided herewith to do everything necessary for the fulfillment of this contract at the price, and on the terms and conditions therein contained.

The following are included and are to be considered as forming a part of this proposal:

- BID PROPOSAL**
- BID SCHEDULE**
- BIDDER'S STATEMENT REGARDING INSURANCE COVERAGE**
- STATEMENT REGARDING CONTRACTOR'S LICENSING LAWS.**

We agree if our proposal is accepted and a contract for the performance of the work is entered into with the City of Bradbury, to so plan the work and to prosecute it with such diligence that all of the work shall be completed within a timely manner.

NAME OF BIDDER (FIRM): West Coast Arborists, Inc.

MAILING ADDRESS: 2200 East Via Burton, Anaheim, CA 92806

CA - S Corporation  
STATE AND TYPE OF INCORPORATION:

714-991-1900  
TELEPHONE NUMBER:

  
AUTHORIZED SIGNATURE:

Patrick Mahoney, President  
TITLE:

1/10/22  
DATE:

Please refer to next page  
(If Company is a Corporation, provide corporate resolution



Tree Care Professionals Serving Communities Who Care About Trees

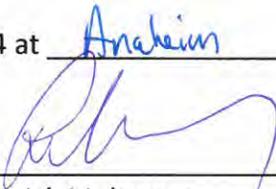
www.WCAINC.com

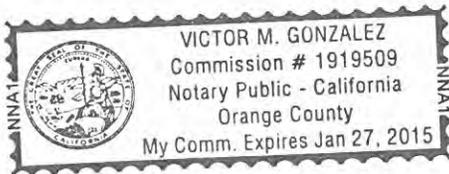
**CERTIFICATE OF CORPORATE AUTHORITY**

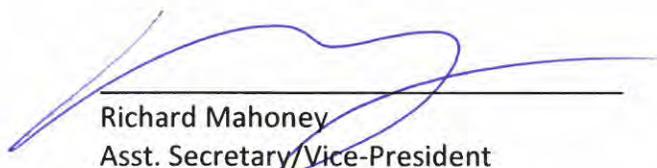
I, Richard Mahoney, being the Assistant Secretary of West Coast Arborists, Incorporated, do hereby affirm and represent as follows:

- I. That **PATRICK MAHONEY** is President of West Coast Arborists, Incorporated, and as President, is authorized to execute all documents, deeds, and contracts on behalf of West Coast Arborists, Incorporated. Furthermore, Patrick Mahoney is authorized to sign on behalf of this corporation on all contracts, bids and legally binding contracts.
- II. That **RICHARD MAHONEY** is Vice-President and Assistant Secretary of West Coast Arborists, Incorporated, and as Vice-President and Assistant Secretary, is authorized to execute all documents, deeds, and contracts on behalf of West Coast Arborists, Incorporated. Furthermore, Richard Mahoney is authorized to sign on behalf of this corporation on all contracts, bids and legally binding contracts.
- III. That **ROSE EPPERSON** is Vice-President and Treasurer of West Coast Arborists, Incorporated, and as Treasurer, is authorized to execute all documents, deeds, and contracts on behalf of West Coast Arborists, Incorporated. Furthermore, Rose Epperson is authorized to sign on behalf of this corporation on all contracts, bids and legally binding contracts.

Executed this 11<sup>th</sup> day of July, 2014 at Anaheim, California.

  
 \_\_\_\_\_  
 Patrick Mahoney  
 President  
 West Coast Arborists, Inc.



  
 \_\_\_\_\_  
 Richard Mahoney  
 Asst. Secretary/Vice-President  
 West Coast Arborists, Inc.

Sworn and subscribed before me this 11<sup>th</sup> day of July, 2014.

  
 \_\_\_\_\_  
 Notary Public

**West Coast Arborists, Inc.**

## Bid Schedule

<b>Grid or Annual Tree Trimming</b>		
<b>Bid Item</b>	<b>Unit</b>	<b>Unit Price</b>
	Per tree	\$85.00
<b>Full trim (Service request or Special Request)</b>		
<b>Tree Size (dbh)</b>	<b>Unit</b>	<b>Unit Price</b>
0-6"	Per tree	\$50.00
7-16"	Per tree	\$100.00
17-24"	Per tree	\$190.00
25-36"	Per tree	\$290.00
37" and over	Per tree	\$390.00
<b>Tree Removal</b>		
Tree and stump	Per dbh	\$44.00
Tree only	Per dbh	\$34.00
Stump only	Per stump diameter	\$10.00
<b>Tree Planting</b>		
15 gallon w/root barrier	Per tree	\$145.00
15 gallon w/o root barrier	Per tree	\$160.00
24 inch box w/ root barrier	Per tree	\$300.00
24 in box w/o root barrier	Per tree	\$320.00
<b>Crew rental</b>		
Standard time	Per manhour	\$100.00
Overtime	Per manhour	\$100.00
<b>Certified Arborist Services</b>		
	Per Hour	\$100.00
<b>Additional Equipment Rates</b>		
	Per hour	N/A
	<b>Total Base Bid</b>	<b>\$2,423.00</b>

**Total Base Bid in words:**

Two Thousand, Four Hundred Twenty-Three and 00/100

**PROPOSAL  
TREE MAINTENANCE AND REMOVAL  
CITY OF BRADBURY, CALIFORNIA**

**WORKERS' COMPENSATION INSURANCE CERTIFICATE**

The Contractor shall execute the following form as required by the California Labor Code, Sections 1860 and 1861:

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

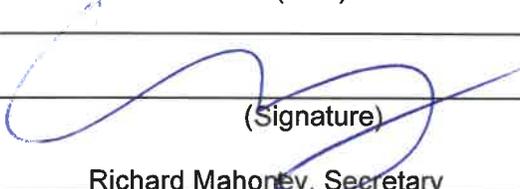
DATE: 1/10/22

Contractor's Business Name West Coast Arborists, Inc.  
(Contractor)

By:   
(Signature)

Patrick Mahoney, President  
(Title)

Attest: \_\_\_\_\_

By:   
(Signature)

Richard Mahoney, Secretary  
(Title)

**STATEMENT REGARDING INSURANCE COVERAGE  
TREE MAINTENANCE AND REMOVAL  
CITY OF BRADBURY, CALIFORNIA**

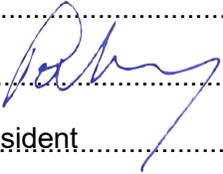
The undersigned representative of Bidder hereby certifies that he/she has reviewed the insurance coverage requirements specified herein. Should Bidder be awarded the contract for the work, the undersigned further certifies that Bidder can meet all of these specification requirements for insurance including insurance coverage of his/her subcontractors.

NAME OF BIDDER: West Coast Arborists, Inc.

MAILING ADDRESS: 2200 East Via Burton, Anaheim, CA 92806

.....

.....

AUTHORIZED SIGNATURE:  .....

TITLE: Patrick Mahoney, President

DATE: 1/10/22

**Proposal Submittal**

Please complete the required forms in the enclosed RFP and email forms by Tuesday, January 11, 2022 prior to 5:00pm to:

**Sophia Musa**  
[smusa@cityofbradbury.org](mailto:smusa@cityofbradbury.org)  
**Management Analyst**  
**City of Bradbury**

Questions can be directed to Sophia Musa at the email listed above and also to the Bradbury City Manager, Kevin Kearney, at [kkearney@cityofbradbury.org](mailto:kkearney@cityofbradbury.org).



**CITY OF BRADBURY**  
RFP: Tree Maintenance Services

WCAINC.COM • 800.521.3714 • LIC #366764 • DIR #1000000956



*Setting the gold standard.*



Tree Pruning



Tree Removal



Tree Planting



GPS Tree Inventory



Emergency Response



Plant Health Care



ISA Certified



# CORPORATE CAPABILITIES

**WEST COAST ARBORISTS, INC. (WCA)** is a family-owned and operated union company employing over 1,000 full-time employees providing tree maintenance and management services. We are proudly serving over 330 municipalities and public agencies. We provide superior and safe tree care operations seven days a week, 24 hours a day throughout California and Arizona.

### COMPANY INFORMATION

President: Patrick Mahoney  
Organization Type: Corporation  
Established: 1972  
Federal Tax ID: 95-3250682  
DIR Registration: 1000000956  
Members of Laborers' Union: LiUNA!

### CORPORATE OFFICE

2200 E. Via Burton St.  
Anaheim, CA 92806

### REGIONAL OFFICES

- Fresno, CA
- Indio, CA
- Phoenix, AZ
- Pinole, CA
- Riverside, CA
- Sacramento, CA
- San Diego, CA
- San Jose, CA
- Stockton, CA
- Ventura, CA

### CONTRACT ADMINISTRATION

Victor Gonzalez, Vice President  
Corporate Office  
Phone (714) 991-1900  
Fax (714) 956-3745  
Email: vgonzalez@wcainc.com

### FIELD MANAGEMENT

Herminio Padilla, Area Manager  
2200 East Via Burton  
Anaheim, CA 92806  
Phone (714) 991-1900  
Fax (714) 956-3745  
Email: hpadilla@wcainc.com

**EMERGENCY RESPONSE 24/7**  
866-LIMB-DOWN

### OUR VISION

As a corporate citizen, WCA's responsibility and accountability are to the communities where we do business. We hold ourselves to the highest standards of ethical conduct and environmental responsibility, communicating openly with our customers and the communities in which we work. It is our goal and vision to lead the industry in state-of-the-art urban tree care and management services.

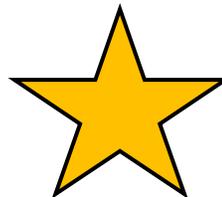
*Tree care professionals serving communities who care about trees.*

### 100% CUSTOMER SATISFACTION

Customer satisfaction is our top priority. We guarantee your complete satisfaction with every facet of our services. Our dedication to customer service has earned WCA a reputation unrivaled in the industry for dependability, integrity, quality and courtesy. We authorize our employees to do whatever is necessary to achieve the highest quality results. We know that high quality work saves our customer's valuable time and is far more cost effective if we do our work properly the first time. We are committed to courteous and prompt customer service to fully resolve any issue.



**90+ ISA Certified Arborists**



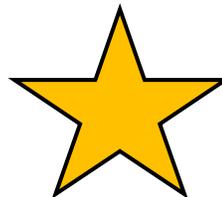
**45+ Years Experience (Similar Size & Scope)**



**1,000+ Qualified Employees**



**Proud Union Company LiUNA!**



**Local Office Anaheim**



**1500+ Fleet of Equipment(Owned)**

# CORPORATE CAPABILITIES

West Coast Arborists, Inc., is committed to successfully completing each project in accordance with the specifications, budget, schedule and with the highest quality of service. Our customers' satisfaction is a direct result of our means to carry out each project. Listed below are some of our corporate capabilities, which not only provide a sense of comfort and confidence to our customers, but also assure them of our continuous ability to carry out the duties of managing their urban forest. WCA has no negative history to report.

- In business continuously and actively since 1972
- Contractor's License C61/D49 & C27, C21, C31, A, B
- Over \$8,500,000 line of credit available
- Bonded by ARCH, an A+ rated company
- 1,000+ employees
- 330+ contracts with public agencies
- 90+ Certified Arborists
- 150+ Certified Tree Workers
- Drug-free workplace
- 14,000 sq. ft. company-owned Headquarters (Anaheim)
- Department of Agriculture Nursery license
- Avg. 675,000 trees **pruned** annually over past 3 years
- Avg. 46,000 trees **removed** annually over past 3 years
- Avg. 18,500 trees **planted** annually over past 3 years
- Avg. 250,000 trees **inventoried** annually over past 3 years
- Fully insured with insurance up to \$10 million
- Federal Tax ID #95-3250682, current on all taxes and fillings with state and federal government
- Sales volume over \$110 million annually
- Fleet of approximately 1,500 pieces of equipment



**Active Memberships:**

**Tree Care Industry Association (TCIA)**

- International Society of Arboriculture (ISA)
- League of California Cities (LCC)
- California Parks & Recreation Society (CPRS)
- Association of California Cities- Orange County (ACCOC)
- Maintenance Superintendents Association (MSA)
- California Landscape Contractors Association (CLCA)
- Street Tree Seminar (STS)
- California Urban Forest Council (CaUFC)
- American Public Works Association (APWA)



**CONTRACTORS STATE LICENSE BOARD**  
**ACTIVE LICENSE**

License Number: **366764**

Expiration Date: WEST COAST ARBORISTS INC

Classification: C61/D49 C27 A C21 B C31

Expiration Date: 12/31/2022



Entity: CORP



[www.cslb.ca.gov](http://www.cslb.ca.gov)

State of California  
**Department of Industrial Relations**

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**Contractor Information**

Legal Entity Name	WEST COAST ARBORISTS, INC.
Corporation	
Active	
1000000956	
07/01/19	
06/30/22	
2200 E. VIA BURTON ANAHEIM 92806 CA United States of America	
2200 E. VIA BURTON ANAHEIM 92806 CA United States of America	
vgonzalez@wcainc.com	
License Number (s)	
CSLB:366764	



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## STAFF QUALIFICATIONS



**Staff members have diverse educational backgrounds including accounting, business administration, engineering, and forestry.**

### INTRODUCTION

West Coast Arborist's (WCA) is a company comprised of a management team and a safety committee. Staff members have diverse educational backgrounds including accounting, business administration, engineering and forestry.

### WORK FORCE

WCA actively maintains ongoing processes to assure that only qualified and competent staff provides safe and quality tree maintenance services. These skilled employees can only be achieved through both training and work experience. We believe that essential experience should always be obtained through qualified supervision; this includes both basic and extended skills. WCA makes every attempt to ensure that this is undertaken before performing work, leading a crew, or career advancement. The work performed on this contract is routine, recurring and usual. The work includes watering, trimming, pruning, planting, removal and replacement of trees and plants, and servicing of irrigation. The rates included in the Cost Proposal are based on the current prevailing wage determination for "Tree Maintenance (Laborer)."

### CERTIFICATION

WCA encourages its employees to get certified through the International Society of Arboriculture, in an effort to raise the standard of professional tree care companies. This standard exemplifies our company's commitment to providing customers with competent, knowledgeable certified workers. WCA employs a large number of ISA Certified Arborists and ISA Certified Tree Workers.

### CREW EVALUATION

WCA employees are evaluated through an internal mechanism supervised by our Management Team. Each employee performs their duties according to a criteria-based job description that reflects safety, quality workmanship, productivity, appropriateness of care, problem solving and customer service. A performance appraisal is conducted for each employee upon completion of the probationary period and at least annually thereafter. Each worker is also required to complete a competency assessment and orientation upon hire and annually thereafter in selected areas to assure that ongoing requirements are met and opportunities for improvement are identified.

Patrick Mahoney, President



Rose Epperson, Vice President



Chris Crippen, VP IT



Andy Trotter, VP Field Operations



Jason Pinegar, Regional Manager



Richard Mahoney, Vice President



Debbie DePasquale, VP Contract Services



Victor Gonzalez, VP Marketing



Randy Thompson, VP Operations



## UPPER MANAGEMENT TEAM

From marketing, contract administration, field and fleet management, to information technology, our Upper Management Team is involved in the day-to-day operations supporting each Project Team and Customer to ensure the highest quality of tree care is being achieved in the industry.

## PROJECT TEAM

### HERMINIO PADILLA, AREA MANAGER

ISA Certified Arborist #WE 7552AU - TCIA Certified Tree Care Safety Professional #139 - ATSSA Traffic Control Technician #00228618 - TLC Wildlife Aware NCCCO National Commission Certification Crane Operations #06325578

Herminio has over 30 years experience in the tree care industry as he joined WCA, Inc. 1990. During his career, he has earned many promotions within the company; from Groundman to Tree Trimmer to Foreman to Supervisor and now Area Manager. As an Area Manager, he will be the Agency's main point of contact as he is responsible for providing customer services, estimating work, all while managing field operations and crews throughout the East Los Angeles region.

### NICOLE ANGENE, CUSTOMER SERVICE REPRESENTATIVE (CSR)

As the CSR (Customer Service Representative), Nicole is responsible for providing support to the Area Manager, Site Supervisors and crew. She is to act as a liaison between the company and it's clients as well as the general public. Nicole is responsible for responding to customer service inquires and facilitating contracting functions, such as: mapping, underground service alert, data entry, field book preparation, list preparation, etc.

### DANIEL CHAVARRIA, SUPERVISOR

ISA Certified Arborist WE-10292A - TCIA Electrical Hazards Awareness Program #2787 - TCIA Treecare Safety Professional #3532

As the Site Supervisor, Daniel is a full-time employee and speaks fluent English. He is responsible for reviewing the day's activities, assisting the Area Manager in scheduling, and ensuring proper safety procedures are being followed. As a Supervisor, he will communicate with City officials and other interested parties on a daily basis. Reports and resolves malfunctions, damage, or industrial injury. They also assist in employee training programs, maintain records, and file daily reports and receipts.

### ERNESTO MACIAS, RISK MANAGER, V.P.

Ensures safety company-wide which includes the development, implementation and review of the company's in-house training programs, crew safety audits, and the company's Injury & Illness Prevention Program.

### TIM CROTHERS, PLANT HEALTH CARE MANAGER

ISA Board Certified Master Arborist WE 7655 BUM - DPR Qualified Applicator #145321 - QAL Categories B&D

WCA's PHC program is managed in-house; there is no subcontracting. Staff is licensed by the CA Dept. of Pesticide Regulation. Our program goes beyond standard chemical applications as we expanded our services to include an Integrated Pest Management program. Inspection, diagnosis and treatments are available as needed.



Herminio Padilla, Area Mgr.

Nicole Angene, Customer Svc.

Daniel Chavarria,

Ernesto Macias, Risk Mgr.

Tim Crothers, PHC Mgr.

**1,000+**

Employees

# LiUNA!

In partnership with the Laborer's International Union of North America (LiUNA!).  
**Higher Standards + Exemplary Training = Superior Employees**

## ISA Certified

**90**

Arborists

**5**

Board Certified Master Arborists

**150**

Tree Workers

WCA staff is trained to design and implement Traffic Control Plans.

**ATSSA**



**1**

Certified Urban Forester

**112**

WCA Certified Utility Line Clearance Workers

**18**

ISA Certified Utility Specialists

**50**

TCIA Certified Tree Care Safety Professionals

**11**

ISA Municipal Specialist

**1**

Nursery in Placentia & Dedicated Manager

**6**

Information Technology Specialists

**75**

Fleet Mechanics

**16**

NCCCO Certified Crane Operators

## Unique Capabilities

**PHC**

WCA has developed an exemplary Plant Health Care Program that goes beyond standard chemical applications.

### CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION

**1**

Advisor

**14**

Applicators



**WILDLIFE PROTECTION**

WCA's VP of Field Operations is a key contributor in identifying and developing the first ever Best Management Practices guidelines for Tree Care for Birds and Other Wildlife.



**95**

WCA has 95 staff members certified through the Wildlife Aware and Wildlife Training Institute and a certified biologist on staff.

### Board Certified Master Arborists

- Michael Palat #WE-6541 BUM
- Kelley Gilleran #WE-7061 B
- Tim Crothers #WE-7655 BUM
- Joseph Bartolo #WE-2034 BU
- Eugene Bordson #WE-10777BT



**2 ASCA Consulting Arborists: Kelley Gilleran RCA #688 - Tim Crothers, RCA #721**

## Additional List of ISA Certified Arborists

Employee Name	Cert #	Employee Name	Cert #
ADAN BALTAZAR REYNAGA	<a href="#">WE-7786AT</a>	JESUS RAYA	<a href="#">WE-3449A</a>
AL EPPERSON	<a href="#">WE-0719A</a>	JOEL LOPEZ	<a href="#">WE-10871A</a>
ANDREW R. TROTTER	<a href="#">WE-0642A</a>	JOHN LEE PINEDA	<a href="#">WE-10367A</a>
ARLENE BISCAN	<a href="#">WE-9806A</a>	JORGE MAGANA	<a href="#">WE-3460A</a>
BENJAMIN EUGENE BORDSON	<a href="#">WE-10777A</a>	JOSE A. GONZALEZ MENDEZ	<a href="#">WE-6475A</a>
BRIAN C. KIRKEGAARD	<a href="#">WE-10476A</a>	JOSE M. CORTEZ TORRES	<a href="#">WE-8539A</a>
BRIAN M. KOCH	<a href="#">WE-0341A</a>	JOSE M. CHAVARRIA MANZO	<a href="#">WE-11210AT</a>
CALVIN F. HAUPT	<a href="#">WE-7634A</a>	JOSE MANUEL PEREZ	<a href="#">WE-0818A</a>
CARLOS BRACAMONTES	<a href="#">WE-8557A</a>	JOSEPH BARTOLO	<a href="#">WE-2034AU</a>
CHARLES PATRICK MADSEN	<a href="#">WE-0462A</a>	JOSEPH NICK ALAGO	<a href="#">WE-4396A</a>
CORINNE GRUNDER BASSETT	<a href="#">WE-11625A</a>	JUAN ORTIZ	<a href="#">WE-8514A</a>
CRISTAN ANGELO FALCO	<a href="#">WE-7490A</a>	JUAN C. IXTA	<a href="#">WE-10144A</a>
CURTIS PATRICK WORTH	<a href="#">WE-10972A</a>	JUSTIN LEE MENZEL	<a href="#">WE-11756A</a>
DANIEL CHAVARRIA	<a href="#">WE-10292A</a>	KELLEY LEWIS GILLERAN	<a href="#">WE-7061A</a>
DANIEL MAHONEY	<a href="#">WE-10434A</a>	KRIS BURBIDGE	<a href="#">WE-9566A</a>
DAVID COOPER	<a href="#">WE-0497A</a>	LEONEL CORTEZ	<a href="#">WE-8625A</a>
DEBORAH DEPASQUALE	<a href="#">WE-3812A</a>	LORENZO PEREZ	<a href="#">WE-7443A</a>
EDUARDO VARGAS	<a href="#">WE-11058AT</a>	MANUEL BRIANO	<a href="#">WE-8791A</a>
ELOY MARQUEZ	<a href="#">WE-11566AT</a>	MARCO A. PADILLA JIMENEZ	<a href="#">WE-8621A</a>
ERICK SERRANO	<a href="#">WE-6750A</a>	MARIA MUNOZ-CAMPOS	<a href="#">WE-8267A</a>
ERNESTO J. F. MACIAS	<a href="#">WE-7120A</a>	MATED ARVIZU	<a href="#">WE-10151A</a>
EUGENE BARRIENTOS	<a href="#">WE-8701A</a>	MICHAEL W. PALAT	<a href="#">WE-6541A</a>
FELIX HERNANDEZ	<a href="#">WE-2037A</a>	NESTOR VALENCIA	<a href="#">WE-11359A</a>
GERARDO PEREZ	<a href="#">WE-9131AT</a>	PATRICK D. MAHONEY	<a href="#">WE-1172A</a>
GERARDO MARTINEZ GARCIA	<a href="#">WE-11358A</a>	RANDY J. THOMPSON	<a href="#">WE-1043A</a>
GLENN D. WHITLOCK REEVE	<a href="#">WE-10177A</a>	REBECCA A. MEJIA	<a href="#">WE-2355A</a>
GONZALO REGALADO	<a href="#">WE-9952A</a>	RENE ROSALES	<a href="#">WE-7941AT</a>
HECTOR MONTES	<a href="#">WE-8079A</a>	RICHARD R. MAHONEY	<a href="#">WE-1171A</a>
HERMINIO PADILLA	<a href="#">WE-7552A</a>	ROBERT D. THOMPSON	<a href="#">WE-0915AU</a>
HUGO ANGEL RINCON	<a href="#">WE-8710A</a>	RODNEY LYNN MORGAN	<a href="#">WE-9546A</a>
IGNACIO LOPEZ	<a href="#">WE-7329A</a>	ROSE M. EPPERSON	<a href="#">WE-1045A</a>
ISIDRO ESTRADA BARBOZA	<a href="#">WE-11685A</a>	SEAN PATRICK SULLIVAN	<a href="#">WE-10050A</a>
J. ALONSO GARCIA-LOPEZ	<a href="#">WE-8499A</a>	SHAWN A. GUZIK	<a href="#">WE-3182A</a>
JAIME ROSELIO HERNANDEZ	<a href="#">WE-5297A</a>	STEFAN B. KALLENBERG	<a href="#">WE-10730A</a>
JAMES CHARLES WORKING	<a href="#">WE-1592A</a>	STEPHEN GLENN DAVIS JR	<a href="#">WE-10894A</a>
JAMES PAUL SPECK II	<a href="#">WE-10858AT</a>	STEVE B. HUNT	<a href="#">WE-1044A</a>
JARED LEE MAYSEY	<a href="#">WE-11510A</a>	TIMOTHY CROTHERS	<a href="#">WE-7655A</a>
JASON PINEGAR	<a href="#">WE-2039AU</a>	VICTOR M. GONZALEZ	<a href="#">WE-7175A</a>
JASON ROSS DAVLIN	<a href="#">WE-7628A</a>	WALLACE BURCH	<a href="#">WE-0713A</a>
JEFFERY B. WILLIAMS	<a href="#">WE-1100A</a>	WILLIAM STEVE PONCE	<a href="#">WE-6461A</a>

## WCA's ISA Certified Tree Workers

Employee Name	Cert #	Employee Name	Cert #
ADAM RODRIGUEZ	<a href="#">WE-11281T</a>	FELIX HERNANDEZ	<a href="#">WE-2037AT</a>
ADAN BALTAZAR REYNAGA	<a href="#">WE-7786AT</a>	FRANCISCO LOPEZ	<a href="#">WE-10952T</a>
AGUSTIN LOZANO	<a href="#">WE-11306T</a>	FRANCISCO RAMIREZ	<a href="#">WE-11259T</a>
ALEJANDRO VALENZUELA	<a href="#">WE-11674T</a>	FRANCISCO VILLANUEVA	<a href="#">WE-10965T</a>
ALFREDO ANGEL LOPEZ	<a href="#">WE-11334T</a>	FRANCISCO URENA JIMENEZ	<a href="#">WE-11075T</a>
ANDRES ROMAN	<a href="#">WE-11285T</a>	GABRIEL GAMINO	<a href="#">WE-11167T</a>
ANTONIO CASTELLANDS	<a href="#">WE-11203T</a>	GABRIEL MERCADO RUIZ	<a href="#">WE-11568T</a>
ANTONIO GRADILLA	<a href="#">WE-11185T</a>	GERARDO PEREZ	<a href="#">WE-9131AT</a>
ANTONIO GARCIA CONTRERAS	<a href="#">WE-11173T</a>	GERARDO A. ORDUND	<a href="#">WE-11036T</a>
ARIEL ALONSO	<a href="#">WE-10906T</a>	GERARDO MARTINEZ GARCIA	<a href="#">WE-10997T</a>
ARMANDO SOTO	<a href="#">WE-11131T</a>	GLENN D. WHITLOCK REEVE	<a href="#">WE-10177ATM</a>
ARMANDO O. LOPEZ	<a href="#">WE-10953T</a>	GONZALO REGALADO	<a href="#">WE-9952AT</a>
AUDOMARO CORRAL	<a href="#">WE-11220T</a>	HECTOR MONTES	<a href="#">WE-8079AUT</a>
AURELIO COVARRUBIAS	<a href="#">WE-11629T</a>	HERIBERTO CORONEL WENCESLAD	<a href="#">WE-11218T</a>
AURELIO PAZ-GUZMAN	<a href="#">WE-11084T</a>	HUGO ANGEL RINCON	<a href="#">WE-8710AT</a>
BRIAN C. KIRKEGAARD	<a href="#">WE-10476AT</a>	HUMBERTO CHAVARRIA	<a href="#">WE-11207T</a>
CARLOS IXTA	<a href="#">WE-11106T</a>	ISAIAS MACIAS	<a href="#">WE-10979T</a>
CARLOS RAMOS	<a href="#">WE-11263T</a>	ISRAEL A. RAMIREZ	<a href="#">WE-11567T</a>
CELEDONIO R. MANZANO OLEA	<a href="#">WE-10984T</a>	J. REFUGIO ESCAMILLA	<a href="#">WE-1153T</a>
CELESTINO PEREZ	<a href="#">WE-11243T</a>	J. SOCORRO GARCIA	<a href="#">WE-11172T</a>
CESAR WENCESLAD	<a href="#">WE-10968T</a>	JAIME ROSELIO HERNANDEZ	<a href="#">WE-5297AT</a>
CESAR G. VALENZUELA REYES	<a href="#">WE-11076T</a>	JAMES CHARLES WORKING	<a href="#">WE-1592AT</a>
CHARLES F.M. INSCO	<a href="#">WE-11368T</a>	JEFFERY B. WILLIAMS	<a href="#">WE-1100AT</a>
CURTIS PATRICK WORTH	<a href="#">WE-10972AT</a>	JESUS RAYA	<a href="#">WE-3449AT</a>
DANIEL CHAVARRIA	<a href="#">WE-10292AT</a>	JESUS A. MONTES	<a href="#">WE-11014T</a>
DANIEL RIVAS	<a href="#">WE-10850T</a>	JESUS M. SARABIA PENIA	<a href="#">WE-11450T</a>
DANIEL GEORGE POTTS	<a href="#">WE-11534T</a>	JOEL LOPEZ	<a href="#">WE-10871AT</a>
DANIEL J. KNUTSEN JR	<a href="#">WE-11715T</a>	JOEL MARTINEZ	<a href="#">WE-10992T</a>
DANNY AVITIA	<a href="#">WE-11638T</a>	JOEL ORTIZ	<a href="#">WE-11039T</a>
DELFINO AGUILAR-MORALES	<a href="#">WE-10900T</a>	JOEL M. RIVERA	<a href="#">WE-11273T</a>
DEMETRIO LIRA	<a href="#">WE-11323T</a>	JOHN LEE PINEDA	<a href="#">WE-10367AT</a>
DEMETRIO OSEGUERA	<a href="#">WE-11043T</a>	JORGE ARREDOLA-HERNANDEZ	<a href="#">WE-11321T</a>
EDIBERTO SERNA SALAZAR	<a href="#">WE-11051T</a>	JORGE DUENAS	<a href="#">WE-11144T</a>
EDUARDO AVILA	<a href="#">WE-10812T</a>	JORGE JIMENEZ	<a href="#">WE-11110T</a>
EDUARDO MARTINEZ BECERRA	<a href="#">WE-10991T</a>	JOSAFAT MONTOYA	<a href="#">WE-11015T</a>
EDUARDO VARGAS	<a href="#">WE-11058T</a>	JOSE AGUAYO	<a href="#">WE-10899T</a>
ELIGIO IBARRA CARDOZO	<a href="#">WE-11197T</a>	JOSE JIMENEZ	<a href="#">WE-11108T</a>
ELOY MARQUEZ	<a href="#">WE-11566T</a>	JOSE JIMENEZ HERNANDEZ	<a href="#">WE-11113T</a>
ENRIQUE SANDOVAL	<a href="#">WE-11302T</a>	JOSE VEGA	<a href="#">WE-11062T</a>
ERNESTO GONSALEZ	<a href="#">WE-11461T</a>	JOSE A. ALVAREZ	<a href="#">WE-10908T</a>
EUGENE BARRIENTOS	<a href="#">WE-8701AUT</a>	JOSE A. GONZALEZ MENDEZ	<a href="#">WE-6475AT</a>
FAUSTO GUZMAN	<a href="#">WE-11083T</a>	JOSE ABEL CANGINO	<a href="#">WE-11192T</a>
FELIX GARCIA	<a href="#">WE-11170T</a>	JOSE AGUSTIN CARRILLO	<a href="#">WE-11200T</a>
MELCHOR LEMUS	<a href="#">WE-11237T</a>	JOSE F. ORELLANA	<a href="#">WE-11483T</a>
MICHAEL LOUIS YOUNG	<a href="#">WE-11687T</a>	ROBERT JAY ADDISON JR	<a href="#">WE-10898T</a>
MIGUEL AYALA	<a href="#">WE-10924T</a>	RODNEY LYNN MORGAN	<a href="#">WE-9546AUT</a>
MIGUEL MACIAS	<a href="#">WE-10978T</a>	ROMUALDO GAETA LUNA	<a href="#">WE-11165T</a>
NELSON R. AGUIRRE	<a href="#">WE-10901T</a>	SALOMON SILVA	<a href="#">WE-11053T</a>
OSCAR IGNACIO RIVERA	<a href="#">WE-11424T</a>	SALUSTIO SANCHEZ	<a href="#">WE-11462T</a>
PEDRO CUEVAS	<a href="#">WE-11765T</a>	SAMUEL JIMENEZ	<a href="#">WE-11109T</a>
PEDRO GARCIA	<a href="#">WE-11168T</a>	SANTOS MACIAS LEMUS	<a href="#">WE-10980T</a>
PEDRO SANDOVAL	<a href="#">WE-11301T</a>	SERGIO LOPEZ-RIVERA	<a href="#">WE-10957T</a>
PEDRO ALTAMIRANO	<a href="#">WE-11095T</a>	STEFAN B. KALLENBERG	<a href="#">WE-10730AT</a>
RAMON ZUNIGA GOMEZ	<a href="#">WE-10977T</a>	STEPHEN GLENN DAVIS	<a href="#">WE-10894AT</a>
RANULFO PERALTA CASTANEDA	<a href="#">WE-11202T</a>	STEVE B. HUNT	<a href="#">WE-1044A</a>
RAUL MANZO HERNANDEZ	<a href="#">WE-10985T</a>	VENTURA GOMEZ	<a href="#">WE-11180T</a>
RAUL TELLEZ TAPIA	<a href="#">WE-11138T</a>	WALLACE BURCH	<a href="#">WE-0713AT</a>
RAYMUNDO GUTIERREZ	<a href="#">WE-11080T</a>		
RENE ROSALES	<a href="#">WE-7941AT</a>		

JOSE INEZ MANGILLA	<a href="#">WE-10983T</a>	JULIO C. GARCIA VAZQUEZ	<a href="#">WE-11175T</a>
JOSE JUAN PEREZ	<a href="#">WE-11246T</a>	KYLE JAMES VIGNEAU	<a href="#">WE-10962T</a>
JOSE LUIS DELREAL	<a href="#">WE-11231T</a>	LEONARDO RAMOS	<a href="#">WE-11264T</a>
JOSE M. CORTEZ TORRES	<a href="#">WE-8539AUT</a>	LEONEL CORTEZ	<a href="#">WE-8625AT</a>
JOSE M. MUNIZ GARCIA	<a href="#">WE-11686T</a>	LETUSA MUAUJ JR	<a href="#">WE-11021T</a>
JOSE M. CHAVARRIA MANZO	<a href="#">WE-11210T</a>	LORENZO PEREZ	<a href="#">WE-7443AT</a>
JOSE MANUEL PEREZ	<a href="#">WE-0818AT</a>	LUIS A. MUNOZ RAMIREZ	<a href="#">WE-11023T</a>
JOSE R. GRANADOS	<a href="#">WE-11186T</a>	LUIS P. PEREZ	<a href="#">WE-11245T</a>
JOSEPH ANTHONY NUNN	<a href="#">WE-11034T</a>	MANUEL BARRAGAN	<a href="#">WE-10925T</a>
JUAN BECERRA	<a href="#">WE-10932T</a>	MANUEL BRIANO	<a href="#">WE-8791AT</a>
JUAN MARQUEZ	<a href="#">WE-10987T</a>	MARCO A. PADILLA JIMENEZ	<a href="#">WE-8621AT</a>
JUAN ORTIZ	<a href="#">WE-8514AT</a>	MARCO ANTONIO VERGARA	<a href="#">WE-11065T</a>
JUAN TELLEZ TAPIA	<a href="#">WE-11137T</a>	MARCOS RICHARD-MARTINEZ	<a href="#">WE-10989T</a>
JUAN AMADOR ARCE	<a href="#">WE-11480T</a>	MARCOS GAMINO	<a href="#">WE-11482T</a>
JUAN C. PENIA-ARIAS	<a href="#">WE-11327T</a>	MARTIN BARRERA	<a href="#">WE-10928T</a>
JUAN CARLOS MORA	<a href="#">WE-11019T</a>	MATED ARVIZU	<a href="#">WE-10918T</a>

# SPECIALIZED SAFETY TRAINING

Our ISA Certified Tree Workers go through specialized testing that proves they are competent to work in trees in a safe manner that protects themselves as well as the general public. We also qualify our employees to operate in a safe and efficient manner that meets and exceeds the industry standards, these programs are WCA Qualified Level 1 Tree Trimmer, WCA Qualified Level 2 Tree Trimmer, WCA Qualified Level 3 Tree Trimmer, WCA Qualified Big Boom Operator, WCA Qualified Loader Operator, WCA Qualified Roll-Off Driver. We also qualify all drivers that operate our vehicles by conducting 2 driving test and entering them into the California DMV pull program that monitors their driving record to ensure safe driving operators.

## SAFETY TRAINING PROGRAMS

**Jobsite Briefing** - Conducted each work day.

**Weekly Tailgate** - Meetings held for each crew.

**On the Job Training** - New employees are assigned a "buddy" with experience to assist them.

**Video Training** - Programs included are Professional Tree Care, Electrical Hazards, Aerial Rescue, Chipper Safety, Chain Saw Safety and Pruning Technique. Video presentations in cooperation with Tree Care Industry Association (TCIA).

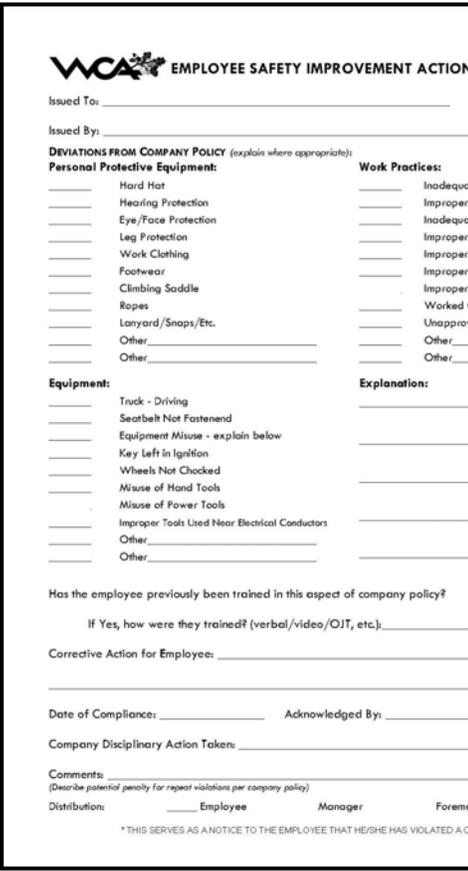
**Safety Crew Lunch** - This program rewards employees company-wide quarterly.

**Safety Team** - A 10 person committee that reviews and discusses safety procedures, problems and incentives.

**Injury & Illness Prevention** - Integral program to WCA's overall safety program.

**Leadership Training** - Continued training and study utilizing the Crew Leader Home Study Program, available through the Tree Care Industry Association (TCIA).

**Certification Training** - Continued study sessions are held in preparation for the International Society of Arboriculture Certification Programs.



**WCA EMPLOYEE SAFETY IMPROVEMENT ACTION PLAN FORM**

Issued To: \_\_\_\_\_

Issued By: \_\_\_\_\_

**DEVIATIONS FROM COMPANY POLICY** (explain where appropriate):

<b>Personal Protective Equipment:</b>	<b>Work Practices:</b>
_____ Hard Hat	_____ Inadequate
_____ Hearing Protection	_____ Improper
_____ Eye/Face Protection	_____ Inadequate
_____ Leg Protection	_____ Improper
_____ Work Clothing	_____ Improper
_____ Footwear	_____ Improper
_____ Climbing Saddle	_____ Improper
_____ Ropes	_____ Worked On
_____ Lanyard/Snaps/Etc.	_____ Unapproved
_____ Other _____	_____ Other _____
_____ Other _____	_____ Other _____

**Equipment:**

_____ Truck - Driving	_____ Explanation:
_____ Seatbelt Not Fastened	
_____ Equipment Misuse - explain below	
_____ Key Left In Ignition	
_____ Wheels Not Chocked	
_____ Misuse of Hand Tools	
_____ Misuse of Power Tools	
_____ Improper Tools Used Near Electrical Conductors	
_____ Other _____	
_____ Other _____	

Has the employee previously been trained in this aspect of company policy?  
If Yes, how were they trained? (verbal/video/OJT, etc.): \_\_\_\_\_

Corrective Action for Employee: \_\_\_\_\_

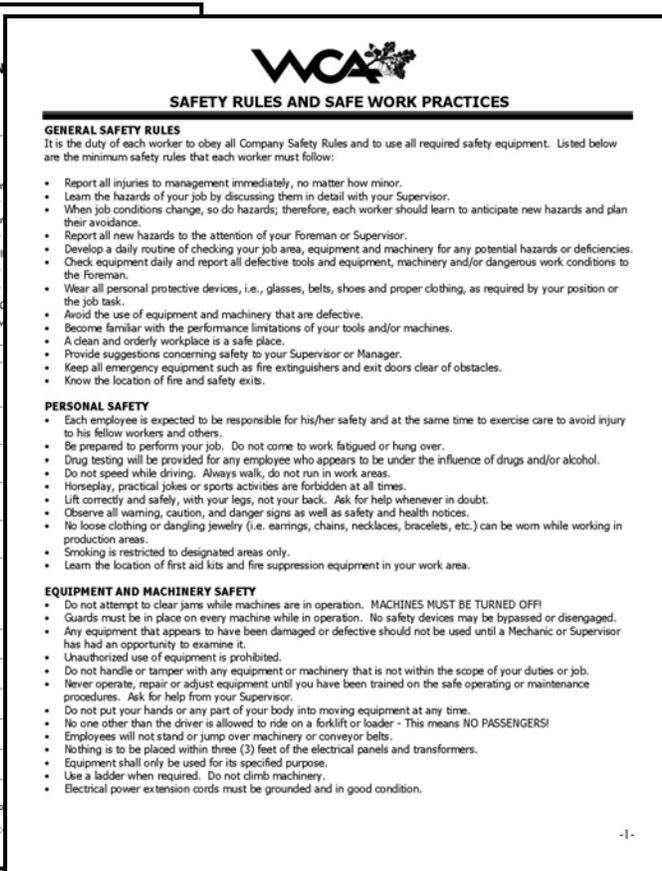
Date of Compliance: \_\_\_\_\_ Acknowledged By: \_\_\_\_\_

Company Disciplinary Action Taken: \_\_\_\_\_

Comments: \_\_\_\_\_  
(Describe potential penalty for repeat violations per company policy)

Distribution: \_\_\_\_\_ Employee \_\_\_\_\_ Manager \_\_\_\_\_ Foreman \_\_\_\_\_

\* THIS SERVES AS A NOTICE TO THE EMPLOYEE THAT HE/SHE HAS VIOLATED A COMPANY POLICY



**WCA SAFETY RULES AND SAFE WORK PRACTICES REVIEW SHEET**

**GENERAL SAFETY RULES**

It is the duty of each worker to obey all Company Safety Rules and to use all required safety equipment. Listed below are the minimum safety rules that each worker must follow:

- Report all injuries to management immediately, no matter how minor.
- Learn the hazards of your job by discussing them in detail with your Supervisor.
- When job conditions change, so do hazards; therefore, each worker should learn to anticipate new hazards and plan their avoidance.
- Report all new hazards to the attention of your Foreman or Supervisor.
- Develop a daily routine of checking your job area, equipment and machinery for any potential hazards or deficiencies.
- Check equipment daily and report all defective tools and equipment, machinery and/or dangerous work conditions to the Foreman.
- Wear all personal protective devices, i.e., glasses, belts, shoes and proper clothing, as required by your position or the job task.
- Avoid the use of equipment and machinery that are defective.
- Become familiar with the performance limitations of your tools and/or machines.
- A clean and orderly workplace is a safe place.
- Provide suggestions concerning safety to your Supervisor or Manager.
- Keep all emergency equipment such as fire extinguishers and exit doors clear of obstacles.
- Know the location of fire and safety exits.

**PERSONAL SAFETY**

- Each employee is expected to be responsible for his/her safety and at the same time to exercise care to avoid injury to his fellow workers and others.
- Be prepared to perform your job. Do not come to work fatigued or hung over.
- Drug testing will be provided for any employee who appears to be under the influence of drugs and/or alcohol.
- Do not speed while driving. Always walk, do not run in work areas.
- Horseplay, practical jokes or sports activities are forbidden at all times.
- Lift correctly and safely, with your legs, not your back. Ask for help whenever in doubt.
- Observe all warning, caution, and danger signs as well as safety and health notices.
- No loose clothing or dangling jewelry (i.e. earrings, chains, necklaces, bracelets, etc.) can be worn while working in production areas.
- Smoking is restricted to designated areas only.
- Learn the location of first aid kits and fire suppression equipment in your work area.

**EQUIPMENT AND MACHINERY SAFETY**

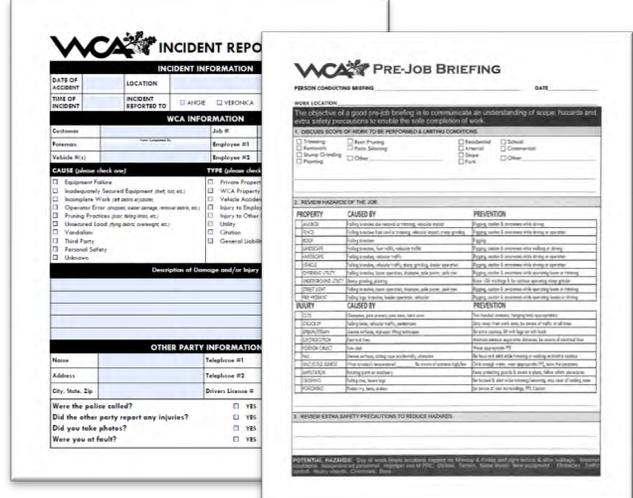
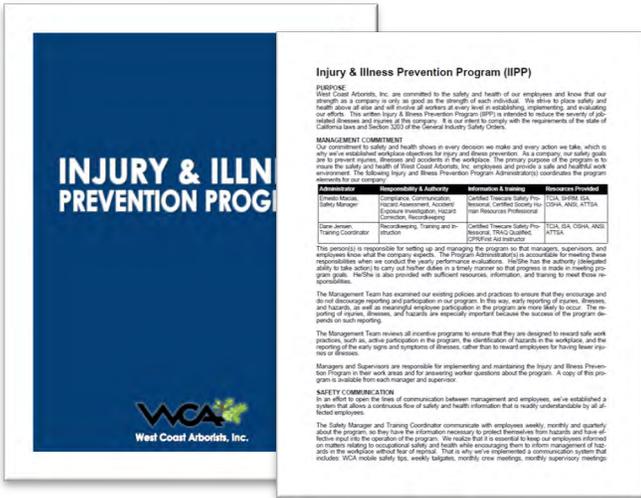
- Do not attempt to clear jams while machines are in operation. MACHINES MUST BE TURNED OFF!
- Guards must be in place on every machine while in operation. No safety devices may be bypassed or disengaged.
- Any equipment that appears to have been damaged or defective should not be used until a Mechanic or Supervisor has had an opportunity to examine it.
- Unauthorized use of equipment is prohibited.
- Do not handle or tamper with any equipment or machinery that is not within the scope of your duties or job.
- Never operate, repair or adjust equipment until you have been trained on the safe operating or maintenance procedures. Ask for help from your Supervisor.
- Do not put your hands or any part of your body into moving equipment at any time.
- No one other than the driver is allowed to ride on a forklift or loader - This means NO PASSENGERS!
- Employees will not stand or jump over machinery or conveyor belts.
- Nothing is to be placed within three (3) feet of the electrical panels and transformers.
- Equipment shall only be used for its specified purpose.
- Use a ladder when required. Do not climb machinery.
- Electrical power extension cords must be grounded and in good condition.

-1-

Pictured left: Sample Safety Improvement Action Plan Form & Safety Rules and Safe Work Practices review sheet.

# EMPLOYEE TRAINING PROGRAM

West Coast Arborists, Inc. provides an extensive in-house training curriculum for all employees to broaden their knowledge of the arboriculture field of study. Included in this training are the ISA standards, both Treeworker and Arborist study programs, and a variety of Tree Care Industry Association home study programs. We also offer training courses to our staff in areas of customer service satisfaction, maintaining professional conduct, and Qualified Line Clearance Trimmer Training. Our Training and Safety team members are tasked with completing field evaluations of crews and members are on-site to coach and train employees on safe practices. Employees receive performance evaluations at 90 days, 6 months, then annually (or as-needed) after their first year. All employees are provided copies of WCA's Injury & Illness Prevention Program.

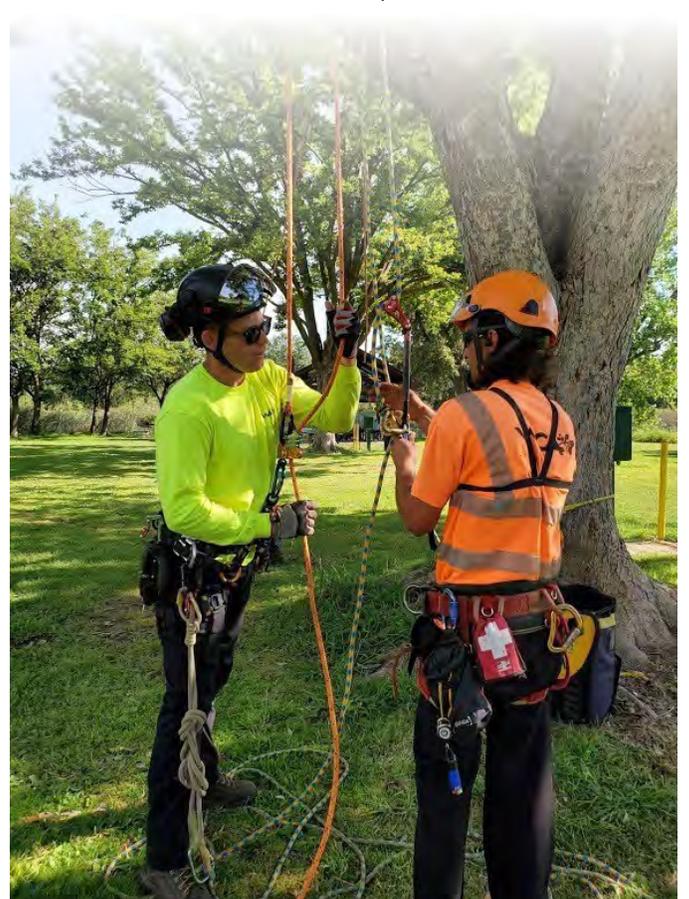


# SAFETY PROGRAM

Safety standards are top priority at West Coast Arborists, Inc. Our line of work demands that all work is performed in a manner that provides the maximum safety to the general public as well as our employees. Our crews are instructed to follow the safety standards of ANSI Z133.1 as well as Cal-OSHA requirements. We have one of the most extensive safety training programs in the industry. We provide our employees with state-of-the-art training tools and instructional sessions company wide. Our insurance carriers and Cal-OSHA have recognized us repeatedly for outstanding safety training efforts.

We have a full time Safety & Training Manager, Dane Jensen, that is professionally trained in the field of horticulture. As WCA's Training Manager, Dane is responsible for staying up-to-date on all tree-related industry standards as related to safety and the wellness of our employees and the public in which we serve. Training materials are regularly reviewed and updated to ensure WCA employees receive the proper education, instruction and hands on experience needed to perform their day to day activities safely and efficiently. Training topics include a full-circle from proper pruning techniques, arboriculture, to customer service and everything in between.

- ISA Certified Utility & Municipal Arborist #WE-120144
- ISA Kills Test Evaluator—TW Climber
- TCIA Certified Treecare Safety Professional #3303
- ISA Tree Risk Assessment Qualification #E4068
- American Heart Association BLS and First Aid Instructor





3

QUALITY  
CONTROL

## IMPLEMENTATION PLAN

To ensure the quality of work and the level of service expected, WCA abides by a well-defined quality control plan that incorporates the following:

- Certified personnel
- Safety
- Pruning specifications and guidelines
- Sound, reliable equipment
- Public relations
- Proper traffic control
- State-of-the-art communication systems

## Area Manager: HERMINIO PADILLA

ISA Certification #: WE -7552AU

The project Area Manager will be the central point of contact and will work cooperatively with Agency staff, local residents and business owners, etc. The Area Manager will provide overall field supervision and crew management.

## Daily Management

Daily management will consist of, but not be limited to:

- Email notification complete with location, crew, equipment type, and work description
- Supervise crew personnel to insure proper pruning standards are followed in a safe manner
- Traffic control setup and maintenance of work zone
- Ensure work area is left free of debris at the end of shift
- Maintain record of work completed each day
- Maintain good public relations at all times
- Provide immediate notification to Agency Inspector upon damage of personal property including a plan for corrective measures to take place within 48 hours

## Weekly Management

Weekly management will consist of, but is not limited to:

- Weekly inspection of work completed
- Meet with the City to review work schedule and progress
- Insure standards of pruning are performed in accordance with City specifications
- Maintain open communication with the City Inspector and field crew

### Scheduling of Work

The Area Manager is responsible for scheduling work which shall conform to the Agency's schedule of performance. We recommend equal distribution of work throughout the course of the fiscal year. Notifications will be provided to residents prior to the start of pruning operations in said area. All work will be performed in a cooperative manner as to cause the least amount of interference or inconvenience.

### Public Notification

Upon Agency staff approval, WCA will post a door hanger notice prior to commencement of grid pruning (within 24-48 hours). After tree plantings, door hangers will be provided to residents instructing them on the proper care for their newly planted tree. For more comprehensive outreach we can also submit a press release for special projects or routine maintenance. The Agency may modify the procedures and materials to which we notify residents.

### Communication Systems

Our use of modern and reliable communication systems affect our daily job performance by increasing our efficiency. Management and Field Personnel utilize smart phones as both navigational and communication devices in the field. Smart phones have proven to be a convenient method to input data as related to tree inventories, daily work records, timesheets, photos, and billing information; eliminating the need to handwrite data and improving customer service by minimizing response time.

### Permits and Licensing

WCA will procure a City Business License as necessary and any "no-fee" permits prior to commencement of work. Permits (i.e., encroachment, traffic control, etc.) requiring fees will be charged back to the Agency.

### Right-of-Way

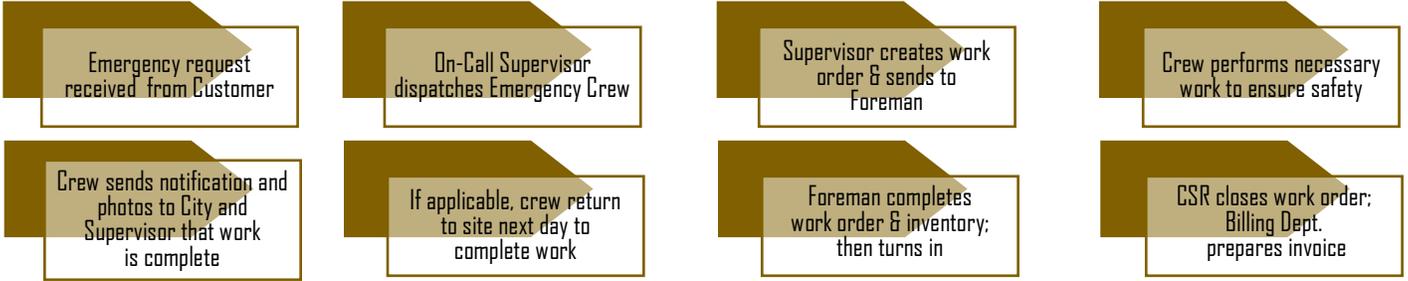
All work will be performed in the public right-of-way. Employees will not utilize private property for eating, breaks or any other reason or use water or electricity from such property without prior written permission of owner.

### Cooperation and Collateral Work

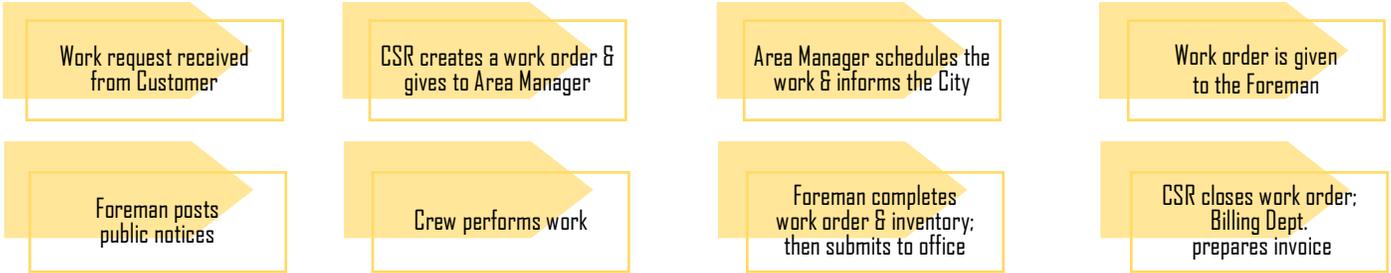
WCA will give right to operate within the project to the Agency workers and/other contractors, utility companies, street sweepers, and others as needed in a cooperative effort to minimize interference in daily operations.

# WORKFLOW TIMELINE

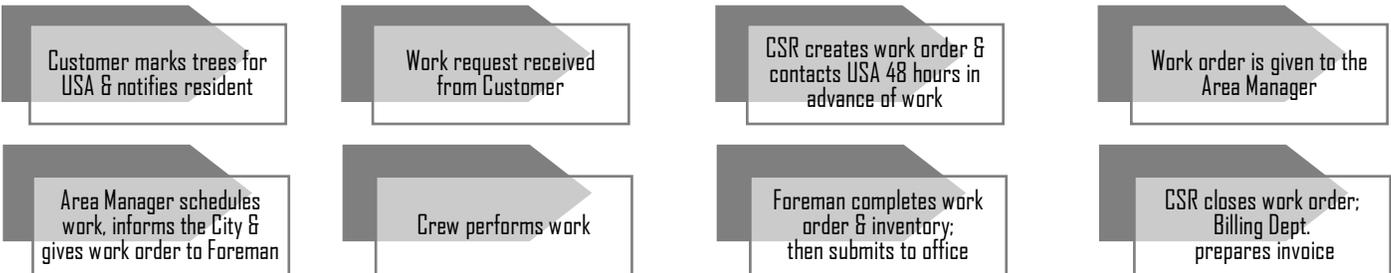
## Emergency Flowchart (1 Hour Response/ 24 Hour Completion)



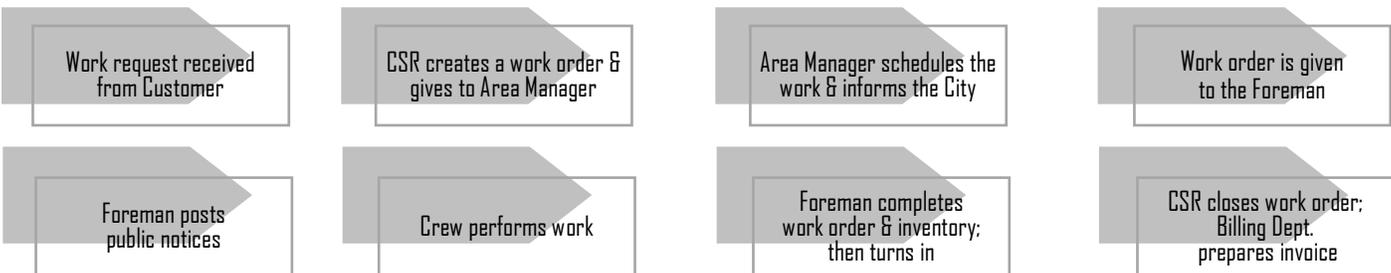
## Scheduled Tree Pruning Flowchart (30 day Completion)



## Scheduled Removal Flowchart (15 day Completion)



## Service Request Flowchart (15 day Completion)



## Project Site Maintenance

Work site will be left free of debris at the end of each workday. We will not discharge smoke, dust, or any other air containments in quantities that violate the regulations of any legally constituted authority.

## Protection of Public and Private Property

WCA will provide all safety measures necessary to protect the public and worker within the work area. We will maintain good public relations at all times. The work will be conducted in a manner which will cause the least disturbance.

## Public Convenience and Safety

WCA will comply with any and all local sound control and noise level rules, regulations, and ordinances which apply to any work performed in the contracted area. All work will cease by 5:00 pm or as directed by the City.

\*Excluding emergency services.



## Traffic Control

Traffic control procedures will be set-up in accordance with the Work Area Traffic Control Handbook (WATCH) and State of California Manual of Traffic Controls as well as the Agency Traffic and Safety Operating Rules. WCA will make adequate provisions to insure the normal flow of traffic over the public streets and park roads. Every effort will be made to keep commercial driveways and passageways open to the public during business hours. High visibility arrowboard(s) will be used when needed. Prior to use, the Agency will approve traffic safety equipment and devices. Pedestrian and vehicular traffic shall be allowed to pass through the work areas only under conditions of safety and with as little inconvenience and delay as possible. Unless the work area is totally barricaded or otherwise kept safe, at least one worker will serve to coordinate safe operations on the ground at all times when work operations are in progress.

## EMERGENCY CONTACTS

TOLL FREE  
**866.546.2369**

in case of emergency  
after normal business hours

Leave a message, if you do not receive a  
call back within 10 minutes, call the  
following contacts in order:

**DANIEL CHAVARRIA**, SUPERVISOR  
626.255.2821

**LEONEL CORTEZ**, SUPERVISOR  
714.412.0424

**HERMINIO PADILLA**, AREA MANAGER  
714.396.9544

After confirmation from on call Manager, you can  
email multiple locations to:  
[LIMBDOWN@WCAINC.COM](mailto:LIMBDOWN@WCAINC.COM)

NORMAL BUSINESS HOURS  
714.991-1900



## SAMPLE PLANTING DOOR HANGER

**HELP ME GROW!**

**WATER THE TREE**  
once (1) per week during cool months.

**WATER THE TREE**  
twice (2) per week during warm months.

**PLEASE DO NOT**  
change or adjust the stakes.

**PLEASE DO NOT**  
adjust the water basin or mulch placed around the tree.

**KEEP THE TREE FREE**  
of weeds and other plants.

**WCA**

Services Provided By:  
West Coast Arborists, Inc., 2200 E. Via Burton St., Anaheim, CA 92806  
**800.521.3714**

**TREE CARE PROFESSIONALS**  
SERVING COMMUNITIES WHO CARE ABOUT TREES

## PRUNE CLASSIFICATIONS

**Grid Prune-** Grid tree pruning is based on pruning in pre-designed districts, or grids on a set cycle and includes all trees (small, medium and large-sized.) Pruning will include structural pruning, crown raising, and crown cleaning in accordance with the standards set forth by the International Society of Arboriculture Pruning Standards (Best Management Practices) and shall have no more than 25% of the live foliage removed at a given time.

**Full Prune/Crown Reduction-** Crown reduction is performed when conditions within the crown of a hardwood tree are such that the entire tree needs to be reduced. A full prune is recommended when the primary objective is to maintain or improve tree health and structure, and includes pruning to reduce overall canopy mass and excessive wood weight. Trees that are identified for a full prune shall have more than 25% of the live foliage removed at a given time.

## Service Requests

A Service Request Prune includes tree maintenance services on designated tree(s) as ordered by the City Arborist or designee. Pruning may include structural pruning, crown raising, crown cleaning or pruning to reduce/restore the crown. Whichever work type is ordered by the City, pruning will be performed in accordance with the standards set forth by the International Society of Arboriculture Pruning Standards and the Best Management Practice, Tree Pruning Guidelines. Work assignments from the City may require mobilization from one tree site to another within the City.

## Line Clearance

Trees that interfere or have the possibility of interfering with utility lines will be trimmed in a manner to achieve the required clearances as specified and in accordance with the California Public Utilities Commission. It is our goal to protect the current health and condition of the tree and to maintain its symmetry and direct growth away from the utility lines.

## Small Tree Care

Proper pruning and care during the early stages of the tree's life will save money in the future, and create a safer, more beautiful, healthy, easy-to-maintain tree. We believe that tree care that is performed early will affect its shape, strength and life span. Our specialized small tree care team consists of certified personnel trained to perform the following:

- Selective structural pruning
- Removal of dead, interfering, split and/or broken limbs
- Pre-conditioning the water retention basin built around the tree
- Staking or re-staking
- Adjusting tree ties
- Adjusting trunk protectors

# 4

## METHODOLOGY/ SERVICE APPROACH

### Palm Trunk Skinning

Palm tree skinning consists of the removal of dead frond bases (only), at the point they make contact with the trunk without damage to the live trunk tissue.

### Root Pruning

We strongly recommend against any root pruning, however, should the City elect to proceed, we recommend that it be done no closer than 3 times the diameter of the trunk. Roots will be pruned to a depth of approximately 12 inches by cleanly slicing through the roots, so as not to tear or vibrate the root causing damage to the tree. The excavated area will be backfilled with native soil and debris will be hauled away.

### Tree Removal Operations

With a minimum of 48 hours advanced notice, WCA will inform Underground Service Alert (USA) of the location of work for the purpose of identifying any and all utility lines. The removal process consists of lowering limbs delicately onto the ground to prevent any hardscape damage. Immediately following the removal, the stump will be ground down, if ordered to do so and with proper USA notification.

### Tree Planting

We can replace trees that have been removed and plant new trees in accordance with specifications. We are prepared financially and logistically to acquire and purchase selected tree species for tree planting. At a minimum of 48 hours in advance we will inform Underground Service Alert (USA) of the location of work for the purpose of identifying any and all utility lines. A well-trained planting team will perform the soil preparation and installation of the tree.

### Tree Watering

Tree watering will be performed by a full-time, WCA team member on various routes, when requested by the City. This team will also be responsible for reporting special care needs to the small tree care team. This could include reporting weeds, soil that has settled, and/or staking and tying needs.

## Emergency Response

We are prepared for emergency calls 24 hours a day, 7 days a week, including holidays. The toll free number is 866-LIMB-DOWN (866-546-2369). This number will be provided to the City, Police Department and/or Fire Department. Our emergency response team will do what is necessary to render the hazardous tree or tree-related condition safe until the following workday.

## Crew Rental

Due to our vast amount of resources, including our specialty equipment and qualified personnel we are able to extend our commitment to our customers by providing various miscellaneous services outside of the most common tree maintenance services:

- Flag hanging
- Holiday light installation
- Changing ball park lights
- Misc. use of aerial towers and cranes (including equipment rental)
- Crown reduction
- Crown restoration

## Arborist Reports

We have full-time Certified Arborists on staff that can prepare detailed arborist reports, tree evaluations and site inspections based on your specific needs. Reporting can be generated for one tree or an entire selection and is handled on a case-by-case basis.

## Plant Health Care

**Tim Crothers**, Plant Health Care Manager

- ISA Board Certified Master Arborist WE-7655 BUM
- DPR Qualified Pest Control Applicator #145321
- QAL Category B & D

Our PHC program managed by Tim Crothers goes beyond standard chemical applications. We have developed an efficient Integrated Pest Management Program (IPM) that requires diagnosis before treatment. WCA is staffed with licensed applicators and advisors that are environmentally conscious as well as compliant with the California Department of Pesticide Regulation. This service allows us to provide you with:

- Proper diagnosis based on on-site inspection with laboratory testing when necessary
- Proactive and preventative recommendations that reduce the amount of potential pest and disease issues
- Follow-up evaluations to ensure that the recommended treatments result in a healthy and balanced urban forest

## Shot Hole Borer

The Polyphagous Shot Hole Borer (PSHB) is a new pest in Southern California. This boring beetle drills into trees and brings with it a pathogenic fungus (*Fusarium euwallacea*), as well as other fungal species. When heavily infested, the resulting Fusarium causes the decline and death of trees. Over 120 different tree species are affected in Southern California and over 30 reproductive hosts are of high concern.

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## ABILITY TO ACQUIRE, PURCHASE & STAGE TREES

Cities expect the highest quality of new trees, proven varieties and an organization with the knowledge and skills to provide them with the latest and most reliable information available related to tree planting. By meeting these expectations, we're able to contribute to the success of reforestation projects within communities. In order to complete successful tree planting programs, cities can rely on us to locate, acquire and purchase different tree species.

As part of our Corporate Capability, we are financially able to purchase large quantities of trees for planting projects. Being familiar with over 50 nurseries in California, allows us to obtain the best tree available from a broad and plentiful stock. The process by which we obtain trees is quite simple: First, we utilize our database of nurseries, and contact several of them requesting specific trees with their prices.

Upon locating the availability of trees, we then perform a tree pre-inspection at the nursery. When time is of the essence, nurseries will provide us with photos either by mail or by e-mail for our review. Once the trees are purchased, and depending on the size of the project, we have them delivered to our facility in Placentia, Brea, or if possible, at a staging area within the City. It is through this process that we have planted an average of 14,000 trees for all of our customers each year during the past three years.



## Customer Service Department

As we work with, or near, the public, we are mindful that we will most likely be the first person the public contacts. We have a full-time Customer Service Department with each Customer Service Representative (CSR) trained in addressing concerned residents and bystanders.

## Complaints & Damage Resolution

Should there be any property damage, we adhere to specific procedures to resolve the problem. The Foreman on the job site will notify the resident and the Inspector immediately.

If the resident is not at home, then we will leave a WCA card with instructions to call our Claims Coordinator in our corporate office. The ultimate goal at each work site is to leave the property in the same condition as before we entered it. We will notify the City Representative immediately upon damage of personal property including plans for corrective measures to take place within 48 hours.

All WCA vehicles are equipped with an Accident Kit should anything happen during the work day. Each kit has an Incident Report, an Accident Report, an Injury Report, a camera, First Aid instructions and protocol for contacting the corporate office. A computerized log of all incidents is maintained to include the date, time of occurrence, location, problem and action to be taken pursuant thereto or reasoning for non-action.

Any activities found by the City to be unacceptable will be rectified immediately. All other complaints will be abated or resolved within twenty-four (24) hours of the occurrence. We have teams specifically assigned for handling damage to properties, both private and public. Through our communication system, we have the ability to dispatch either of these teams and have them respond immediately to the site for proper repair. We pride ourselves on professional workmanship to avoid these types of incidents, however, should one occur, we take all appropriate measures to resolve the matter in a timely and efficient manner.



## OATH OF COMMITMENT

*WCA is committed to working with the your agency staff to develop and maintain a work schedule that will provide the citizens with the most effective and efficient means to perform tree care services. We will adhere to the schedule established by your agency and ensure residents of our dedication to completing work in a timely manner. We understand that there may be fluctuations in the agency's budget and that the agency may ask us to reduce service levels in an effort to meet the current economic demands. By being flexible, we can help to ease any financial strain, promote contractor stability and guarantee residents with quality tree care & customer service.*

*This is our oath of commitment to uphold the namesake of your agency by providing gold standard tree care services.*



Patrick Mahoney, President

2022

# 5 INFORMATION MANAGEMENT



## ARBORACCESS FEATURES

- Ease of use
- Create work orders
- View tree site details
- View work history
- View invoices
- Mobile app
- Live data
- GIS/GPS mapping

## LIST TRACKING SYSTEM

The List Tracking Report in ArborAccess is a useful tool in the management of incoming work. This report allows both parties to track specific jobs as they are ordered by the City. Proper use of this system enables the City and WCA to track the completion of work that is ordered.

## INVENTORY SOFTWARE- ARBORACCESS

Our tree management program sets us apart from other companies. With nearly 2,000 active users, ArborAccess and our mobile app will help you easily manage your urban forest with ease and convenience. Tree site attributes include location (utilizing GPS coordinates), species type, and parkway size. Features allow you to view and edit work history records and create work orders directly from the field, all from our secure cloud.

The information contained in ArborAccess is live data that can also be linked directly to a GIS program, such as ArcView, for geo-coding purposes and can assist your City in meeting GASB34 requirements. ArborAccess provides an unlimited resource of information regarding your urban forest.

## SOFTWARE TRAINING

Our IT Department is based out of our corporate office in Anaheim, CA with regional offices located throughout California and Arizona. Each office has the ability to provide software training to our customers. We are also available to provide training sessions on-site at the customer's discretion. On-site training is proven to be effective as it provides a guided hands-on experience.

We offer periodic tree maintenance and management workshops each year. These free workshops are provided to our customers regionally and educate over 250 people annually. They have proven to be a great round-table and networking opportunity for the different agencies in attendance. Presentations are provided by WCA management staff and complimented with guest speakers in the industry. Certified Arborists and Tree Workers who attend are eligible to receive continuing education credits (CEU's) from the International Society of Arboriculture.

The success of any urban forest program depends on the proper management of information. Unlimited telephone and/or email support is available to answer technical questions and aid staff in the use of the software system. Software training and support is included in the cost associated with the inventory data collection.

WCA has completed **300+** GPS tree inventories.

## BILLING

WCA, Inc. operates a modern invoicing system that is updated on a daily basis. Progress billings will be submitted to the Customers on a bi-weekly basis, unless otherwise requested. Invoices will reflect an amount complete for the billing period, along with a year-to-date total for that job. Each billing will include a listing of completed work by address, tree species, work performed and appropriate data acceptable to the customer. This information will be supplied in hardcopy and immediately accessible on ArborAccess. Job balances reflecting the percent of completion for each job can be viewed on ArborAccess.

## SAMPLE MANAGEMENT TOOLS

### DETAILED TREE SITE CHARACTERISTICS

The advanced technology provides a valuable tool to urban forestry professionals by displaying specific tree site information along with a representative photograph of the species type and a recommended maintenance field. ArborAccess' built-in quality control features assist in data accuracy. As maintenance is performed, the work history is updated and accompanied with bi-weekly invoices. This process eliminates the need for dual-inputting and helps keep the tree inventory current and accurate.

## MAINTENANCE RECORDS

Accurate maintenance records for each location oftentimes can assist the City with liability claims. Maintaining a detailed history of the work performed at each location demonstrates good faith in preserving its urban forest. It is imperative that work requests are pulled from the system prior to the work being performed, otherwise inventory accuracy is not guaranteed.

## SAMPLE CITY SPECIES FREQUENCY REPORT

	Botanical	Common	Total	Pct.
	Liquidambar styraciflua	AMERICAN SWEETGUM	4,781	14.36%
	Lagerstroemia indica	CRAPE MYRTLE	2,008	6.03%
	Ulmus parvifolia	CHINESE ELM	1,963	5.90%
	Fraxinus velutina 'Modesto'	MODESTO ASH	1,820	5.47%
	Cupaniopsis anacardioides	CARROTWOOD	1,568	4.71%
	Fraxinus velutina	ARIZONA ASH	1,259	3.78%
	Pinus canariensis	CANARY ISLAND PINE	1,191	3.58%
	Grevillea robusta	SILK OAK	1,141	3.43%
	Pistacia chinensis	CHINESE PISTACHE	1,127	3.39%
	Liriodendron tulipifera	TULIP TREE	1,076	3.23%
	Other	OTHER	15,355	46.13%
	<b>Total Trees</b>		<b>33,289</b>	<b>100%</b>

The Species Frequency report can assist your City in identifying the tree population within the urban forest. This type of information is valuable in the event of an insect infestation, deadly disease, or even estimating future maintenance costs. In addition, an analysis can be performed to evaluate the history of the performance of a particular species within your City.

## DETAILED REPORTING OPTIONS

- Inventory
- View Invoices
- Job Balances
- Green Waste
- Work History
- Work Type by District
- DBH Frequency
- Height Frequency
- District Frequency
- Species Frequency (sample above)
- All Tees at an Address
- Estimated Tree Value



**Modern Fleet consisting of  
1500+  
pieces of equipment.**

# 6 EQUIPMENT SUMMARY

## EQUIPMENT

Our modern fleet undergoes daily inspection prior to use to ensure efficiency and safety. All equipment is routinely serviced, painted, and detailed. All equipment used during the duration of this project will meet state and federal safety requirements and have all up-to-date certifications as required.

## CHP Biennial Inspection of Terminal Certification

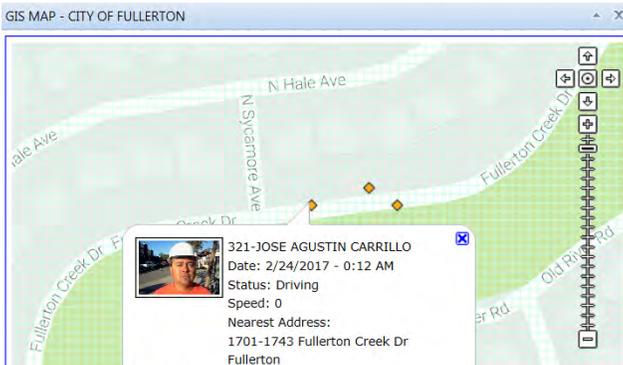
We have successfully been awarded the CHP Biennial Inspection Award of Recognition. This inspection has assisted our company in instituting several safety programs, as well as our Preventative Maintenance Program utilized by our in-house fleet department. The inspection reviews our vehicle maintenance and repair records, our procedural methods and policies for vehicle maintenance and operations. This certification ensures that our vehicles operate safely.

## Telematics Fleet Solutions

WCA has partnered with Telematics Fleet Solutions to provide GPS units on all vehicles and equipment. This investment has given us and our customers the following benefits:

- Provide faster response times and more efficient routing allowing us to service more customers
- Lower operational costs by optimizing our fleet size, reducing labor, overtime, and insurance, and minimizing costly vehicle repairs
- Decrease fuel use by monitoring fleet fuel economy and saving on unnecessary fuel expenditures
- Reduce emissions by helping drivers improve their habits such as speed and idle time, and reducing total miles driven which will significantly reduce harmful greenhouse gas emissions
- Improve dispatching with landmarks and driving directions. GPS units helps us to better dispatch so that we can service more customers, faster
- Recover stolen vehicles reducing liability costs which can be passed on to customers

EQUIPMENT LIST SUMMARY:	
Pick Up Trucks	320
Aerial Lift Devices	324
95' Aerial Devices	15
Dump Trucks	181
Flat Beds	39
Forklifts	6
Arrowboards	73
ATVs	7
Stump Grinders	59
Loaders	70
Rubber Track Loader	1
Root Pruners	2
Rolloff Trucks	50
Saw Mill	2
Log Skidder	1
Back Hoes	1
Brush Chippers	170
Cranes	5
Toyota Prius	11
Toyota Yaris	8
Ford CMAX	4



## CURRENT CONTRACT WORK EXPERIENCE

WCA, Inc. understands the challenge that many cities face to reduce the cost of tree maintenance services, while increasing the level of performance. Utilizing our services as a valuable, cost-effective resource, cities are able to provide better services to their community. These contracts cover a range of services from providing emergency response to maintaining the City's entire urban forest.

### CITY OF NORWALK—SINCE 1997



**Annual Budget:** \$ 400,000  
**Contact:** Joe Garcia, Maintenance Supervisor  
**Address:** 12700 Norwalk Blvd., Norwalk, CA 90650  
**Phone:** (562) 929-5511  
**Email:** jgarcia@ci.norwalk.ca.us

### CITY OF WHITTIER—SINCE 2005



**Annual Budget:** \$ 1,000,000  
**Contact:** Wayne McBurney, Tree Maint. Supv.  
**Address:** 13230 Penn St., Whittier, CA 90602  
**Phone:** (562) 464-3375  
**Email:** wmcburney@cityofwhittier.org

### COUNTY OF LOS ANGELES—SINCE 2010



**Annual Budget:** \$ 4,300,000  
**Contact:** Nathan Birdwell, Tree Superintendent  
**Address:** 38126 N. Sierra Highway, Palmdale, CA 93550  
**Phone:** (661) 974-7173 x. 257  
**Email:** nbirdwell@dpw.lacounty.gov

### CITY OF TEMPLE CITY—SINCE 2002



**Annual Budget:** \$ 295,000  
**Contact:** Adam Matsumoto, Parks & Rec, Dir.  
**Address:** 9701 Las Tunas, Temple City, CA 91780  
**Phone:** (626) 285-2171 x4505  
**Email:** amatsumoto@templecity.us

### CITY OF SANTA FE SPRINGS—SINCE 2006



**Annual Budget:** \$ 300,000  
**Contact:** Eric Borunda  
**Address:** 12636 Emmens Way, Santa Fe Springs, CA 90670  
**Phone:** (562) 868-0511  
**Email:** ericborunda@santafesprings.org

# 7

## REFERENCES/ EXPERIENCE

WCA performs various tree maintenance services for the City. The City is currently on a 3 year maintenance cycle which includes major arterials, residential areas, parks and facilities. WCA maintains all tree maintenance records in ArborAccess

WCA performs various tree maintenance services for the City and maintains the work records for 22,623 city-owned tree sites including parkways, parks, and facilities. The City of Whittier is currently on a 5 year grid trim maintenance cycle. Emergency response is also provided

WCA trims nearly 25,000 trees of the county's 500,000 tree population annually. We also perform tree removals and tree planting on an as-needed basis. Part of our work requirements include palm tree inspection and bird nesting inspections as work is performed.

WCA performs tree maintenance in several areas including blocks, medians, trails, facilities and parks. The ficus trees are on an annual maintenance cycle. WCA assisted the City in developing a Master Plan for their urban forest. In 2012 the GPS inventory was updated to reflect the circumstantial changes effected by the storm damage in 2011

WCA performs tree maintenance services throughout the City of Santa Fe Springs that includes but is not limited to grid tree pruning, special request tree removals, stump removals and pruning. WCA also uses it's own inventory software system ArborAccess in which the City has full access to. Emergency services are available as needed.



State of California

# Department of Industrial Relations

## Contractor Information

Legal Entity Name  
WEST COAST ARBORISTS, INC.  
Legal Entity Type  
Corporation  
Status  
Active  
Registration Number  
100000956  
Registration effective date  
07/01/19  
Registration expiration date  
06/30/22  
Mailing Address  
2200 E. VIA BURTON ANAHEIM 92806 CA United States of America  
Physical Address  
2200 E. VIA BURTON ANAHEIM 92806 CA United States of America  
Email Address  
vgonzalez@wcainc.com  
Trade Name/DBA  
License Number (s)  
CSLB:366764

## Registration History

Effective Date	Expiration Date
05/29/18	06/30/19
06/07/17	06/30/18
06/09/16	06/30/17
06/26/15	06/30/16
08/19/14	06/30/15
07/01/19	06/30/22



# CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)  
07/01/2021

**THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.**

**IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).**

<b>PRODUCER</b> Aon Risk Insurance Services West, Inc. Los Angeles CA Office 707 Wilshire Boulevard Suite 2600 Los Angeles CA 90017-0460 USA	<b>CONTACT NAME:</b> PHONE (A/C. No. Ext): (866) 283-7122      FAX (A/C. No.): (800) 363-0105 E-MAIL ADDRESS:														
<b>INSURED</b> West Coast Arborists, Inc. 2200 E Via Burton Anaheim CA 92806 USA	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;">INSURER(S) AFFORDING COVERAGE</th> <th style="width: 20%;">NAIC #</th> </tr> </thead> <tbody> <tr> <td>INSURER A: Starr Indemnity &amp; Liability Company</td> <td>38318</td> </tr> <tr> <td>INSURER B: Starr Specialty Insurance Company</td> <td>16109</td> </tr> <tr> <td>INSURER C: Navigators Specialty Insurance Company</td> <td>36056</td> </tr> <tr> <td>INSURER D:</td> <td></td> </tr> <tr> <td>INSURER E:</td> <td></td> </tr> <tr> <td>INSURER F:</td> <td></td> </tr> </tbody> </table>	INSURER(S) AFFORDING COVERAGE	NAIC #	INSURER A: Starr Indemnity & Liability Company	38318	INSURER B: Starr Specialty Insurance Company	16109	INSURER C: Navigators Specialty Insurance Company	36056	INSURER D:		INSURER E:		INSURER F:	
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INSURER D:															
INSURER E:															
INSURER F:															

Holder Identifier :

**COVERAGES      CERTIFICATE NUMBER: 570088275316      REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS												
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR  GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:			1000100141211	07/01/2021	07/01/2022	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>EACH OCCURRENCE</td><td style="text-align: right;">\$2,000,000</td></tr> <tr><td>DAMAGE TO RENTED PREMISES (Ea occurrence)</td><td style="text-align: right;">\$1,000,000</td></tr> <tr><td>MED EXP (Any one person)</td><td style="text-align: right;">\$5,000</td></tr> <tr><td>PERSONAL &amp; ADV INJURY</td><td style="text-align: right;">\$2,000,000</td></tr> <tr><td>GENERAL AGGREGATE</td><td style="text-align: right;">\$4,000,000</td></tr> <tr><td>PRODUCTS - COMP/OP AGG</td><td style="text-align: right;">\$4,000,000</td></tr> </table>	EACH OCCURRENCE	\$2,000,000	DAMAGE TO RENTED PREMISES (Ea occurrence)	\$1,000,000	MED EXP (Any one person)	\$5,000	PERSONAL & ADV INJURY	\$2,000,000	GENERAL AGGREGATE	\$4,000,000	PRODUCTS - COMP/OP AGG	\$4,000,000
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PRODUCTS - COMP/OP AGG	\$4,000,000																		
A	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> NON-OWNED AUTOS ONLY			1000198198211	07/01/2021	07/01/2022	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>COMBINED SINGLE LIMIT (Ea accident)</td><td style="text-align: right;">\$2,000,000</td></tr> <tr><td>BODILY INJURY (Per person)</td><td></td></tr> <tr><td>BODILY INJURY (Per accident)</td><td></td></tr> <tr><td>PROPERTY DAMAGE (Per accident)</td><td></td></tr> </table>	COMBINED SINGLE LIMIT (Ea accident)	\$2,000,000	BODILY INJURY (Per person)		BODILY INJURY (Per accident)		PROPERTY DAMAGE (Per accident)					
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A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below			1000004229	07/01/2021	07/01/2022	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td><input checked="" type="checkbox"/> PER STATUTE</td> <td><input type="checkbox"/> OTH</td> <td></td> </tr> <tr><td>E.L. EACH ACCIDENT</td><td></td><td style="text-align: right;">\$1,000,000</td></tr> <tr><td>E.L. DISEASE-EA EMPLOYEE</td><td></td><td style="text-align: right;">\$1,000,000</td></tr> <tr><td>E.L. DISEASE-POLICY LIMIT</td><td></td><td style="text-align: right;">\$1,000,000</td></tr> </table>	<input checked="" type="checkbox"/> PER STATUTE	<input type="checkbox"/> OTH		E.L. EACH ACCIDENT		\$1,000,000	E.L. DISEASE-EA EMPLOYEE		\$1,000,000	E.L. DISEASE-POLICY LIMIT		\$1,000,000
<input checked="" type="checkbox"/> PER STATUTE	<input type="checkbox"/> OTH																		
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B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below		N/A	1000004228	07/01/2021	07/01/2022	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>E.L. EACH ACCIDENT</td><td></td><td style="text-align: right;">\$1,000,000</td></tr> <tr><td>E.L. DISEASE-EA EMPLOYEE</td><td></td><td style="text-align: right;">\$1,000,000</td></tr> <tr><td>E.L. DISEASE-POLICY LIMIT</td><td></td><td style="text-align: right;">\$1,000,000</td></tr> </table>	E.L. EACH ACCIDENT		\$1,000,000	E.L. DISEASE-EA EMPLOYEE		\$1,000,000	E.L. DISEASE-POLICY LIMIT		\$1,000,000			
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E.L. DISEASE-EA EMPLOYEE		\$1,000,000																	
E.L. DISEASE-POLICY LIMIT		\$1,000,000																	

570088275316

Certificate No :

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

<b>CERTIFICATE HOLDER</b>  West Coast Arborists, Inc. 2200 E Via Burton Anaheim CA 92806 USA	<b>CANCELLATION</b>  SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.  AUTHORIZED REPRESENTATIVE  <div style="text-align: center;"><i>Aon Risk Insurance Services West, Inc.</i></div>
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## EXHIBIT D

### EQUAL EMPLOYMENT OPPORTUNITY

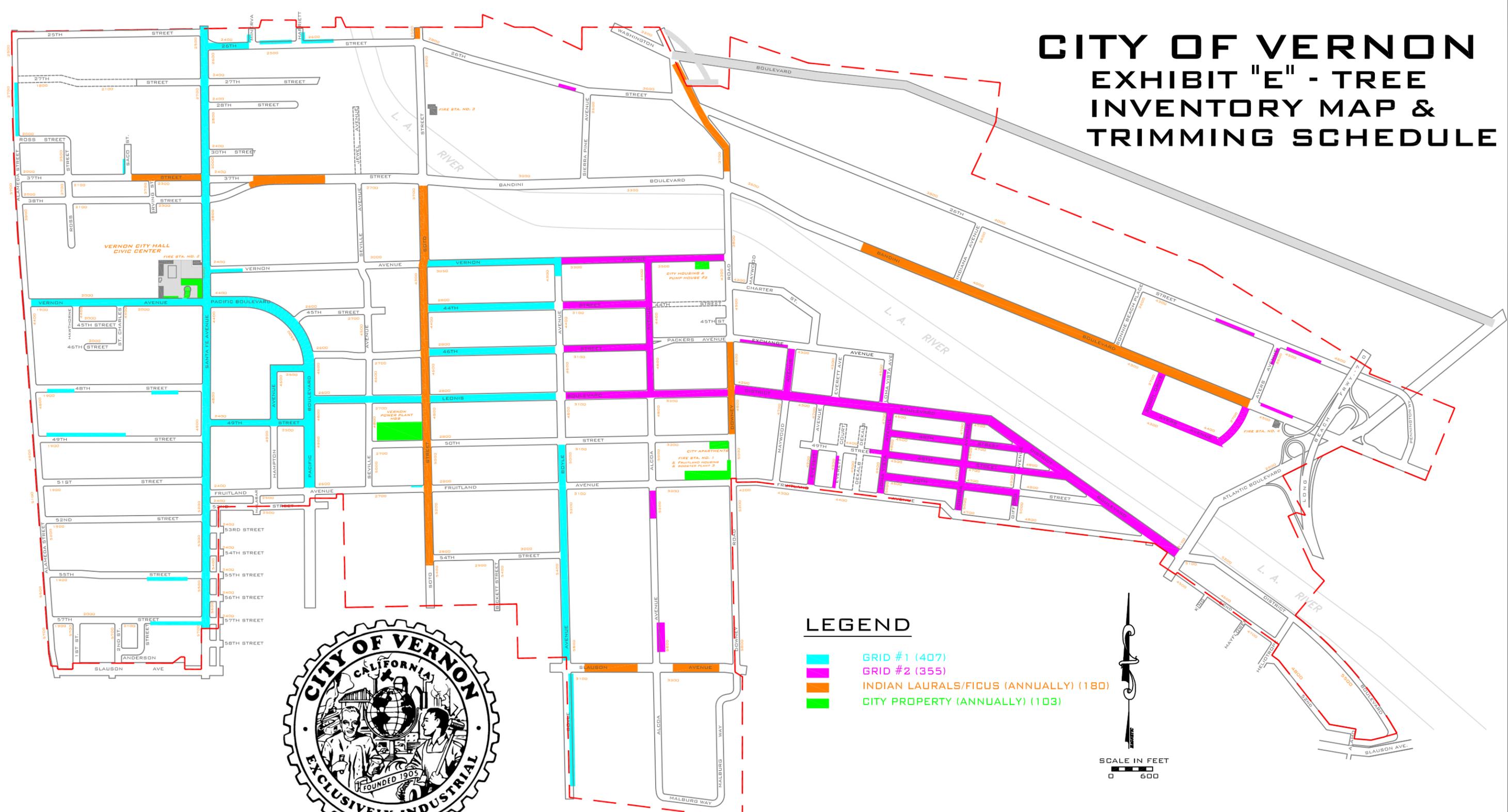
#### PRACTICES PROVISIONS

- A. Contractor certifies and represents that, during the performance of this Contract, the contractor and each subcontractor shall adhere to equal opportunity employment practices to assure that applicants and employees are treated equally and are not discriminated against because of their race, religious creed, color, national origin, ancestry, handicap, sex, or age. Contractor further certifies that it will not maintain any segregated facilities.
- B. Contractor agrees that it shall, in all solicitations or advertisements for applicants for employment placed by or on behalf of Contractor, state that it is an "Equal Opportunity Employer" or that all qualified applicants will receive consideration for employment without regard to their race, religious creed, color, national origin, ancestry, handicap, sex or age.
- C. Contractor agrees that it shall, if requested to do so by the City, certify that it has not, in the performance of this Contract, discriminated against applicants or employees because of their membership in a protected class.
- D. Contractor agrees to provide the City with access to, and, if requested to do so by City, through its awarding authority, provide copies of all of its records pertaining or relating to its employment practices, except to the extent such records or portions of such records are confidential or privileged under state or federal law.
- E. Nothing contained in this Contract shall be construed in any manner as to require or permit any act which is prohibited by law.

EXHIBIT E

TREE INVENTORY MAP & TRIMMING SCHEDULE

# CITY OF VERNON EXHIBIT "E" - TREE INVENTORY MAP & TRIMMING SCHEDULE



## LEGEND

- GRID #1 (407)
- GRID #2 (355)
- INDIAN LAURALS/FICUS (ANNUALLY) (180)
- CITY PROPERTY (ANNUALLY) (103)

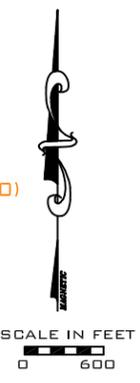


EXHIBIT F  
SCHEDULE OF COSTS

# City of Vernon

## Urban Forest Management Services provided by West Coast Arborists, Inc.

### Summary of Estimated Charges 2022-2024 February 2, 2022

**YEAR NO. 1 (2022)**

Item #	Description	Est. Qty.	Unit	Unit Rate	Ext. Total
1	Trim Indian Laurel Fig - Lg Size	78	Each	\$ 290.00	\$ 22,620.00
2	Trim Indian Laurel Fig - X-Lg Size	77	Each	\$ 390.00	\$ 30,030.00
3	Grid No. 2 Inventory	407	Each	\$ 85.00	\$ 34,595.00
4	City Government Bldg	62	Each	\$ 190.00	\$ 11,780.00
5	City Housing	33	Each	\$ 190.00	\$ 6,270.00
6	City Apartments	7	Each	\$ 190.00	\$ 1,330.00
					<b>\$ 106,625.00</b>

**YEAR NO. 2 (2023)**

Item #	Description	Est. Qty.	Unit	Unit Rate	Ext. Total
1	Trim Indian Laurel Fig - Lg Size	78	Each	\$ 298.00	\$ 23,244.00
2	Trim Indian Laurel Fig - X-Lg Size	77	Each	\$ 399.00	\$ 30,723.00
3	Grid No. 1 Inventory	355	Each	\$ 87.00	\$ 30,885.00
4	City Government Bldg	62	Each	\$ 195.00	\$ 12,090.00
5	City Housing	33	Each	\$ 195.00	\$ 6,435.00
6	City Apartments	7	Each	\$ 195.00	\$ 1,365.00
					<b>\$ 104,742.00</b>

**YEAR NO. 3 (2024)**

Item #	Description	Est. Qty.	Unit	Unit Rate	Ext. Total
1	Trim Indian Laurel Fig - Lg Size	78	Each	\$ 307.00	\$ 23,946.00
2	Trim Indian Laurel Fig - X-Lg Size	77	Each	\$ 413.00	\$ 31,801.00
3	Grid No. 2 Inventory	407	Each	\$ 90.00	\$ 36,630.00
4	City Government Bldg	62	Each	\$ 199.00	\$ 12,338.00
5	City Housing	33	Each	\$ 199.00	\$ 6,567.00
6	City Apartments	7	Each	\$ 199.00	\$ 1,393.00
					<b>\$ 112,675.00</b>

	<b>Additional Services (As-Needed)</b>	Est. Qty.	Unit	Unit Rate
7	Tree & Stump Removal	1	Dia Inch	\$ 44.00
8	Stump Removal	1	Dia Inch	\$ 10.00
9	Tree Only Removal	1	Dia Inch	\$ 34.00
10	Root Pruning	1	Linear Foot	\$ 300.00
11	Tree Planting - 15-gal w/out RB	1	Each	\$ 145.00
12	Tree Planting - 15-gal w/ RB	1	Each	\$ 160.00
13	Tree Planting - 24" box w/out RB	1	Each	\$ 300.00
14	Tree Planting - 24" box w/ RB	1	Each	\$ 320.00
15	Tree Watering Services	1	Man Hour	\$ 100.00
16	Arborist Services	1	Hour	\$ 100.00
17	Crew Rental - with standard equip	1	Man Hour	\$ 100.00
18	Emergency Response	1	Man Hour	\$ 100.00

*Rates for Additional Services shall remain the same over the 3-year term.*

# City Council Agenda Item Report

Submitted by: Lissette Melendez  
Submitting Department: Public Works  
Meeting Date: March 1, 2022

## **SUBJECT**

Services Agreement with CleanStreet, LLC for Street Sweeping Services (Contract No. CS-1434)

## **Recommendation:**

- A. Find that the proposed action is categorically exempt from California Environmental Quality Act (CEQA) review, in accordance with CEQA Guidelines § 15301, because the project consists of the maintenance of existing streets and involves no expansion of an existing use; and
- B. Approve and authorize the City Administrator to execute a Services Agreement with CleanStreet, LLC, in substantially the same form as submitted, for a three (3) year term in an amount not-to-exceed \$1,001,242.44, with an effective date of April 1, 2022.

## **Background:**

Street sweeping is an important routine maintenance activity that is critical to ensuring that the City remains clean, attractive, and inviting. With the City's existing agreement with Webco LB, LLC near its expiration, staff initiated the Request for Proposals (RFP) process to secure a vendor for a new three-year term.

On January 31, 2022, the City Administrator authorized the issuance of a an RFP for street sweeping services. As required by Vernon Municipal Code Sections 3.32.130 and 3.32.220 respectively, on February 2, 2022, the RFP was advertised online via the City's Planetbids portal (accessible via the City's website) and sent to 14 vendors likely to qualify to submit a proposal. The City received two (2) proposals in response to the RFP. The proposals were evaluated based on the rating criteria outlined in the RFP. The rating criteria took into account the following factors: price, qualifications, responsiveness to the RFP, and references.

The Public Works Department received proposals from the following vendors:

Webco LB, LLC  
CleanStreet, LLC

The two (2) proposals received were reviewed and evaluated by a panel of City staff. Ultimately, CleanStreet, LLC (CleanStreet), was deemed as the most qualified based on the ranking criteria noted above. Upon City Council approval, CleanStreet shall provide street sweeping services for all public streets, and public alleys within the City's jurisdiction. Approximately 108 curb miles will be swept on a weekly basis. In addition, the contractor is required to provide street sweeping services prior to and after any special events, as well as 24-hour per day emergency sweeping services within 2-hour notification from the City for the period of April 1, 2022 through March 31, 2025. Staff recommends that CleanStreet be awarded the contract for street sweeping services (Contract No. CS-1434) based on the results of the RFP process. The proposed agreement has been reviewed and approved as to form by the City Attorney's Office.

The current agreement with Webco LB, LLC for street sweeping services will expire on March 1, 2022. During the transition between agreements (approximately one month), street sweeping services will be performed by Public Works personnel. The proposed services agreement will become effective April 1, 2022.

**Fiscal Impact:**

Funds in the amount of \$130,000 for street sweeping services were included in the FY 2021-22 Repairs & Maintenance, Public Works Department budget Account No. 011.1043.590000. An additional \$50,000, required for the remainder of the fiscal year, in excess of the amount budgeted for street sweeping will come from Public Works salary savings. Salary savings are the savings realized from budgeted but currently vacant positions. Sufficient funds for the proposed agreement will be budgeted accordingly in subsequent fiscal years.

**Attachments:**

1. [CS-1434 - Services Agreement with CleanStreet, LLC](#)

SERVICES AGREEMENT BETWEEN THE CITY OF VERNON AND CLEANSTREET,  
LLC FOR STREET SWEEPING SERVICES CONTRACT NO. CS-1434

COVER PAGE

Contractor:	CleanStreet, LLC
Responsible Principal of Contractor:	David V. Padilla Jr., General Manager – California
Notice Information - Contractor:	CleanStreet, LLC 1937 W. 169 <sup>th</sup> Street Gardena, CA 90247 Attention: David V. Padilla Jr., General Manager – California Telephone: (310) 436-6510 Email: dpadilla@sweepingcorp.com
Notice Information - City:	City of Vernon 4305 Santa Fe Avenue Vernon, CA 90058 Attention: Daniel Wall, Director of Public Works Telephone: (323) 583-8811 ext. 305 Email: dwall@cityofvernon.org
Commencement Date:	April 1, 2022
Termination Date:	March 31, 2025
Consideration:	Total not to exceed \$1,001,242.44 (includes all applicable sales tax); and more particularly described in Exhibit B
Records Retention Period	Three (3) years, pursuant to Section 11.20

SERVICES AGREEMENT BETWEEN THE CITY OF VERNON AND CLEANSTREET, LLC  
FOR STREET SWEEPING SERVICES CONTRACT NO. CS-1434

This Agreement is made between the City of Vernon ("City"), a California charter City and California municipal corporation ("City"), and CleanStreet, LLC, a California limited liability company ("Contractor").

The City and Contractor agree as follows:

1.0 EMPLOYMENT OF CONTRACTOR. City agrees to engage Contractor to perform the services as hereinafter set forth as authorized by the City Council on March 1, 2022.

2.0 SCOPE OF SERVICES.

2.1 Contractor shall perform all work necessary to complete the services set forth in the City's Request for Proposals issued on or about February 2, 2022, and titled Street Sweeping Services Contract No. CS-1434, and Contractor's proposal to the City ("Proposal") dated February 10, 2022, Exhibit "A", a copy which is attached to and incorporated into this Agreement by reference.

2.2 All services shall be performed to the satisfaction of City.

2.3 All services shall be performed in a competent, professional, and satisfactory manner in accordance with the prevailing industry standards for such services.

2.4 All work shall conform to Part 1 – General Provisions of *The "GREENBOOK" Standard Specifications for Public Works Construction (2018 Edition)*, referred to hereafter as the "Standard Specifications", and the service requirements outlined in the General Requirements, as set forth and attached hereto as Exhibit "D".

3.0 PERSONNEL.

3.1 Contractor represents that it employs, or will employ, at its own expense, all personnel required to perform the services under this Agreement.

3.2 Contractor shall not subcontract any services to be performed by it under this Agreement without prior written approval of City.

3.3 All of the services required hereunder will be performed by Contractor or by City approved subcontractors. Contractor, and all personnel engaged in the work, shall be fully qualified and authorized or permitted under State and local law to perform such services and shall be subject to approval by the City.

4.0 TERM. The term of this Agreement shall commence on April 1, 2022, and it shall continue until March 31, 2025, unless terminated at an earlier date pursuant to the provisions thereof.

5.0 COMPENSATION AND FEES.

5.1 Contractor has established rates for the City of Vernon which are comparable to and do not exceed the best rates offered to other governmental entities in and around Los Angeles County for the same services. For satisfactory and timely performance of the services, the City will pay Contractor in accordance with the payment schedule set forth in Exhibit "B" attached hereto and incorporated herein by reference.

5.2 Contractor's grand total compensation for the entire term of this Agreement, shall not exceed \$1,001,242.44 without the prior authorization of the City, as appropriate, and written amendment of this Agreement.

5.3 Contractor shall, at its sole cost and expense, furnish all necessary and incidental labor, material, supplies, facilities, equipment, and transportation which may be required for furnishing services pursuant to this Agreement. Materials shall be of the highest quality. The above Agreement fee shall include all staff time and all clerical, administrative, overhead, insurance, reproduction, telephone, air travel, auto rental, subsistence, and all related costs and expenses.

5.4 City shall reimburse Contractor only for those costs or expenses specifically approved in this Agreement, or specifically approved in writing in advance by City. Unless otherwise approved, such costs shall be limited and include nothing more than the following costs incurred by Contractor:

5.4.1 The actual costs of subcontractors for performance of any of the services that Contractor agrees to render pursuant to this Agreement, which have been approved in advance by City and awarded in accordance with this Agreement.

5.4.2 Approved reproduction charges.

5.4.3 Actual costs and/or other costs and/or payments specifically authorized in advance in writing and incurred by Contractor in the performance of this Agreement.

5.5 Contractor shall not receive any compensation for extra work performed without the prior written authorization of City. As used herein, "extra work" means any work that is determined by City to be necessary for the proper completion of the Project, but which is not included within the Scope of Services and which the parties did not reasonably anticipate would be necessary at the time of execution of this Agreement. Compensation for any authorized extra work shall be paid in accordance with the payment schedule as set forth in Exhibit "B," if the extra work has been approved by the City.

5.6 Licenses, Permits, Fees, and Assessments. Contractor shall obtain, at Contractor's sole cost and expense, such licenses, permits, and approvals as may be required by law for the performance of the services required by this Agreement. Contractor shall have the sole obligation to pay for any fees, assessments, and taxes, plus applicable penalties and interest, which may be imposed by law and which arise from or are necessary for the performance of the Services by this Agreement.

6.0 PAYMENT.

6.1 As scheduled services are completed, Contractor shall submit to the City an invoice for the services completed, authorized expenses, and authorized extra work actually performed or incurred according to said schedule.

6.2 Each such invoice shall state the basis for the amount invoiced, including a detailed description of the services completed, the number of hours spent, reimbursable expenses incurred and any extra work performed.

6.3 Contractor shall also submit a progress report with each invoice that describes in reasonable detail the services and the extra work, if any, performed in the immediately preceding calendar month.

6.4 Contractor understands and agrees that invoices which lack sufficient detail to measure performance will be returned and not processed for payment.

6.5 City will pay Contractor the amount invoiced within thirty (30) days after the City approves the invoice.

6.6 Payment of such invoices shall be payment in full for all services, authorized costs, and authorized extra work covered by that invoice.

7.0 CITY'S RESPONSIBILITY. City shall cooperate with Contractor as may be reasonably necessary for Contractor to perform its services; and will give any required decisions as promptly as practicable so as to avoid unreasonable delay in the progress of Contractor's services.

8.0 COORDINATION OF SERVICES. Contractor agrees to work closely with City staff in the performance of Services and shall be available to City's staff, consultants, and other staff at all reasonable times.

9.0 INDEMNITY. Contractor agrees to indemnify City, its officers, elected officials, employees and agents against, and will hold and save each of them harmless from, any and all actions, suits, claims, damages to persons or property, losses, costs, penalties, obligations, errors, omissions or liabilities (herein "claims or liabilities"), including but not limited to professional negligence, that may be asserted or claimed by any person, firm or entity arising

out of or in connection with the work, operations or activities of Contractor, its agents, employees, subcontractors, or invitees, provided for herein, or arising from the acts or omissions of Contractor hereunder, or arising from Contractor's performance of or failure to perform any term, provision, covenant or condition of this Agreement, except to the extent such claims or liabilities arise from the gross negligence or willful misconduct of City, its officers, elected officials, agents or employees.

10.0 INSURANCE. Contractor shall, at its own expense, procure and maintain policies of insurance of the types and in the amounts set forth below, for the duration of the Contract, including any extensions thereto. The policies shall state that they afford primary coverage.

i. Automobile Liability with minimum limits of at least \$1,000,000 combined single limit, including owned, hired, and non-owned liability coverage.

ii. Contractor agrees to subrogate automobile liability resulting from performance under this agreement by agreeing to defend, indemnify and hold harmless, the City, and its respective employees, agents, and City Council from and against all claims, liabilities, suits, losses, damages, injuries and expenses, including all costs and reasonable attorney's fees ("Claims"), which are attributable to any act or omission by the City under the performance of the services.

iii. General Liability with minimum limits of at least \$1,000,000 per occurrence and \$2,000,000 aggregate written on an Insurance Services Office (ISO) Comprehensive General Liability "occurrence" form or its equivalent for coverage on an occurrence basis.

Premises/Operations and Personal Injury coverage is required. The City of Vernon, its directors, commissioners, officers, employees, agents, and volunteers must be endorsed on the policy as additional insureds as respects liability arising out of the Contractor's performance of this Contract.

- (1) If Contractor employs other contractors as part of the services rendered, Contractor's Protective Coverage is required. Contractor may include all subcontractors as insureds under its own policy or shall furnish separate insurance for each subcontractor, meeting the requirements set forth herein.
- (2) Contractor agrees to subrogate General Liability resulting from performance under this agreement by agreeing to defend, indemnify and hold harmless, the City, and its respective employees, agents, and City Council from and against all claims, liabilities, suits, losses, damages,

injuries and expenses, including all costs and reasonable attorney's fees ("Claims"), which are attributable to any act or omission by the City under the performance of the services.

iv. Contractors Pollution Liability (CPL) policy limit shall provide coverage of no less than \$1,000,000 per claim and in the aggregate. Coverage shall apply to bodily injury; property damage, including loss of use of damaged property or of property that has not been physically injured; cleanup costs; and costs of defense, including costs and expenses incurred in the investigation, defense, or settlement of claims.

- (1) Contractor shall obtain, pay for, and maintain for the duration of the Contract CPL insurance that provides coverage for liability caused by pollution conditions arising out of the operations of the Contractor. Coverage shall be included on behalf of the insured for covered claims arising out of the actions of independent contractors. If the insured is using Subcontractors, the policy must include work performed "by or on behalf" of the insured.
- (2) All activities contemplated in the Contract shall be specifically scheduled on the CPL policy as "covered operation." In addition, the policy shall provide coverage for the hauling of waste from the Project site to the final disposal location, including non-owned disposal sites.
- (3) The policy shall specifically provide for a duty to defend on the part of the insurer. The City of Vernon, its officers, employees and agents shall be added to the policy as additional insureds by endorsement.

v. Contractor shall comply with the applicable sections of the California Labor Code concerning workers' compensation for injuries on the job. In addition, Contractor shall require each subcontractor to similarly maintain workers' compensation insurance in accordance with the laws for California for all of the subcontractor's employees. Compliance is accomplished in one of the following manners:

- (1) Provide copy of permissive self-insurance certificate approved by the State of California; or
- (2) Secure and maintain in force a policy of workers' compensation insurance with statutory limits and Employer's Liability Insurance with a minimal limit of \$1,000,000 per accident. The policy shall be endorsed to waive all rights of subrogation against City, its directors, commissioners, officers, employees, and volunteers for losses arising from performance of this

Contract; or

(3) Provide a "waiver" form certifying that no employees subject to the Labor Code's Workers' Compensation provision will be used in performance of this Contract.

vi. Each insurance policy included in this clause shall be endorsed to state that coverage shall not be cancelled except after thirty (30) days' prior written notice to City.

vii. Insurance shall be placed with insurers with a Best's rating of no less than A-VIII.

viii. Prior to commencement of performance, Contractor shall furnish City with a certificate of insurance for each policy. Each certificate is to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificate(s) must be in a form approved by City. City may require complete, certified copies of any or all policies at any time.

ix. Failure to maintain required insurance at all times shall constitute a default and material breach. In such event, Contractor shall immediately notify City and cease all performance under this Contract until further directed by the City. In the absence of satisfactory insurance coverage, City may, at its option: (a) procure insurance with collection rights for premiums, attorney's fees and costs against Contractor by way of set-off or recoupment from sums due to Contractor, at City's option; (b) immediately terminate this Contract and seek damages from the Contract resulting from said breach; or (c) self-insure the risk, with all damages and costs incurred, by judgment, settlement or otherwise, including attorney's fees and costs, being collectible from Contractor, by way of set-off or recoupment from any sums due to Contractor.

#### 11.0 GENERAL TERMS AND CONDITIONS.

##### 11.1 INDEPENDENT CONTRACTOR.

11.1.1 It is understood that in the performance of the services herein provided for, Contractor shall be, and is, an independent contractor, and is not an agent, officer or employee of City and shall furnish such services in its own manner and method except as required by this Agreement, or any applicable statute, rule, or regulation. Further, Contractor has and shall retain the right to exercise full control over the employment, direction, compensation and discharge of all persons employed by Contractor in the performance of the services hereunder. City assumes no liability for Contractor's actions and performance, nor assumes responsibility for taxes, bonds, payments, or other commitments, implied or explicit, by or for Contractor. Contractor shall be solely responsible for, and shall indemnify, defend and save City harmless from all matters relating to the payment of its employees, subcontractors

and independent contractors, including compliance with social security, withholding and all other wages, salaries, benefits, taxes, exactions, and regulations of any nature whatsoever.

11.1.2 Contractor acknowledges that Contractor and any subcontractors, agents or employees employed by Contractor shall not, under any circumstances, be considered employees of the City, and that they shall not be entitled to any of the benefits or rights afforded employees of City, including, but not limited to, sick leave, vacation leave, holiday pay, Public Employees Retirement System benefits, or health, life, dental, long-term disability or workers' compensation insurance benefits.

11.2 CONTRACTOR NOT AGENT. Except as the City may authorize in writing, Contractor and its subcontractors shall have no authority, express or implied, to act on behalf of or bind the City in any capacity whatsoever as agents or otherwise.

11.3 OWNERSHIP OF WORK. All documents and materials furnished by the City to Contractor shall remain the property of the City and shall be returned to the City upon termination of this Agreement. All reports, drawings, plans, specifications, computer tapes, floppy disks and printouts, studies, memoranda, computation sheets, and other documents prepared by Contractor in furtherance of the work shall be the sole property of City and shall be delivered to City whenever requested at no additional cost to the City. Contractor shall keep such documents and materials on file and available for audit by the City for at least three (3) years after completion or earlier termination of this Agreement. Contractor may make duplicate copies of such materials and documents for its own files or for such other purposes as may be authorized in writing by the City.

11.4 CORRECTION OF WORK. Contractor shall promptly correct any defective, inaccurate or incomplete tasks, deliverables, goods, services and other work, without additional cost to the City. The performance or acceptance of services furnished by Contractor shall not relieve the Contractor from the obligation to correct subsequently discovered defects, inaccuracy, or incompleteness.

11.5 RESPONSIBILITY FOR ERRORS. Contractor shall be responsible for its work and results under this Agreement. Contractor, when requested, shall furnish clarification and/or explanation as may be required by the City, regarding any services rendered under this Agreement at no additional cost to City. In the event that an error or omission attributable to Contractor occurs, then Contractor shall, at no cost to City, provide all necessary design drawings, estimates and other Contractor professional services necessary to rectify and correct the matter to the sole satisfaction of City and to participate in any meeting required with regard to the correction.

11.6 WAIVER. The City's waiver of any term, condition, breach, or default of this Agreement shall not be considered to be a waiver of any other term, condition, default or breach, nor of a subsequent breach of the one waived. The delay or failure of either party at any time to require performance or compliance by the other of any of its obligations or agreements shall in no way be deemed a waiver of those rights to require such performance or compliance. No waiver of any provision of this Agreement shall be effective unless in writing and executed by a duly authorized representative of the party against whom enforcement of a waiver is sought.

11.7 SUCCESSORS. This Agreement shall inure to the benefit of, and shall be binding upon, the parties hereto and their respective heirs, successors, and/or assigns.

11.8 NO ASSIGNMENT. Contractor shall not assign or transfer this Agreement or any rights hereunder without the prior written consent of the City and approval by the City Attorney, which may be withheld in the City's sole discretion. Any unauthorized assignment or transfer shall be null and void and shall constitute a material breach by the Contractor of its obligations under this Agreement. No assignment shall release the original parties from their obligations or otherwise constitute a novation.

11.9 COMPLIANCE WITH LAWS. Contractor shall comply with all Federal, State, County and City laws, ordinances, rules and regulations, which are, as amended from time to time, incorporated herein and applicable to the performance hereof. Violation of any law material to performance of this Agreement shall entitle the City to terminate the Agreement and otherwise pursue its remedies. Further, if the Contractor performs any work knowing it to be contrary to such laws, rules, and regulations Contractor shall be solely responsible for all costs arising therefrom.

11.10 ATTORNEY'S FEES. If any action at law or in equity is brought to enforce or interpret the terms of this Agreement, the prevailing party shall be entitled to reasonable attorney's fees, costs, and necessary disbursements in addition to any other relief to which such party may be entitled.

11.11 INTERPRETATION.

11.11.1 Applicable Law. This Agreement shall be deemed an agreement and shall be governed by and construed in accordance with the laws of the State of California. Contractor agrees that the State and Federal courts which sit in the State of California shall have exclusive jurisdiction over all controversies and disputes arising hereunder, and submits to the jurisdiction thereof.

11.11.2 Entire Agreement. This Agreement, including any exhibits attached hereto, constitutes the entire agreement and understanding between the parties regarding its subject matter and supersedes all prior or contemporaneous negotiations, representations, understandings, correspondence, documentation, and agreements (written or oral).

11.11.3 Written Amendment. This Agreement may only be changed by written amendment executed by Contractor and the City Administrator or other authorized representative of the City, subject to any requisite authorization by the City Council. Any oral representations or modifications concerning this Agreement shall be of no force or effect.

11.11.4 Severability. If any provision in this Agreement is held by any court of competent jurisdiction to be invalid, illegal, void, or unenforceable, such portion shall be deemed severed from this Agreement, and the remaining provisions shall nevertheless continue in full force and effect as fully as though such invalid, illegal, or unenforceable portion had never been part of this Agreement.

11.11.5 Order of Precedence. In case of conflict between the terms of this Agreement and the terms contained in any document attached as an Exhibit or otherwise incorporated by reference, the terms of this Agreement shall strictly prevail. The terms of the City's Request for Proposals shall control over the Contractor's Proposal.

11.11.6 Construction. In the event an ambiguity or question of intent or interpretation arises with respect to this Agreement, this Agreement shall be construed as if drafted jointly by the parties and in accordance with its fair meaning. There shall be no presumption or burden of proof favoring or disfavoring any party by virtue of the authorship of any of the provisions of this Agreement.

11.12 TIME OF ESSENCE. Time is strictly of the essence of this agreement and each and every covenant, term, and provision hereof.

11.13 AUTHORITY OF CONTRACTOR. The Contractor hereby represents and warrants to the City that the Contractor has the right, power, legal capacity, and authority to enter into and perform its obligations under this Agreement, and its execution of this Agreement has been duly authorized.

11.14 ARBITRATION OF DISPUTES. Any dispute for under \$25,000 arising out of or relating to the negotiation, construction, performance, non-performance, breach, or any other aspect of this Agreement, shall be settled by binding arbitration in accordance with the Commercial Rules of the American Arbitration Association at Los Angeles, California and judgment upon the award rendered by the Arbitrators may be entered in any

court having jurisdiction thereof. The City does not waive its right to object to the timeliness or sufficiency of any claim filed or required to be filed against the City and reserves the right to conduct full discovery.

11.15 NOTICES. Any notice or demand to be given by one party to the other must be given in writing and by personal delivery or prepaid first-class, registered or certified mail, addressed as follows. Notice simply to the City of Vernon or any other City department is not adequate notice.

If to the City:

City of Vernon  
Attention: Daniel Wall, Director of Public Works  
4305 Santa Fe Avenue  
Vernon, CA 90058

If to the Contractor:

CleanStreet, LLC  
Attention: David V. Padilla Jr., General Manager-California  
1937 West 169<sup>th</sup> Street  
Gardena, CA 90247

Any such notice shall be deemed to have been given upon delivery, if personally delivered, or, if mailed, upon receipt, or upon expiration of three (3) business days from the date of posting, whichever is earlier. Either party may change the address at which it desires to receive notice upon giving written notice of such request to the other party.

11.16 NO THIRD PARTY RIGHTS. This Agreement is entered into for the sole benefit of City and Contractor and no other parties are intended to be direct or incidental beneficiaries of this Agreement and no third party shall have any right or remedy in, under, or to this Agreement.

11.17 TERMINATION FOR CONVENIENCE (Without Cause). City may terminate this Agreement in whole or in part at any time, for any cause or without cause, upon fifteen (15) calendar days' written notice to Contractor. If the Agreement is thus terminated by City for reasons other than Contractor's failure to perform its obligations, City shall pay Contractor a prorated amount based on the services satisfactorily completed and accepted prior to the effective date of termination. Such payment shall be Contractor's exclusive remedy for termination without cause.

11.18 DEFAULT. In the event either party materially defaults in its obligations hereunder, the other party may declare a default and terminate this Agreement by written notice to the defaulting party. The notice shall specify the basis for the default. The Agreement shall terminate unless such default is cured before the effective date of termination stated in such notice, which date shall be no sooner than ten (10) days after the date of the notice. In case of default by Contractor, the City reserves the right to procure the goods or services from other sources and to hold the Contractor responsible for any excess costs occasioned to the City thereby. Contractor shall not be held accountable for additional costs incurred due to delay or default as a result of Force Majeure. Contractor must notify the City immediately upon knowing that non-performance or delay will apply to this Agreement as a result of Force Majeure. At that time Contractor is to submit in writing a Recovery Plan for this Agreement. If the Recovery Plan is not acceptable to the City or not received within 10 days of the necessary notification of Force Majeure default, then the City may cancel this order in its entirety at no cost to the City, owing only for goods and services completed to that point.

11.19 TERMINATION FOR CAUSE. Termination for cause shall relieve the terminating party of further liability or responsibility under this Agreement, including the payment of money, except for payment for services satisfactorily and timely performed prior to the service of the notice of termination, and except for reimbursement of (1) any payments made by the City for service not subsequently performed in a timely and satisfactory manner, and (2) costs incurred by the City in obtaining substitute performance. If this Agreement is terminated as provided herein, City may require, at no additional cost to City, that Contractor provide all finished or unfinished documents, data, and other information of any kind prepared by Contractor in connection with the performance of Services under this Agreement. Contractor shall be required to provide such document and other information within fifteen (15) days of the request.

11.19.1 Additional Services. In the event this Agreement is terminated in whole or in part as provided herein, City may procure, upon such terms and in such manner as it may determine appropriate, services similar to those terminated.

11.20 MAINTENANCE AND INSPECTION OF RECORDS.

The City, or its authorized auditors or representatives, shall have access to and the right to audit and reproduce any of the Contractor's records to the extent the City deems necessary to insure it is receiving all money to which it is entitled under the Agreement and/or is paying only the amounts to which Contractor is properly entitled under the Agreement or for other purposes relating to the Agreement.

The Contractor shall maintain and preserve all such records for a period of at least three (3) years after termination of the Agreement.

The Contractor shall maintain all such records in the City of Vernon. If not, the Contractor shall, upon request, promptly deliver the records to the City of Vernon or reimburse the City for all reasonable and extra costs incurred in conducting the audit at a location other than the City of Vernon, including, but not limited to, such additional (out of the City) expenses for personnel, salaries, private auditors, travel, lodging, meals, and overhead.

11.21 CONFLICT. Contractor hereby represents, warrants, and certifies that no member, officer, or employee of the Contractor is a director, officer, or employee of the City of Vernon, or a member of any of its boards, commissions, or committees, except to the extent permitted by law.

11.22 HEADINGS. Paragraphs and subparagraph headings contained in this Agreement are included solely for convenience and are not intended to modify, explain or to be a full or accurate description of the content thereof and shall not in any way affect the meaning or interpretation of this Agreement.

11.23 ENFORCEMENT OF WAGE AND HOUR LAWS. Eight hours labor constitutes a legal day's work. The Contractor, or subcontractor, if any, shall forfeit twenty-five dollars (\$25) for each worker employed in the execution of this Agreement by the respective Contractor or subcontractor for each calendar day during which the worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of Sections 1810 through 1815 of the California Labor Code as a penalty paid to the City; provided, however, work performed by employees of contractors in excess of 8 hours per day, and 40 hours during any one week, shall be permitted upon compensation for all hours worked in excess of 8 hours per day at not less than 1½ times the basic rate of pay.

11.24 PREVAILING WAGES. The provisions of California Labor Code 1770, et seq., regarding the payment of prevailing wages on public works, and related regulations, apply to all City agreements. In addition, the selected consultant and/or any subcontractor must be currently registered and qualified (including payment of any required fee) with the State Department of Industrial Relations pursuant to Labor Code section 1725.5. This project is subject to compliance monitoring and enforcement by the State Department of Industrial Relations.

11.25 EQUAL EMPLOYMENT OPPORTUNITY PRACTICES. Contractor certifies and represents that, during the performance of this Agreement, it and any other parties

with whom it may subcontract shall adhere to equal employment opportunity practices to assure that applicants, employees and recipients of service are treated equally and are not discriminated against because of their race, religion, color, national origin, ancestry, disability, sex, age, medical condition, sexual orientation or marital status. Contractor further certifies that it will not maintain any segregated facilities. Contractor further agrees to comply with The Equal Employment Opportunity Practices provisions as set forth in Exhibit "C".

[Signatures Begin on Next Page].

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the Commencement Date stated on the cover page.

City of Vernon, a California charter City and California municipal corporation

CLEANSTREET, LLC, a California limited liability company

By: \_\_\_\_\_  
Carlos Fandino, City Administrator

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

ATTEST:

By: \_\_\_\_\_

\_\_\_\_\_  
Lisa Pope, City Clerk

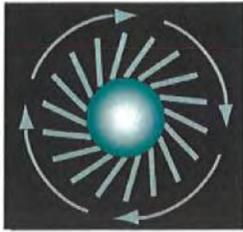
Name: \_\_\_\_\_

Title: \_\_\_\_\_

APPROVED AS TO FORM:

\_\_\_\_\_  
Zaynah N. Moussa,  
Interim City Attorney

EXHIBIT A  
CONTRACTOR'S PROPOSAL



# CleanStreet

Cleaning Your Environment



**Street Sweeping Services  
Contract No. CS-1434**

**EXCLUSIVELY FOR  
CITY OF VERNON**

**FEBRUARY 11, 2022**

1937 W. 169<sup>th</sup> Street  
Gardena, CA 90247  
(800) 225-7316 x108



February 10, 2022

City of Vernon  
Public Works Department  
Attention: Daniel Wall, Director of Public Works  
4305 Santa Fe Avebue  
Vernon, CA 90058

Dear Mr. Wall,

It is my pleasure to present to you our proposal for providing high-quality street services for the City of Vernon. You will find it in complete compliance with your contract specifications and service agreement.

The street sweeping proposal includes the payment of prevailing wage on this project. If the requirement for prevailing wage is waived, the city would see a substantial decrease in the cost.

This proposal is valid for a period of not less than ninety (90) days from the date of submittal. This contract will be managed directly out of our headquarters facility located in Gardena, California and will not be subcontracted.

We serve more than 55 cities in southern California. We are committed to providing a high-quality street sweeping program and high-quality customer service. Street sweeping is the primary business that CleanStreet engages in, not a secondary business endeavor.

We understand that City of Vernon is seeking quality reliable service. We are confident that we will be able to perform this contract perfectly without any exceptions or problems.

I am the Director of Business Development, and I will serve as the contact person for this project. I can be reached by phone at (800) 225-7316 x108, by cell at (310)740-1601, by fax at (310) 538-8015 or by email at [randerson@cleanstreet.com](mailto:randerson@cleanstreet.com).

Thank you for this opportunity. I hope we can be of service.

Sincerely,  
CLEANSTREET

*Rick Anderson*  
Director of Business Development

## BACKGROUND



CleanStreet has its headquarters in Gardena, California. CleanStreet was formerly known as California Street Maintenance and South Bay Sweeping.

Company founder, Jere Costello began sweeping shopping centers in 1961. In 1969 with the help of George Graziadio and Imperial Bank, Jere purchased his first revolutionary and dependable Tymco Air Sweeper.

By 1973, the company had become one of the largest shopping center sweeping companies in Southern California. That year the company began sweeping its first municipality, Rolling Hills Estates. We will always be grateful to City Manager Harry Peacock for giving us that opportunity.

In 1978 Proposition 13 passed. All of sudden more cities became interested in saving money. Often potential municipal clients would say "of course we would like to contract for street sweeping services and save money, but how do we know you will do a good job? We have had some bad experiences with irresponsible and non-responsive contractors."

We would say, "We will make a simple promise to you and your City. We will sweep every street on time every day. We will instruct our operator to take as many passes as are necessary to clean every street thoroughly. If we ever do receive a complaint, we will re-sweep it immediately. No questions asked."

As word spread that we are a good dependable company, we slowly and steadily grew year after year. Our commitment to quality and customer satisfaction turned out to be an overwhelming success.

Today CleanStreet serves scores of municipalities and major private facilities with high quality cleaning and sweeping services. The key to our success is the fact that we kept that promise of quality to our clients.

CleanStreet takes pride in its high level of expertise that it brings to every job. We employ the best methods and the most effective equipment.

Our employees are well trained and enjoy good pay and healthcare benefits. Our employees take great pride in the quality of their work and in your complete satisfaction.



(800) 225-7316 x108  
1937 W. 169<sup>th</sup> Street  
Gardena, CA 90247

# WORK PLAN



## Personnel Staffing Plan

Streets in this contract will be swept on an alternate day sweeping schedule. An alternate day schedule requires CleanStreet to sweep the two sides of a street on two separate consecutive work days. After notification that CleanStreet has been awarded this contract, CleanStreet will provide a finalized and working alternate day sweeping schedule to the contract manager. CleanStreet is an expert at scheduling alternate side sweeping programs.

CleanStreet will only utilize full-time staff, which may require a driver to work in one or more projects.

During leaf season, additional drivers may be utilized to complete routes in a timely manner.

Areas shall not be swept on the same day as trash pickup is scheduled. All sweeping will be scheduled the day after trash pickup, one to two days after trash pickup if alternate side sweeping.

Streets adjacent to schools and commercial developments shall be swept prior to 7 a.m. or before such times as public activities start. Streets adjacent to apartments, condominiums, or other areas where night on street parking is prevalent shall be swept after 8 a.m. All residential areas will be swept between the hours of 7 a.m. and 3:30 p.m.

All debris collected by the street sweeping operation will be taken to a legally established landfill or transfer station. There will be no on site dumping.

## Personnel

### Supervisors

Satisfaction and consistent quality service is the foundation of our company. Our supervisors are full-time employees, not temporary hired guns. They are highly trained so all phases of the project runs smoothly. Our supervisors are directly involved with each account and job inspections to ensure quality.

Although we believe that there is always room for improvement, we strive to recognize our employees for their good work. This type of supervision helps build operator pride.



(800) 225-7316 x108  
1937 W. 169<sup>th</sup> Street  
Gardena, CA 90247

# WORK PLAN



CleanStreet knows that street sweeping is an extremely noticeable city service that is best done properly if you wish to have satisfied residents. With our experience coupled with our approach assure the various locations that this work will be done extremely well. We can eliminate all complaints. We believe that our quality street sweeping programs is a great value when you consider the cost and negativity generated by complaints.

## **Operators**

Our first step is to educate our operators as to what is an accepted and the quality of work that is expected. Our operators are encouraged to take as many passes as are necessary to do a great job in removing all leafs, paper, dirt, rocks, glass, bottles, cans, and other debris to ensure free flow of water in the gutter and to maintain streets in a state of cleanliness. In combination with this approach, the CleanStreet supervisors will conduct unannounced spot checks for quality and quantity of the work performed.

Our operators are trained to value and care for their equipment. They are knowledgeable about proper driving speed, adjustment of brooms and the most efficient and effective performance of their equipment.

Our operators understand the importance of punctuality and the importance of quality work. Our drivers take pride in our customer's satisfaction.

## **Repair and Maintenance Crew**

CleanStreet has seven full-time mechanics who are expert in the repair and maintenance of our equipment. Our mechanics are factory trained to help ensure high quality performance of our equipment. We also have mechanics available around-the-clock to help ensure our ability to meet our commitments.

CleanStreet knows that one of the keys to customer satisfaction is dependable well-maintained equipment. Consequently, we feel that the quality of our repairs and maintenance is crucial to our sweepers.

We have an additional four full-time employees who are mechanics helpers. They change of brooms, tires, and help keep our sweepers clean.

## **Dispatchers**

The Dispatch and Operations department is the very nerve center of CleanStreet. It is from our experience that this position is very mission critical where oftentimes operational and sometimes financial decisions are made.



(800) 225-7316 x108  
1937 W. 169<sup>th</sup> Street  
Gardena, CA 90247

# METHODS AND APPROACH



CleanStreet is the premiere street sweeping contractor in California. With over 45 years of experience in providing street sweeping services, CleanStreet has demonstrated that it can deliver the highest quality service.

CleanStreet enjoys the best reputation in the industry because of our proven ability to provide excellent service with punctuality and dependability.

There are 10 key components that insure that all streets will be swept properly and on time:

## 1. Operator Training:

Our street sweeper operator training program lasts two to four weeks. New operators are evaluated by veteran drivers and the regional driver supervisor. During the Introductory Period, trainees are evaluated on safety, performance and progress. Drivers in the training program must pass multiple tests before they are permitted to work alone. Approximately one out of every three trainees is offered permanent employment.

a. Pre-employment requirements for all trainees include:

1. Clean driving record, verified by current copy of Department of Motor Vehicles H6 printout
2. No accidents
3. Strong references
4. Pre-employment physical
5. Pre-employment drug testing

## 2. Operator Retention:

CleanStreet has a large staff of qualified sweeper operators because we have been successful in retaining employees.

Our company policy is keeping the same operators because they have the detailed knowledge and experience that will enable them to avoid complaints.

The most common and egregious complaint I hear about other sweeping companies from their municipal clients is the constant swapping of operators.



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# METHODS AND APPROACH



We achieve retention through excellent pay and benefits complemented by a family friendly working environment. We are very proud of our excellent staff.

### 3. Equipment:

We will provide these skilled operators with new or late-model sweepers that are in excellent operating condition and appearance.

CleanStreet equips its trucks with Global Positioning Satellite (GPS) systems. All of the real-time data is monitored by CleanStreet's dispatchers. This permits CleanStreet to monitor the driver's speed, time, and location and gutter broom activity.

All equipment used will be in compliance with SCAQMD Rules 1186 and 1186.1 and all other applicable laws and rules.

Back-up equipment is available at all times.

### 4. Equipment Maintenance:

A key component of an effective sweeping program is high quality equipment repairs and maintenance. Broom changes and tire repairing will be performed at CleanStreet's headquarters located in Gardena. All preventative maintenance and repairs will be performed in Gardena.

We have a staff of 16 mechanics and helpers who are expert at sweeper repair and maintenance.

We have a full inventory of parts and supplies readily available. We have all necessary tools and equipment needed to repair virtually everything on a street sweeper.

### 5. Back-up Sweepers:

We will have back-up sweepers available at all times. We own and operate a tremendous fleet of sweepers that gives us depth and strong resources capable of dealing with any eventuality.

### 6. Back-up Operators:

We have over 80 full-time sweeper operators working throughout California. We have many highly qualified operators that could come in and perform well on very short notice.



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Gardena, CA 90247

# METHODS AND APPROACH



The size of our staff gives us a tremendous advantage over our smaller, less qualified competitors.

## 7. Supervision:

Supervision is an important component of an intelligent street sweeping program. Rick Anderson has been with CleanStreet for over 28 years and has helped the company grow and diversify in new areas.

We are fortunate to have Rick Anderson and his experience, and he will be responsible for the day-to-day management and supervision of this contract.

## 8. Complaint Handling:

Our operators are encouraged to take as many passes as necessary to do a great job. They take great pride in the complete satisfaction of the residents. Consequently, they receive very few complaints.

We will handle any and all complaints on the day they are received. We believe that responsiveness is key to establishing public confidence in our ability and integrity.

We also believe that the operator is more highly motivated to do a good job the first time if he knows he may have to come back again if he doesn't. Our operators take great pride in not receiving complaints and doing a great job the first time.

Our operators will check in with the designated city person on a daily basis to see if there are any complaints. If there are complaints, we will go out and re-sweep them immediately. We will always respond in less than six hours.

Our attitude toward quality and this level of service makes the whole sweeping program run smoothly.

## 9. Communication / Emergencies:

All administrative staff will provide the City with cell phone numbers that can be used to reach us 24 hours a day, seven days per week.

Our sweeper operators will have cell phones for your convenience.



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## METHODS AND APPROACH



### 10. Safety Program:

CleanStreet differentiates itself from the competition by having an aggressive accident prevention program. We reward our operators for accident free driving.

We have regular safety meetings with employees to remind them of the importance of working accident-free.

Our pro-active emphasis on safety makes CleanStreet a stronger, healthier company. This is good for our employees, good for our clients and essential to our containing the tremendous cost of insurance.



**CleanStreet**  
Cleaning Your Environment

(800) 225-7316 x108  
1937 W. 169<sup>th</sup> Street  
Gardena, CA 90247

EXHIBIT C

UNIT PRICE PROPOSAL FORM

TASK	QTY	UNIT	UNIT PRICE	TOTAL COST
<b>Ordinary Work</b>				
Frequent and regularly schedule sweeping services for all curb and gutter segments of all public streets, raised center medians, and full width of public alleys within the City's jurisdiction	36	Monthly	\$27,162.29	\$ 977,842.44
<b>Extraordinary Work</b>				
Street sweeping services for special events not included in the routine/scheduled sweeping	60	Hourly	\$ 195.00	\$ 11,700.00
Street sweeping services for emergency events not included in the routine/scheduled sweeping	60	Hourly	\$195.00	\$11,700.00

Grand Total of:

one million one thousand two hundred forty-two and forty-four hundredths Dollars

(\$ 1,001,242.44 )

All other work items, labor, materials, tools and incidentals which are not specifically listed in the above items, but are necessary to complete the project per specifications, and all other applicable standards and codes shall be included in the items above, and no additional compensation shall be made therefor.

Submitted by: CleanStreet, LLC

Address: 1937 W 169th Street, Gardena, CA 90247

Signature: *R. Anderson*

## ORGANIZATIONAL INFORMATION



### ***Rick Anderson, Director of Business Development***

The contract manager and key contract representative is Mr. Rick Anderson. Mr. Anderson has been with the company since 1989, and has the experience and expertise to deal with any issue that might arise during the performance of this contract.

He has the authority to take whatever steps necessary to deliver high-quality service. Mr. Anderson is responsible for all pricing and staffing decisions for the organization and approach to this contract. He will be intimately involved in all aspects of the implementation of this contract.

### ***Alex Farias and Stephanie Escobar, Dispatchers***

Dispatch can handle all of your calls with special requests or complaints. They are calm, courteous and capable of responding quickly and effectively to your calls. Their communication skills are a major asset to CleanStreet, and will be to your organization as well.

Both Alex and Jenny offer a high degree of professionalism, solid business ethics, and extensive computer skills. Alex and Jenny are reliable, have a positive attitude and work effectively and with a sense of urgency. They can quickly read, understand, and use street maps and complex mapping software.

### ***Mike Zamora, Site Manager***

Mike joined CleanStreet in 2018. He is the Site Manager.

Mike has been in the transportation industry for 16 years exclusively with waste collection and maintenance. Mike's responsibilities include management of all core driver functions, safety improvement, logistics, and customer service engagement.



(800) 225-7316  
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Gardena, CA 90247

## REFERENCES



### CITY OF DANA POINT

**Contact:** Matthew Sinacori

**Email:** [msinacori@danapoint.org](mailto:msinacori@danapoint.org)

**Mailing Address:** 33282 Golden Lantern, Dana Point, CA 92629

**Phone:** (949) 248-3582

**Work Type:** Municipal Street sweeping

**Service Dates:** 2004-current

### CITY OF COSTA MESA

**Contact:** Paul Mackinen

**Email:** [paul.mackinen@costamesaca.gov](mailto:paul.mackinen@costamesaca.gov)

**Mailing Address:** PO Box 1200, Costa Mesa, CA 92628-1200

**Phone:** (714) 327-7472

**Work Type:** Street and parking lot sweeping

**Service Dates:** 2010-current

### CITY OF GARDEN GROVE

**Contact:** Mark Ladney

**Email:** [markla@ggcity.org](mailto:markla@ggcity.org)

**Mailing Address:** 13802 Newhope Street, Garden Grove, CA 92843

**Phone:** (714) 741-5382

**Work Type:** Street and parking lot sweeping

**Service Dates:** 2006-current

### CITY OF FULLERTON

**Contact:** Jorge Gonzalez

**Email:** [jorge.gonzalez@cityoffullerton.com](mailto:jorge.gonzalez@cityoffullerton.com)

**Mailing Address:** 1580 West Commonwealth Avenue, Fullerton, CA 92833

**Phone:** (714) 738-6803

**Work Type:** Municipal Street sweeping

**Service Dates:** 2019-current



# QUALIFICATIONS



## CleanStreet

CleanStreet specializes in providing street sweeping services. It is not an auxiliary part of our business, and this sharp focus on street sweeping makes us efficient and effective.

CleanStreet is family-owned and has been proudly cleaning city streets since 1973. These decades of successful work have given us an experienced management team, tremendous body of knowledge, and expertise in street sweeping. We have a deep resource base, which includes veteran sweeper operators and back-up sweepers, ensuring sweeping is performed as scheduled and expertly.

CleanStreet currently employs 165 people. We do not move our operators around. We have a company policy and culture that allows us to assign street sweeping operators to a City on a permanent basis. This gives the City and operator(s) time to develop a work relationship.

## Experience

### CITY OF HAWTHORNE

**Supervisor:** Rick Carver

**Title:** Superintendent

**Address:** 4455 W. 126<sup>th</sup> Street, Hawthorne, CA 90250

**Phone:** (310) 970-7955

**Contract Amount:** \$984,000.00 (3 year Contract)

**Contract Term:** 1991 to Current

**Work Type:** *Time posted street sweeping.*



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Gardena, CA 90247

# QUALIFICATIONS



## CITY OF LAWDALE

**Contract Supervisor:** Marlene Miyoshi      **Title:** Director of Public Works

**Address:** 4722 Manhattan Beach Blvd., Lawndale, CA 90260

**Phone:** (310) 973-3265

**Contract Amount:** \$919,920.00 (3 year contract)

**Contract Term:** 2005 to Current      **Work Type:** *Time posted street sweeping.*

## CITY OF PARAMOUNT

**Contract Supervisor:** Chris Cash      **Title:** City Manager

**Address:** 16400 Colorado Ave., Paramount, CA 90723

**Phone:** (562) 220-2106

**Contract Amount:** \$195,000.00 per year

**Contract Start:** 1995 to Current      **Work Type:** *Time posted street sweeping.*

## Current Workload

We currently provide street sweeping services to approximately 50 municipalities within the State of California.

## Financial Environment

CleanStreet prides itself in its ability to maintain a positive financial position with creditors, lenders, and vendors. CleanStreet's outstanding financial history enables the organization the leverage it needs to obtain equipment or cash flow to meet the demands of new accounts and continue organizational growth. CleanStreet has a positive working relationship with key financial Pacific Western Bank. It also sustains favorable credit ratings with vendors such as Wright Express, American Rotary Broom, and



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Gardena, CA 90247

## QUALIFICATIONS



Gardena Auto Parts. The stability of CleanStreet is proven in its 40 plus years of continuous business and holds strong for constant growth.



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Gardena, CA 90247



PUBLIC WORKS  
DEPARTMENT  
4305 Santa Fe Avenue, Vernon, California  
90058 Telephone (323) 583-8811

February 8, 2022

Via Planetbids

**NOTICE TO BIDDERS – ADDENDUM NO. 1**  
**REQUEST FOR PROPOSALS FOR**  
**CONTRACT NO. CS-1434: STREET SWEEPING SERVICES**

This notice shall be considered as Addendum No. 1 for the above-mentioned project. This informational notice is to provide clarification to questions submitted. The questions and responses are the following:

1. What is the contract value for this project?  
*This contract will be awarded to the lowest responsible bidder.*
2. How many motorized sweeping vehicles do you require?  
*Two - main sweeper and backup unit.*
3. Do you need the documents of the sweeping vehicles attached to the proposal?  
*Yes, the information required to be submitted is shown in the RFP, Section L – Equipment, (Page 6 of 18).*
4. Does the City provide other equipment to be used or the contractor provides everything?  
*Contractor to provide everything.*
5. Will the City remove the prevailing wage requirement?  
*As stated in the RFP, this is a prevailing wage contract.*

If you have any questions, please contact Lissette Melendez of my staff at [lmelendez@cityofvernon.org](mailto:lmelendez@cityofvernon.org).

Sincerely,

Daniel Wall, P.E.  
Director of Public Works

*Exclusively Industrial*

EXHIBIT B  
SCHEDULE

**UNIT PRICE PROPOSAL FORM**

TASK	QTY	UNIT	UNIT PRICE	TOTAL COST
<b>Ordinary Work</b>				
Frequent and regularly schedule sweeping services for all curb and gutter segments of all public streets, raised center medians, and full width of public alleys within the City's jurisdiction	36	Monthly	\$27,162.29	\$ 977,842.44
<b>Extraordinary Work</b>				
Street sweeping services for special events not included in the routine/scheduled sweeping	60	Hourly	\$ 195.00	\$ 11,700.00
Street sweeping services for emergency events not included in the routine/scheduled sweeping	60	Hourly	\$195.00	\$11,700.00

Grand Total of:

one million one thousand two hundred forty-two and forty-four hundredths Dollars

(\$ 1,001,242.44 )

All other work items, labor, materials, tools and incidentals which are not specifically listed in the above items, but are necessary to complete the project per specifications, and all other applicable standards and codes shall be included in the items above, and no additional compensation shall be made therefor.

Submitted by: CleanStreet, LLC

Address: 1937 W 169th Street, Gardena, CA 90247

Signature: 

EXHIBIT C

EQUAL EMPLOYMENT OPPORTUNITY

PRACTICES PROVISIONS

- A. Contractor certifies and represents that, during the performance of this Agreement, the contractor and each subcontractor shall adhere to equal opportunity employment practices to assure that applicants and employees are treated equally and are not discriminated against because of their race, religious creed, color, national origin, ancestry, handicap, sex, or age. Contractor further certifies that it will not maintain any segregated facilities.
- B. Contractor agrees that it shall, in all solicitations or advertisements for applicants for employment placed by or on behalf of Contractor, state that it is an "Equal Opportunity Employer" or that all qualified applicants will receive consideration for employment without regard to their race, religious creed, color, national origin, ancestry, handicap, sex or age.
- C. Contractor agrees that it shall, if requested to do so by the City, certify that it has not, in the performance of this Agreement, discriminated against applicants or employees because of their membership in a protected class.
- D. Contractor agrees to provide the City with access to, and, if requested to do so by City, through its awarding authority, provide copies of all of its records pertaining or relating to its employment practices, except to the extent such records or portions of such records are confidential or privileged under state or federal law.
- E. Nothing contained in this Agreement shall be construed in any manner as to require or permit any act which is prohibited by law.

EXHIBIT D  
GENERAL REQUIREMENTS

## EXHIBIT D

### GENERAL REQUIREMENTS

- A. **Specifications:** All work shall conform to Part 1 – General Provisions of *The “GREENBOOK” Standard Specifications for Public Works Construction (2018 Edition)*, referred to hereafter as the “Standard Specifications”.
- B. **Working Hours:** The Contractor will provide street sweeping services for the entire City’s jurisdiction between the hours of 2:00 a.m. to 6:00 a.m. Monday through Thursday, as described in Attachment A, unless otherwise noted. All streets shall be swept once per week with alternate side parking.

The Contractor shall immediately notify the City’s representative, when a street or section of streets will be or had been missed during regularly scheduled street sweeping. Additionally, the Contractor shall notify the City’s representative when re-sweeps are scheduled.

- C. **Holidays:** No work shall be performed on City-recognized holidays. City holidays include New Year’s Day, Martin Luther King, Jr. Day, Presidents Day, Cesar Chavez Day, Memorial Day, Independence Day, Labor Day, Indigenous People’s Day, Veterans Day, Thanksgiving Day, Christmas Eve, Christmas Day, and New Year’s Eve. On any week in which a holiday falls, the scheduled sweeping area shall be rescheduled to the Friday following the holiday.
- D. **Frequent and Regularly Scheduled Street Sweeping:** The Contractor is required to provide a detailed map showing proposed routes for regularly scheduled sweeping areas for the City’s review and approval. The route must be within the City’s jurisdiction, as described in Attachment A and conform to the following:

Sweeping schedule (Monday through Thursday between 2:00 a.m. and 6:00 a.m.)

Mondays and Wednesdays: Sweeper shall sweep the North and East sides of the areas marked for sweeping in Attachment A.

Tuesdays and Thursdays: Sweeper shall sweep the South and West sides of the areas marked for sweeping in Attachment A.

**52<sup>nd</sup> Dr. between Atlantic Blvd. and Heliotrope Ave. is NOT a part of this Agreement.**

**West side of S. Alameda St. from North City Limit to South City Limit is NOT a part of this Agreement.**

Raised center medians shall be swept in its entirety on the first day of the designated zone (i.e. Monday or Wednesday). Arterial streets with posted “No Parking Anytime” on both sides of the street may be swept on the same day.

The City reserves the right to modify the route(s) at any time during the duration of the Agreement. Billing for frequent and regularly scheduled sweeps is based on the monthly

rate attached to this Agreement as Exhibit B.

- E. **Alternate Side Parking:** Alternate side parking allows for vehicles to park on the opposite side of the street during regularly scheduled sweeping. For example, on Monday, the north and east side of all streets located in the Monday and Tuesday sweeping area of Attachment A are to be swept. Vehicles may park on the south and west side of these streets during sweeping times. Alternatively, on Tuesday, the south and west side of all streets located in this sweeping area will be swept and vehicles may park on the north and east side of these streets. This procedure will be similar to streets located in the Wednesday and Thursday sweeping area.
- F. **Liquidated Damages:** In accordance with Section 6-9 of the Standard Specifications, for each consecutive day required to complete the work in excess of the time specified herein for its completion, as adjusted in accordance with Section 6-6 of the Standard Specification, the Contractor shall pay to the City, or have withheld from monies due it, the sum(s) described more fully below.

Failure of the Contractor to complete the work in accordance with the specifications will result in damages being sustained by the City. The parties acknowledge that (i) the amount of loss or damages likely to be incurred is incapable or is difficult to precisely estimate, (ii) the amounts specified below bear a reasonable relationship to, and are not plainly or grossly disproportionate to, the probable loss likely to be incurred in connection with any failure by the Contractor to perform according to the specifications, and (iii) one of the reasons for the Contractor and the City reaching an agreement as to such amounts is the uncertainty and cost of litigation regarding the question of actual damages. The following are non-exclusive examples of causes for liquidated damages:

- a. Operation of sweeper without using sufficient water to control dust.
- b. Operation of sweeper exceeding the stated speed limits of operation.
- c. Missing scheduled sweeping days without providing prior notice to and acknowledgment by the Director of Public Works or authorized designee (including due to inclement weather).
- d. Poor results – Dirt and/or debris left behind.
- e. Any failure or refusal by the Contractor to perform in accordance with the terms of the Agreement. Upon the first occurrence of any of the foregoing acts, the Contractor will be notified in writing by the City. Contractor shall respond within five (5) days with a written plan stating how compliance with the requirements of the agreement must be met. If there is a second occurrence of the same act by the Contractor within a thirty-day (30) period, the City shall have the right to withhold payment of or otherwise charge \$1,500. Each separate and subsequent occurrence of the same act shall result in a liquidated damages charge in the amount of \$500.00.

Execution of the Agreement shall constitute agreement by the City and the Contractor that the sum(s) listed above is the minimum value of the costs and actual damage caused by the failure of the Contractor to complete the Work within the allotted time and according to the specifications. Such sum represents liquidated damages and shall not be construed as a penalty and may be deducted from payments due or otherwise charged to the Contractor if such delays or other non-compliance with the specifications occur.

- G. **Traffic Requirements – General:** The Contractor shall comply with Section 7-10 of the

Standard Specifications and provide safe and continuous passage for pedestrian and vehicular traffic at all times. The Contractor shall provide and maintain all necessary signs, flashers, and any other safety equipment as set forth in the latest publication of the California Manual of Uniform Traffic Control Devices (CA MUTCD) or as required by the City Engineer to insure safe passage of traffic.

- H. **Communications:** The Contractor shall provide a call out list with regularly updated telephone numbers to handle emergency or unusual streets sweeping services.

Sweeper operators shall be equipped with cellular phones that are able to communicate between the City of Vernon and the individual sweepers. Operators shall be required to answer or return any cell phone calls within ten (10) minutes. Operators must adhere to California Senate Bill 1613 requiring the use of a hands-free device when using a cell phone while driving. Drivers must be capable of communicating effectively in English, in order to communicate with City staff and business/residents, if needed.

- I. **Operators/Drivers:** The Contractor shall provide a list of all employees and their supervisors who may work upon the City's premises.

The Contractor's drivers shall maintain safety and driving records in accordance with Federal, State, County, and City regulations. Upon award of the Agreement, the names and years of experience of the sweeper drivers and backup personnel with copies of State of California Department of Motor Vehicles records must be submitted. **Sweeper drivers must have five (5) years of experience operating street sweeping equipment.**

- J. **Periodic Meetings:** A periodic meeting to review service performance will be conducted at the request of the City. Attendees shall include the City representative, a representative of the Contractor, and City Street Supervisor or his/her designee.

- K. **Global Positioning Service:** The Contractor is required to utilize a Global Positioning System (GPS) tracking system (Real-Time Data) on each of his/her vehicles in order to demonstrate service delivery as proposed. The tracking system shall be web-based and the Contractor shall provide the City access to the website in order to verify service delivery, research complaints, and answer resident and business questions. The tracking system shall be able to provide the location, date, time, speed, brush position and operation, and distance traveled of the street sweeping vehicle. Contractor shall provide the brand name of the tracking system to be utilized on their equipment. Searchable records must be kept for the entire duration of the Agreement.

- L. **Equipment:** All sweeping activities must be completed using regenerative air vacuum type sweepers. All equipment must meet the South Coast Air Quality Management District Rules 1186 and 1186.1. The equipment shall be sufficient to perform the work required herein within the hours specified. In the event that a primary sweeper requires repair or replacement, a backup sweeper must be available so that the established sweeping schedule does not fall behind. The Contractor shall be solely responsible for the repair, maintenance, and service of its street sweeper equipment.

The Contractor shall maintain a facility for repair and care of the sweepers used in the City of Vernon. Sweepers in use under the Agreement shall be given priority response for repair and/or equipment delivery replacement. The facility must be available to the

City for inspection of capacity and repair time. Contractor shall minimize the down time of the street sweeping equipment during sweeping hours to no more than two (2) hours. If a street sweeper is having continual maintenance issues, the City maintains the right to demand the permanent replacement of the sweeper for use in the City of Vernon.

At the time of award, the Contractor must provide a detailed inventory of their equipment and accessories that will be used to fulfill the Agreement. The inventory of the sweeper equipment shall include the following:

1. Type (i.e. vacuum, mechanical broom, regenerative air, etc.), model/brand, year of manufacture, and the date the vehicle was acquired.
2. Service records for each vehicle with total number of miles and hours (miles only, if vehicle is not equipped with an hour meter) each vehicle has been in service.
3. Anticipated remaining life as of the date of inventory.
4. Type and manufacturer of recording device for hour of operation, miles per hour, brush operation monitoring, and Global Positioning System (GPS) tracking system.

All sweeper vehicles used shall not exceed ten (10) years in age. Overhauled vehicles ten years or older will not be acceptable. All sweeper vehicles shall be in "good" condition. A vehicle in good condition, on the whole, must not have any major flaws (no body damage). The interior and exterior have very few, if any, apparent dings, scratches or defects, and the paint is still intact. The body of the vehicles should be rust free or have very little rust. The tires all match with minimal wear. Contractor shall ensure that each vehicle is inspected daily for safety related items.

City shall have the right to review vehicle inspection records at any time that the vehicle is operating within the City limits, upon verbal request of the operator of the vehicle by the City representative. The City representative reserves the right to require any corrections deemed necessary to reflect acceptable service standards. Failure to maintain vehicles in a clean and safe condition or the refusal to produce said vehicle inspections will be formally documented by the City subject to further administrative action by the City, up to and including termination of the Agreement.

- M. **Air Quality Requirements:** The Contractor's equipment shall meet all applicable local, state, and Federal air quality laws, rules, and regulations including but not limited to the South Coast Air Quality Management District Rule 1186 relating to alternatively fueled sweeping equipment. All sweeping equipment shall meet all applicable certifications for PM10 and other pollutants as promulgated by the South Coast Air Quality Management District (SCAQMD) at the time of award. Contractors shall **ONLY** provide vehicles operating on alternative fuels, such as, Liquefied Natural Gas (LNG), Compressed Natural Gas (CNG) or other fuels according to the regulations of SCAQMD.
- N. **NPDES Requirements:** Contractor shall meet all applicable local, state and Federal clean water laws, rules and regulations including but not limited to all conditions set forth in the Los Angeles County National Pollution Discharge Elimination System Permit as it relates to street sweeping practices, and all Best Management Practices set forth by the City in compliance with NPDES requirements. Contractor shall not discharge any water containing trash, debris, pollutants, fuels, oils, soaps or other non-allowable constituents from its sweeping vehicles upon any city street, to any storm drain or any non-permitted outlet. As part of its submission, the Contractor shall describe its methods for preventing

NPDES violations during sweeping operations within the City's jurisdiction. In addition, Contractor shall comply with all NPDES requirements at its maintenance facilities, storage yards, and company facilities. Failure to comply with this section may result in termination for cause by the City of any Agreement resulting from this solicitation.

- O. **Speed of Sweepers:** Sweepers shall not operate above **five (5) miles per hour**.
- P. **Quality of Work:** Contractor shall provide sufficient vehicles, equipment, and staff to accomplish a high level of quality of sweeping services to the City. Contractor shall operate sweeping equipment in such a manner that it shall meet the design specifications of the equipment and shall do a thorough and complete job of removing debris and dirt from the city streets. The City shall periodically and randomly inspect sweeping services to determine level of quality. For purposes of inspection, the level of quality shall meet the City's expectation and include the following:
1. Removal of any trash, litter, leaves or light foreign objects 2-inches or greater in diameter from along the curb line and the entire width of the sweeper path.
  2. Removal of dirt, fines and light objects less than 2-inches in diameter along the curb line and the entire width of the sweeper path.
- Q. **Street Sweeping Complaints:** Once notified by the City, Contractor shall investigate any complaints that may concern or involve the performance of the drivers and their operation. Contractor shall report to the City's representative on the next working day as to the action or procedure taken with reference to any complaints.
- R. **Special Street Sweeping:** Occasional sweeping required by Contractor to include add-on scheduled and non-scheduled street sweeping of special events, unusual conditions or any other sweeping requested by the City not included in routine/scheduled sweeping. **The City will give approximately forty-eight (48) hours advanced notice for any special street sweeping.** Billing for special sweeps is based on an hourly rate with travel time included per Exhibit B. Street sweeper shall temporarily postpone scheduled sweep and respond to special sweep locations once agreement has been made to Contractor's office or field personnel by City staff. Scheduled sweep will resume once special sweep has been completed so as location may be inspected and verified for cleanliness. Special sweeps are to be completed during an agreed upon time.
- S. **Emergency Sweeps:** Occasional sweeping required by Contractor to include nonhazardous spills, accident cleanups and unusual conditions which would require after-hour, weekend and holiday responses. **Response to emergency sweeps shall be within two (2) hours of notifications by the City.** Contractor shall provide City with name and phone number of contact person for after-hour sweeps.
- T. **Re-Sweeps:** Re-sweeps are those required by the Contractor when, after inspection by the City, the sweeps are deemed not to meet the City's expectations, or when a street or section has been missed during the regularly scheduled street sweeping. Re-sweeps are completed at the expense of the Contractor.

Responses to re-sweeps shall be within **twenty-four (24) hours** after being notified by the City representative and are to be completed at the expense of the Contractor.

Arterial re-sweeps will be completed prior to **5:00 a.m.** the following day after contacted

by the City's representative and are to be completed at the expense of the Contractor.

Contractor shall notify the City's representative when re-sweeps are completed so City staff may inspect and verify work.

- U. **Non-swept Items:** Non-swept or items not capable of being swept, such as small tree limbs, palm fronds, rocks, silt, mud, trash and debris shall be collected and removed by the Contractor from the normal sweeping path. Larger obstructions such as tree limbs, construction or landscape contractor debris, shall be **immediately reported** to the City's representative.
- V. **Accident Reports:** Contractor shall provide a copy of a detailed written report of any and all accidents involving Contractor's vehicles, personnel, and/or equipment while operating within the City, to the designated City representative within twenty-four (24) hours from the date and time of the accident. Said report shall include the date and time of the accident and a copy of any law enforcement reports or reference identification resulting from the accident. Contractor shall provide the name and contact information of Contractor's safety officer, including cell phone for emergency contact.
- W. **Disposal of Sweeping:** All debris and refuse material swept by the Contractor shall be the property of and the disposal responsibility of the Contractor from and after the time of street sweeping. Contractor shall dispose of all debris and refuse collected by hauling the same to a legally established disposal area. If it becomes necessary to temporarily store said refuse at a transfer site, these sites shall be cleared daily. Obtaining use of such sites shall be the responsibility of the Contractor. All such sites are subject to the approval of the Director of Public Works or his/her representative.

Contractor shall be responsible for the collection, hauling, and disposal of all materials collected during the course of the daily sweeping. The City is under State Mandate to comply with waste diversion requirements that require the City to divert 50% of the waste stream from landfilling. After the award of the Agreement, the Contractor shall describe their proposed collection, hauling, and disposal activities, including identifying proposed waste disposal facilities receiving collected debris and materials. In addition, Contractor shall describe in detail the waste diversion and recycling activities Contractor shall undertake to ensure that 50% of the materials and debris collected during the course of sweeping operations shall be diverted from landfilling or recycled. Contractor shall identify any diversion or recycling facilities proposed for receiving said materials. Contractor shall prepare and submit a report documenting tonnage delivered to each facility and copies of weight tickets for each load. Reports shall be submitted for each calendar quarter and shall be provided to the City by the 20th of the month following the end of the calendar quarter.

- X. **Record Keeping:** Contractor's sweeper operator shall be required to maintain a daily log of the streets swept. Items to be recorded consist of:
  1. Streets swept, date of sweeping;
  2. Operator's name;
  3. Type of sweeper, sweeper number;
  4. Mileage of each street; and
  5. Amount of debris collected (tons) per area.

In addition, Contractor shall record any scheduled areas missed, reasons scheduled sweeping was not done and date and time previously missed areas were swept. Contractor shall also submit to the City a monthly and an annual report that summarizes curb mileage swept and weight of material disposed. Contractor shall meet all Federal, State, or Local regulations pertaining to sweeper equipment operation. Contractor shall provide all necessary operational information and data that may be required to complete the reporting requirements of any legally established regulatory agency.

- Y. **Invoicing:** Invoices submitted by Contractor shall be paid in accordance with the terms stated in Exhibit B. The approved pricing shall remain in effect unless modified by mutual written consent of both parties. The City requires the Contractor to provide monthly invoices for services by sending billing statements to:

City of Vernon Public Works Department  
Attention: Eli Zepeda, Street Supervisor  
4305 Santa Fe Avenue  
Vernon, CA 90058  
Email: [eazepeda@cityofvernon.org](mailto:eazepeda@cityofvernon.org)

Contractor invoices must contain the following information per vehicle:

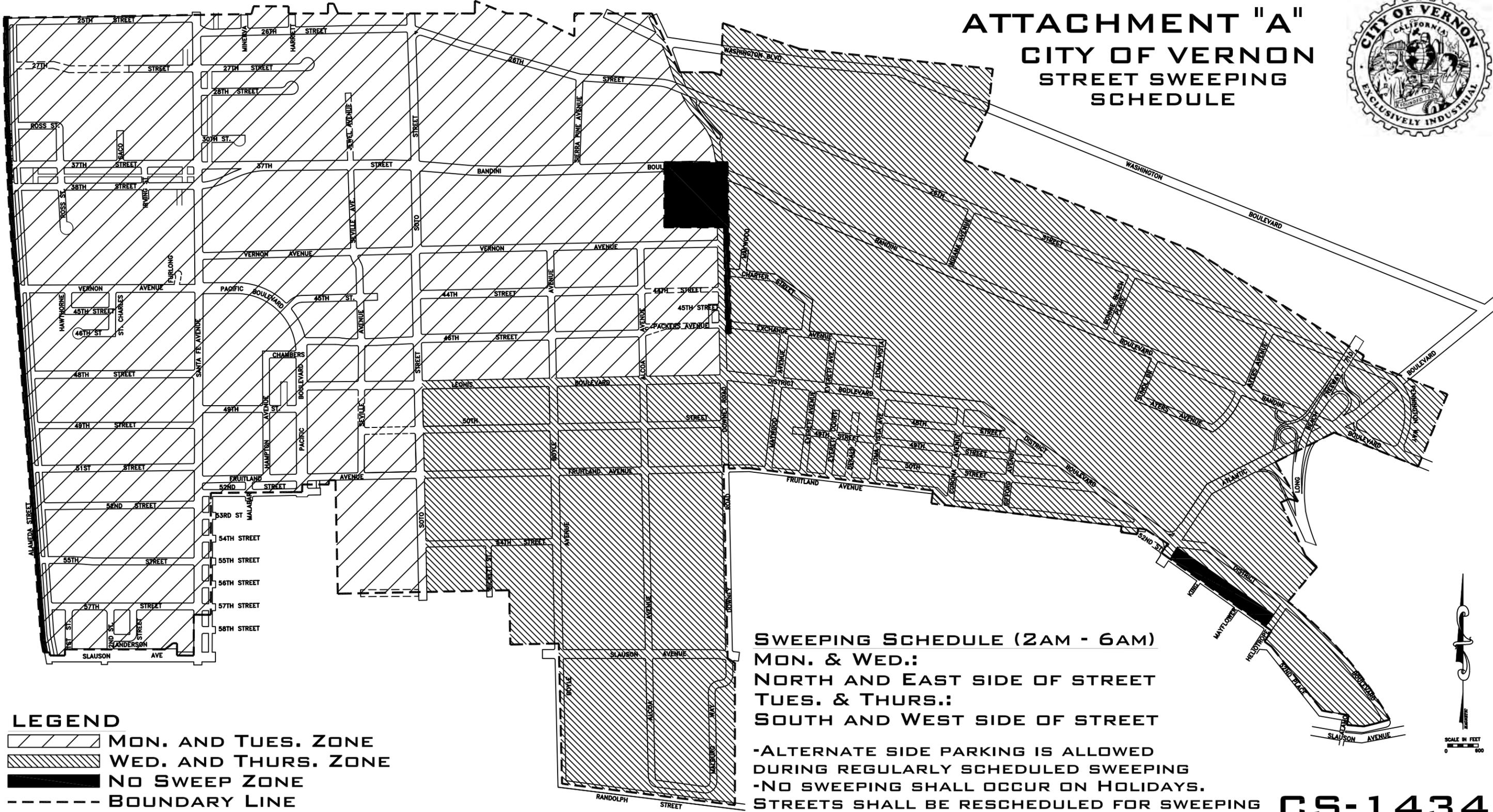
- GPS Data
- Amount of debris and refuse material legally disposed
- Sweeper CNG/LNG usage
- Routes completed
- Curb miles swept
- Complaint Log

- Z. **Water:** The contractor is responsible for providing water for the sweeping equipment.

# ATTACHMENT "A"

## CITY OF VERNON

### STREET SWEEPING SCHEDULE



**LEGEND**

-  MON. AND TUES. ZONE
-  WED. AND THURS. ZONE
-  NO SWEEP ZONE
-  BOUNDARY LINE
-  PRIVATE ALLEY

**SWEEPING SCHEDULE (2AM - 6AM)**  
**MON. & WED.:**  
 NORTH AND EAST SIDE OF STREET  
**TUES. & THURS.:**  
 SOUTH AND WEST SIDE OF STREET

-ALTERNATE SIDE PARKING IS ALLOWED DURING REGULARLY SCHEDULED SWEEPING  
 -NO SWEEPING SHALL OCCUR ON HOLIDAYS.  
 STREETS SHALL BE RESCHEDULED FOR SWEEPING ON THE FRIDAY FOLLOWING THE HOLIDAY.

**CS-1434**

## City Council Agenda Item Report

Submitted by: Claudia Arellano  
Submitting Department: Public Utilities  
Meeting Date: March 1, 2022

### **SUBJECT**

Acceptance of Electrical Easement at 3333 Downey Road (APN 6303-001-001)

### **Recommendation:**

Accept the Electrical Easement and authorize the Mayor to execute the Certificate of Acceptance.

### **Background:**

The tenant occupying the property located at 3333 Downey Road is upgrading certain facility equipment which requires a new electrical service. A new city owned padmounted transformer and switch are being installed to accommodate the electrical service. As such, an easement is required for the installation and maintenance of the City-owned electrical facilities serving the property.

The Public Utilities Department received a fully executed Electrical Easement by BT-OH, LLC for the property at the above-mentioned location, also known as Assessor's Parcel Number 6303-001-001.

The Electrical Easement documents and Certificate of Acceptance have been reviewed and approved as to form by the City Attorney's Office.

### **Fiscal Impact:**

There is no fiscal impact associated with this report.

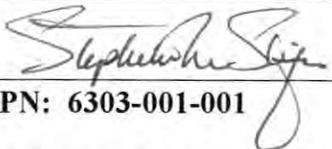
### **Attachments:**

1. [Electrical Easement and Certificate of Acceptance - 3333 Downey Road](#)

RECORDING REQUESTED BY  
and  
WHEN RECORDED MAIL TO:  
City of Vernon  
4305 Santa Fe Avenue  
Vernon, CA 90058  
Attn: City Clerk

MAIL TAX STATEMENTS TO:  
Exempt

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

  
APN: 6303-001-001

**EASEMENT**  
(ELECTRICAL)

**DOCUMENTARY TRANSFER TAX IS NONE – NOT REQUIRED SEC. 11922  
REVENUE TAXATION CODE.**

FOR VALUABLE CONSIDERATION, RECEIPT OF WHICH IS HEREBY  
ACKNOWLEDGED,

**BT-OH, LLC, a Delaware limited liability company (the “Grantor”)**

HEREBY GRANT(S) TO:

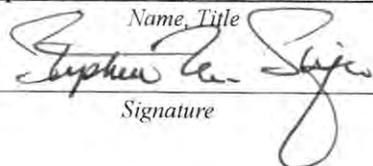
**City of Vernon, a municipal corporation (the “Grantee”)**

An easement for every purpose beneficial to the Vernon Public Utilities Department, including, but not limited to, the right to construct, lay, install, use, maintain, alter, add to, repair, replace, inspect and remove underground and overhead electric and other public utilities, consisting of pole, guys and anchors, crossarms, wires, cables, conduits, manholes, vaults, pull boxes, markers and other fixtures and appliances with the right of ingress and egress in, on, over, under, across and through that certain real property in the City of Vernon, County of Los Angeles, State of California, as described in Exhibit “A” attached hereto and incorporated herein by this reference, and as more particularly shown on the map attached hereto as Exhibit “B” and incorporated herein by this reference. This easement is on a portion of the property owned by the Grantor. The Grantee, and its employees shall have free access to said facilities and every part thereof, at all times, for the purpose of exercising the rights herein granted.

Date: November 17, 2021

**BT-OH, LLC, a Delaware limited liability company  
“Grantor”**

Stephen M. Slifer, Vice President

  
Signature

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of Georgia

County of Fulton

On November 17, 2021 before me, Alyce Louise Iglesias, Notary Public,  
(Insert Name of Notary Public and Title)

personally appeared Stephen M. Slifer who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf on which the person(s) acted, executed the instrument.

**I certify under PENALTY OF PERJURY under the laws of the State of California that the forgoing paragraph is true and correct.**

WITNESS my hand and official seal.

Signature Alyce Louise Iglesias (Seal)



EXHIBIT A - LEGAL DESCRIPTION

EASEMENT DESCRIPTION:

AN EASEMENT FOR CONDUITS, HANDHOLE AND TRANSFORMER SITUATED IN THE CITY OF VERNON, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEING LOCATED ON THAT PORTION OF THE SAN ANTONIO RANCHO, IN THE CITY OF VERNON, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 1 PAGE 389 OF PATENTS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, DESCRIBED AS FOLLOWS:

COMMENCING AT THE RIGHT-OF-WAY LINE INTERSECTION OF S. DOWNEY ROAD AND BANDINI BOULEVARD AS PER MAP RECORDED IN BOOK 161, PAGE 80, THENCE N59°08'44"W A DISTANCE OF 86.14 FEET TO THE POINT OF BEGINNING; THENCE N01°32'37"W A DISTANCE OF 16.00 FEET; THENCE N88°27'23"E A DISTANCE OF 20.00 FEET; THENCE S01°32'37"E A DISTANCE OF 14.81 FEET; THENCE N88°02'20"E A DISTANCE OF 20.90 FEET; THENCE N01°27'59"W A DISTANCE OF 93.30 FEET; THENCE N01°18'02"E A DISTANCE OF 7.90 FEET; THENCE N04°25'00"E A DISTANCE OF 10.20 FEET; THENCE N08°56'46"E A DISTANCE OF 19.61 FEET; THENCE N02°05'26"E A DISTANCE OF 30.92 FEET; THENCE N08°24'31"E A DISTANCE OF 19.83 FEET; THENCE N01°54'15"E A DISTANCE OF 28.60 FEET; THENCE N02°45'50"W A DISTANCE OF 28.13 FEET; THENCE WITH A CURVE CONCAVE SOUTHWESTERLY WITH AN ARC LENGTH OF 27.97 FEET, A RADIUS OF 950.00 FEET, A CHORD BEARING AND DISTANCE OF S13°03'23"E OF 27.97 FEET; THENCE S03°03'31"E A DISTANCE OF 0.80 FEET; THENCE S01°54'15"W A DISTANCE OF 29.10 FEET; THENCE S08°24'31"W A DISTANCE OF 19.84 FEET; THENCE S02°05'26"W A DISTANCE OF 30.95 FEET; THENCE S08°56'46"W A DISTANCE OF 19.71 FEET; THENCE S04°25'00"W A DISTANCE OF 9.87 FEET; THENCE S01°18'02" W A DISTANCE OF 7.64 FEET; THENCE S01°27'59"E A DISTANCE OF 90.15 FEET; THENCE N88°32'01"E A DISTANCE OF 1.20 FEET; THENCE S01°27'59"E A DISTANCE OF 7.00 FEET; THENCE S88°32'01"W A DISTANCE OF 1.20 FEET; THENCE S01°27'59"E A DISTANCE OF 0.99 FEET; THENCE S88°02'20"W A DISTANCE OF 36.89 FEET; THENCE WITH A CURVE CONCAVE NORTHEASTERLY WITH AN ARC LENGTH OF 7.48 FEET, A RADIUS OF 6.54 FEET, AND A CHORD BEARING AND DISTANCE OF N58°14'54"W OF 7.08 FEET; THENCE S88°27'23"W A DISTANCE OF 3.08 FEET TO THE POINT OF BEGINNING.



BUCKLEY D. BLEW  
LICENSED LAND SURVEYOR NO. 9272  
STATE OF CALIFORNIA

EASEMENT EXHIBIT

BLEW & ASSOCIATES, PA  
CIVIL ENGINEERS & LAND SURVEYORS

Project Number:  
20-3358.03

FOR THE USE AND BENEFIT OF  
3333 S. DOWNEY ROAD VERNON, CA 90058

Date: 11/17/2021



1 INCH = 50 FEET

CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING
C1	6.54'	7.48'	7.08'	N 58°14'54" W
C2	950.00'	27.97'	27.97'	S 13°03'23" E

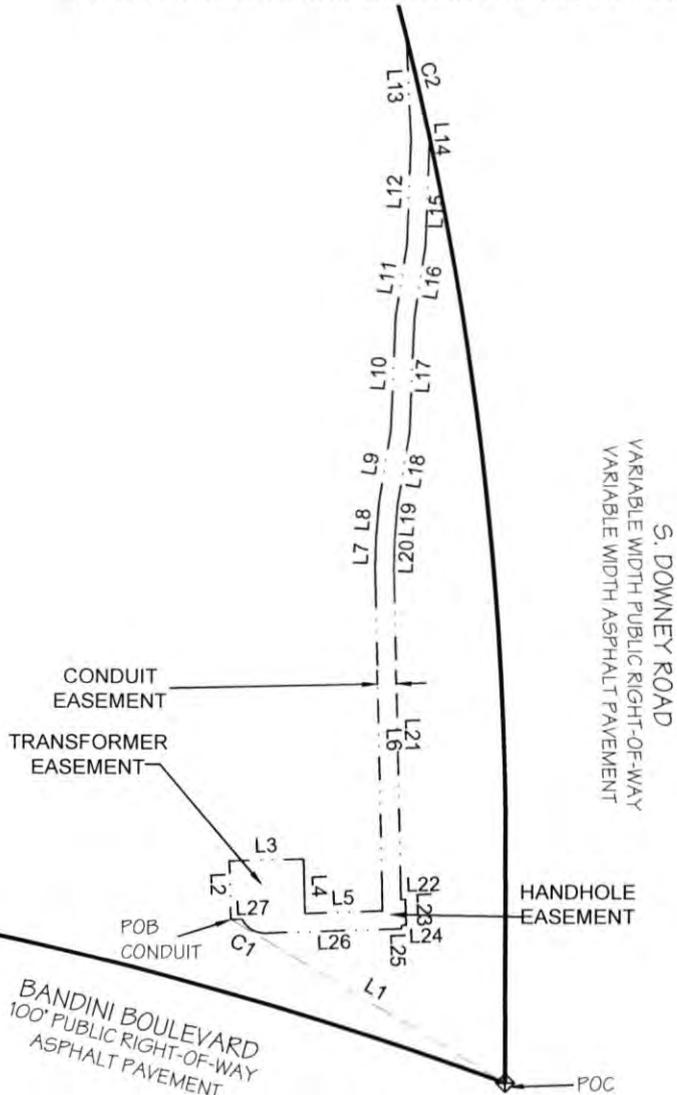
LINE	BEARING	DISTANCE
L1	N 59°08'44" W	86.14'
L2	N 01°32'37" W	16.00'
L3	N 88°27'23" E	20.00'
L4	S 01°32'37" E	14.81'
L5	N 88°02'20" E	20.90'
L6	N 01°27'59" W	93.30'
L7	N 01°18'02" E	7.90'
L8	N 04°25'00" E	10.20'
L9	N 08°56'46" E	19.61'
L10	N 02°05'26" E	30.92'
L11	N 08°24'31" E	19.83'
L12	N 01°54'15" E	28.60'
L13	N 02°45'50" W	28.13'
L14	S 03°03'31" E	0.80'
L15	S 01°54'15" W	29.10'
L16	S 08°24'31" W	19.84'
L17	S 02°05'26" W	30.95'
L18	S 08°56'46" W	19.71'
L19	S 04°25'00" W	9.87'
L20	S 01°18'02" W	7.64'
L21	S 01°27'59" E	90.15'
L22	N 88°32'01" E	1.20'
L23	S 01°27'59" E	7.00'
L24	S 88°32'01" W	1.20'
L25	S 01°27'59" E	0.99'
L26	S 88°02'20" W	36.89'
L27	S 88°27'23" W	3.08'

RECORDED DOCUMENTS USED:

1. PLAT BOOK 1, PAGE 389
2. PLAT BOOK 161, PAGE 80



BUCKLEY D. BLEW  
 LICENSED LAND SURVEYOR NO. 9272  
 STATE OF CALIFORNIA



BANDINI BOULEVARD  
 100' PUBLIC RIGHT-OF-WAY  
 ASPHALT PAVEMENT

EXHIBIT 1 OF 1

- PROPERTY LINE
- - - EASEMENT LINE
- POC POINT OF COMMENCEMENT
- POB POINT OF BEGINNING

**BLEW & ASSOCIATES, PA**  
 CIVIL ENGINEERS & LAND SURVEYORS

Project Number:  
 20-3358.03

## EASEMENT EXHIBIT

FOR THE USE AND BENEFIT OF  
 3333 S. DOWNEY ROAD VERNON, CA 90058

Date: 11/17/2021

CERTIFICATE OF ACCEPTANCE  
**(California Government Code Section 27281)**

This is to certify that interests in real property conveyed to or created in favor of the City of Vernon by that certain Electrical Easement executed by BT-OH, LLC, a Delaware limited liability company and dated November 17, 2021, is hereby accepted by the undersigned officer on behalf of the City pursuant to the authority conferred by Minute Order by the City Council of the City on March 1, 2022, and the grantee consents to recordation thereof by its duly authorized officer.

Dated: \_\_\_\_\_, 2022

CITY OF VERNON

\_\_\_\_\_  
MELISSA YBARRA, Mayor

ATTEST:

\_\_\_\_\_  
LISA POPE, City Clerk

APPROVED AS TO FORM:

\_\_\_\_\_  
ZAYNAH N. MOUSSA,  
Interim City Attorney

# City Council Agenda Item Report

Submitted by: Jessica Balandran  
Submitting Department: Public Utilities  
Meeting Date: March 1, 2022

## **SUBJECT**

Gas Enterprise Cost-of-Service Study and Rate Design

## **Recommendation:**

Receive and file the report.

## **Background:**

The Natural Gas Division of Vernon Public Utilities (VPU) serves as an important resource for the City's business community, providing reliable, high-quality service at some of the lowest rates in the State. In an effort to meet Gas Revenue requirements for the VPU Gas Enterprise Fund to recover the cost of operating the gas utility, VPU is currently in the process of reviewing the gas rates. As part of this process, the utility engaged a consultant to conduct a Gas Enterprise Cost-of-Service Study and provide Rate Adjustment Recommendations.

At the February 10, 2022 Business and Industry Commission (BIC) meeting, VPU staff provided a presentation on the results of the Gas Enterprise Cost-of-Service Study and Rate Adjustment Recommendations. A comprehensive analysis was performed by assessing historical operating expenses and projected future financial needs to recover the cost of operating the gas utility. The assessment included steps to meet the revenue requirement and ensure VPU maintains a competitive advantage in the market for the benefit of the gas customers while providing exceptional and reliable service.

On March 16, 2022, VPU will hold a Community Stakeholders Meeting at City Hall to present the findings and recommendations from the Gas Enterprise Cost-of-Service Study and Recommended Rate Adjustments in an open forum to the business community. The Gas Enterprise Cost-of-Service Study Findings and final recommendations for gas rate adjustments will be presented to the City Council once the community stakeholder engagement is complete (anticipated for May 2022).

## **Fiscal Impact:**

There is no fiscal impact associated with this report.

## **Attachments:**

1. [Gas Enterprise Rate Design Presentation for 2-10-22 BIC Meeting](#)



February 10, 2022

# VERNON PUBLIC UTILITIES – GAS RATE RECOMMENDATIONS



# VPU GAS COST OF SERVICE STUDY & RATE REVIEW

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## Overview of Cost of Service & Rate Review Study

- Used 3<sup>rd</sup> party to perform the study
- NewGen Strategies and Solutions was identified through competitive selection
- The Project Manager, Tony Georgis has more than 20 years of utility financial and regulatory experience, evaluating utilities
- Cost of Service and Rate Review – 1 year assessment
- VPU currently has a total of 124 gas customers
- VPU has 4 types of Gas customer classes:
  - G-1 Residential
  - G-2 Large Commercial
  - G-3 Transport Only
  - G-4 Commercial

# ASSESSMENT FINDINGS

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## Findings:

- Need to meet the Gas Revenue Requirements, which states that the VPU Gas Enterprise Fund needs to recover:
  - Labor, maintenance, and supplies
  - Capital investments to support growth in customer connections
  - Administrative and regulatory costs
- Gas Enterprise Fund is providing
  - VPU Credit – 5% bill credit to all gas customers
- There is an expected shortfall of approximately \$1.8M per year from 2022 - 2024
  - VPU has never increased rates for gas customers – established in 2006

# GAS COST OF SERVICE BREAKDOWN

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## Current Cost of Service Breakdown:

Total Gas Cost of Service (COS): \$12.9M/Yr.

Current rate revenues \$11.7M/Yr. (\$600,000 VPU Credit)  
**\$ -1.8M/Yr.**

- VPU Gas Enterprise Fund is projected to have a revenue shortfall for the next 3 years – 2022 to 2024
- Approximately \$1.8M shortfall per year

## VPU'S GAS GOALS AND MISSION

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### VPU Priorities for Gas Cost of Service & Rate Review

- Ensure that VPU's Gas Enterprise remains safe, reliable and responsive with the necessary funding to operate and maintain the gas system
- Ensure that VPU's gas rates remain significantly lower than other gas providers.
  - Currently VPU's G-2 and G-4 are 50-60% less than SoCalGas
  - G-1 – no residential gas customers
  - G-3 in order to maintain competitive edge, recommend smaller rate adjustment (approx. 4 customers on this rate)

# PROPOSED RECOVERY FRAMEWORK

## Recommended Recovery Framework:

Objective: To recover the gas deficit and create a self-sustaining gas enterprise

**Recommendation:** Implement rate adjustments to be applied to all gas classes, except residential (no gas customers)

Objective: To ensure VPU maintains a significant competitive advantage for customers over SoCal Gas (minimum 15-30% less – SoCal Gas historically has raised rates)

### Recommendations:

- Minimize rate adjustment impact by phasing over a 3-year period
- Reduce rate percent increase to customers by eliminating the VPU credit – effective July 1, 2022

# RATE ADJUSTMENT STRATEGY

## **Proposed Rate Adjustment Strategy**

*Maintain Competitive Advantage to SoCal Gas and  
Recover Full Cost of Service for VPU Gas*

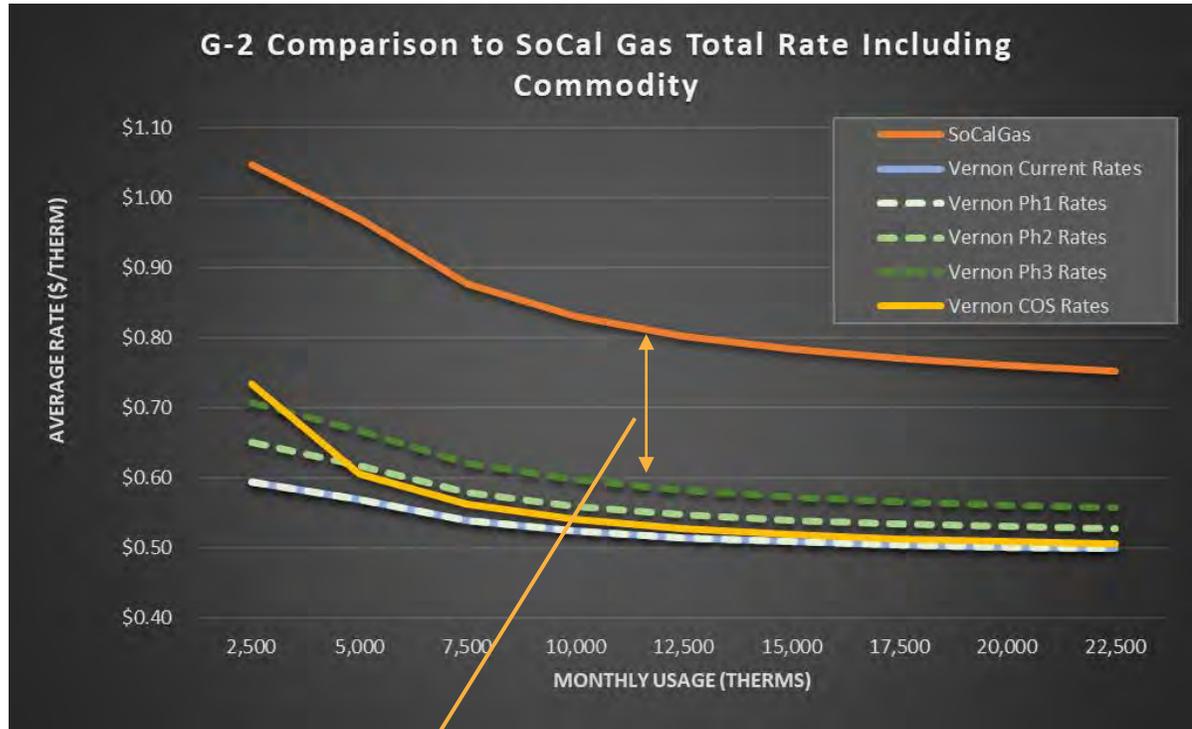
- Propose 3 Year Phase of approximately 5% per year
  - Year 1: Customers do not receive a rate adjustment, VPU will remove VPU UUT Credit for gas customers
  - Year 2: Rate adjustment to G-2 thru G-4 gas customers
  - Year 3: Rate adjustment to G-2 thru G-4 gas customers
- Rate Adjustments breakdown by class:
  - G-1 Residential: No change
  - G-2 Large Commercial: Approximately 5.6% per year
  - G-3 Transport Only: 1% per year
  - G-4 Commercial: Approximately 4.6% per year

# RATE ADJUSTMENT RECOMMENDATIONS

Customer Class	FY 2023 Recommended Bill and Rate Change (Phase 1)	FY 2024 Recommended Bill and Revenue Change (Phase 2)	FY 2025 Recommended Bill and Revenue Change (Phase 3)
G-2 Small Commercial	Remove 5% VPU Bill Credit	5.7%	5.6%
G-3 Transportation Only	Remove 5% VPU Bill Credit	1.0%	1.0%
G-4 Large Commercial	Remove 5% VPU Bill Credit	4.6%	4.6%

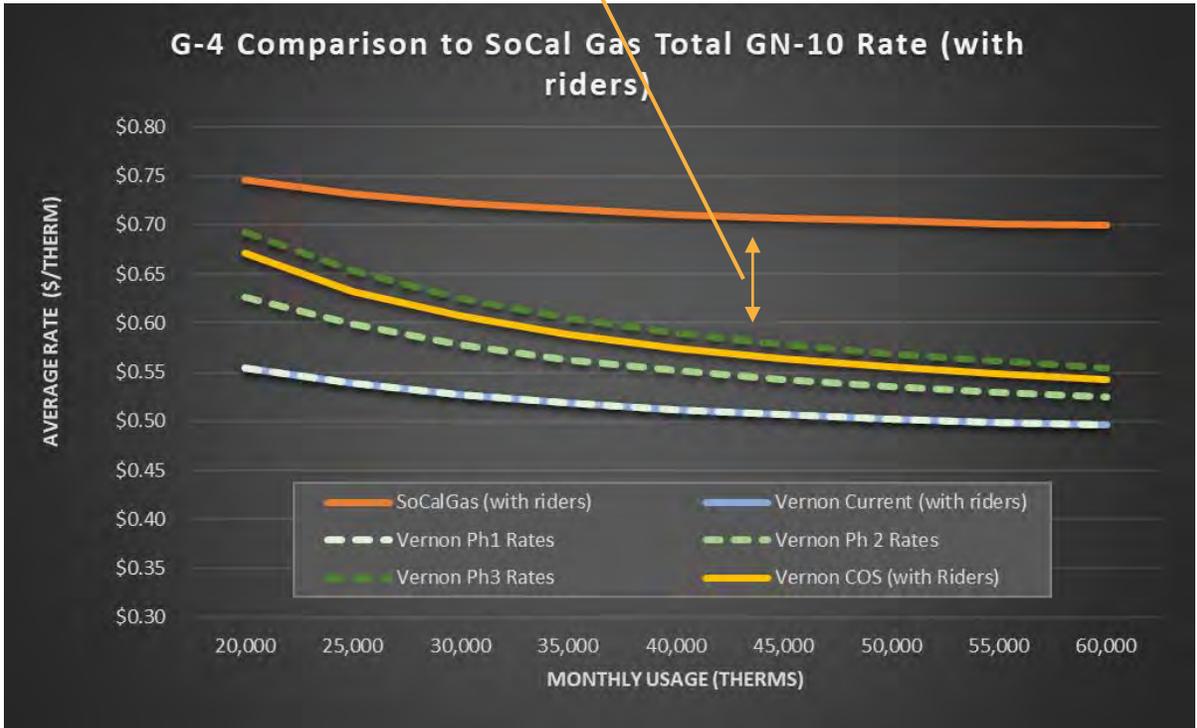
Customer Class	Current Revenues (incl. VPU Discount)	FY 2023 Recommended Revenues	FY 2024 Recommended Revenues	FY 2025 Recommended Revenues
G-2 Small Commercial	\$ 7,076,918	\$ 7,449,387	\$ 7,876,822	\$ 8,319,768
G-3 Transportation Only	\$ 1,291,042	\$ 1,358,992	\$ 1,372,103	\$ 1,385,143
G-4 Large Commercial	\$ 2,737,272	\$ 2,881,339	\$ 3,012,513	\$ 3,150,772
<b>Total Revenues</b>	<b>\$ 11,105,232</b>	<b>\$ 11,689,718</b>	<b>\$ 12,261,438</b>	<b>\$ 12,855,683</b>
<b>Change in Revenues</b>	<b>NA</b>	<b>\$ 584,486</b>	<b>\$ 571,720</b>	<b>\$ 594,245</b>

# COMPETITIVE BENCHMARKING: G-2 AND G-4 TRANSPORT AND COMMODITY SERVICE

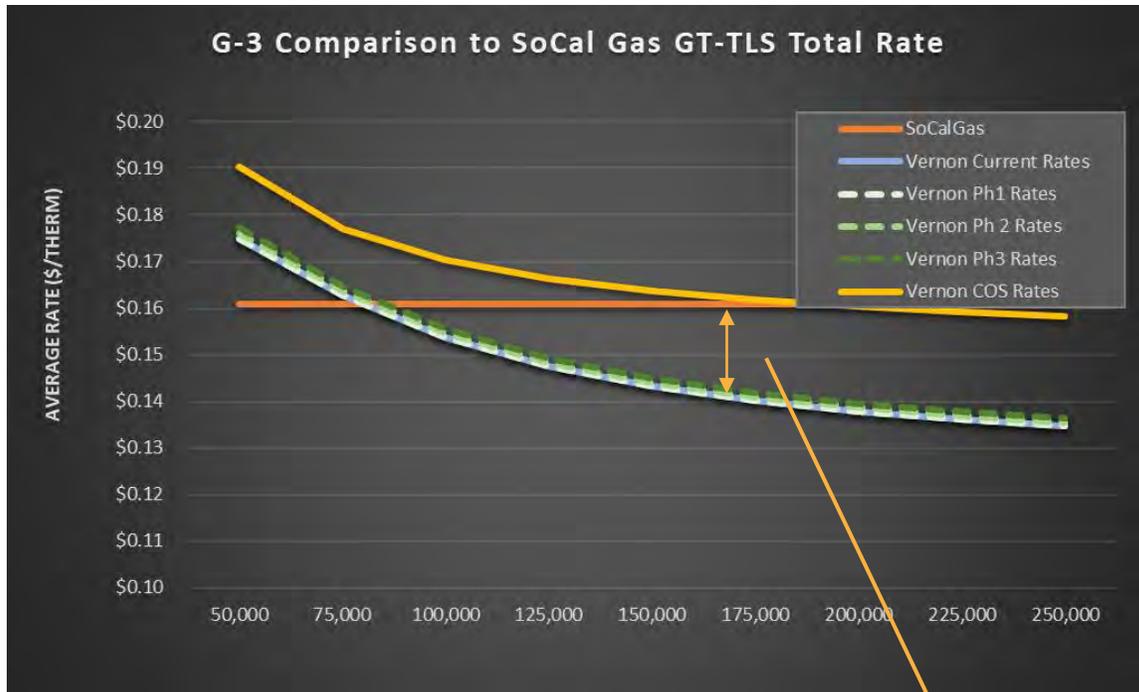


VPU Phase 3 rates 25-30% less than SoCal Gas

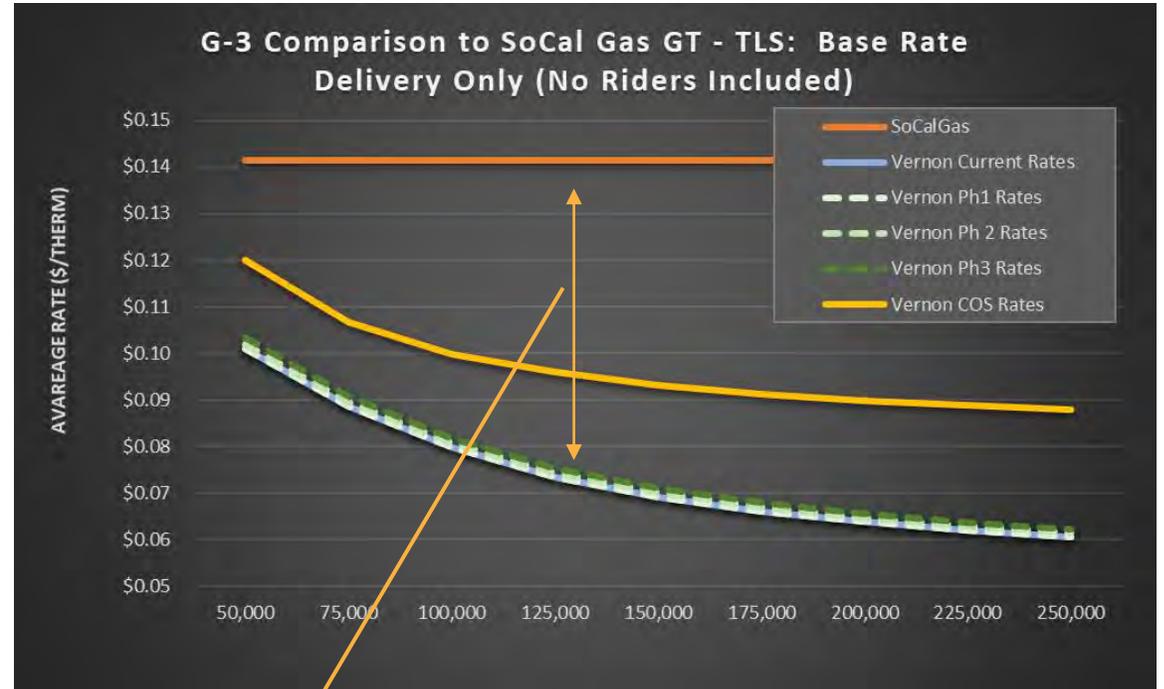
VPU Phase 3 rates 15-20% less than SoCal Gas



# COMPETITIVE BENCHMARKING: G-3 TRANSPORT ONLY SERVICE



VPU Phase 3 rates 12% less than SoCal Gas for larger customers (total bill)



VPU Phase 3 rates 30-55% less than SoCal Gas for all customers without gas rate riders (VPU GHG rider).

# EXAMPLE MONTHLY BILLS AND BENCHMARK

G-2	Item	SoCal Gas Bill	VPU PH1 Bill	VPU PH2 Bill	VPU PH3 Bill
		12,000 Therms	Customer Charge	\$15	\$ 50
	Transport	\$5,005	\$ 1,329	\$1,711	\$2,124
	Commodity	\$3,892	\$3,892	\$3,892	\$3,892
	Riders	\$768	\$924	\$924	\$924
	<b>Total</b>	<b>\$9,680</b>	<b>\$6,195</b>	<b>\$6,597</b>	<b>\$7,021</b>
	<b>Difference from SoCal</b>		<b>-36%</b>	<b>-32%</b>	<b>-27%</b>

G-3	Item	SoCal Gas Bill	VPU PH1 Bill	VPU PH2 Bill	VPU PH3 Bill
		200,000 Therms	Customer Charge	\$0	\$300
	Transport	\$28,260	\$12,467	\$12,631	\$12,804
	Commodity	\$0	\$0	\$0	\$0
	Riders	\$1,542	\$14,800	\$14,800	\$14,800
	<b>Total</b>	<b>\$29,802</b>	<b>\$27,567</b>	<b>\$27,731</b>	<b>\$27,904</b>
	<b>Difference from SoCal</b>		<b>-7%</b>	<b>-7%</b>	<b>-6%</b>

G-4	Item	SoCal Gas Bill	VPU PH1 Bill	VPU PH2 Bill	VPU PH3 Bill
		40,000 Therms	Customer Charge	\$15	\$300
	Transport	\$13,457	\$4,107	\$4,750	\$5,404
	Commodity	\$12,413	\$12,413	\$12,413	\$12,413
	Riders	\$2,559	\$3,080	\$3,080	\$3,080
	<b>Total</b>	<b>\$28,444</b>	<b>\$19,900</b>	<b>\$21,493</b>	<b>\$23,047</b>
	<b>Difference from SoCal</b>		<b>-30%</b>	<b>-24%</b>	<b>-19%</b>

## NEXT STEPS

### Proposed Timeline of Outreach Efforts:

- Present to City Administration early January 2022 ✓
- Outreach to Chamber of Commerce late January 2022 ✓
- Present to Business and Industry Commission February 10, 2022
- Community Stakeholders Meeting on March 16, 2022
- Present to City Council for approval on May 3, 2022
- Implement Rate Adjustment – Effective July 1, 2022

THANK YOU

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**QUESTIONS?**

# City Council Agenda Item Report

Submitted by: Joanna Moreno  
Submitting Department: Public Utilities  
Meeting Date: March 1, 2022

## **SUBJECT**

Construction Contract with Cedro Construction, Inc. (Cedro) for Well No. 22 Equipment and Site Improvements

## **Recommendation:**

- A. Find that the proposed action is categorically exempt from California Environmental Quality Act (CEQA) review, in accordance with CEQA Guidelines § 15301, because the project consists of the maintenance, repair or minor alteration of existing facilities and involves negligible or no expansion of an existing use; in addition, the extensions of sewer, water, and storm drain mains are exempt in accordance with CEQA Guidelines § 15303, because the project consists of minor extensions of utility services
- B. Accept the bid from Cedro as the lowest responsive and responsible bidder and reject all other bids;
- C. Approve and authorize the City Administrator to execute a Construction Contract with Cedro, in substantially the same form as submitted, in an amount not to exceed \$2,507,772, for Well No. 22 equipment and site improvements; and
- D. Authorize a contingency amount of \$501,000 in the event of unforeseen changes in the project, and grant authority to the City Administrator to issue Change Orders for an amount up to the contingency amount, if necessary.

## **Background:**

The Water Division's Capital Improvement Plan (CIP) includes the construction of two new municipal water wells. The new wells will serve to increase the productivity and reliability of the City's water supply. New well construction is a two-phase process; the first phase entails drilling and casing while the second phase entails equipping the well.

On July 7, 2020, Vernon Public Utilities (VPU) completed the first phase of construction for Well 22, drilling and casing. By way of competitive selection, VPU promptly secured the services of Pacific Advanced Civil Engineering, Inc. (PACE) for design services related to the development of the relatively undeveloped property into a municipal water well facility. City Staff and PACE worked together to prepare plans and specifications for improving the property.

On December 22, 2021, VPU advertised the Notice Inviting Bids (NIB) for Well 22 Equipment and Site Improvements (Project). Pursuant to Vernon Municipal Code (VMC) Section 3.32.120, the NIB was posted on the City's PlanetBids website and published in the local newspaper. The scope of work includes furnishing and installing appropriately sized water-moving equipment, a chlorine shed, an electrical equipment building, and corresponding appurtenances. The Project also includes overall site improvements such as asphalt and site security as well as off-site improvements to the storm drain and impacted street sections.

A total of three bids for the Project were received and opened on the bid deadline of January 25, 2022. The bid results for the Project are as follows:

1. Cedro Construction, Inc. \$2,507,772
2. R. Filanc Construction, Inc. \$3,299,700.50
3. Blois Construction, Inc. \$3,628,816.50

VPU Water Division staff evaluated the bids and deemed that the bid received from Cedro is the lowest responsive and responsible bid. Based on staff's bid evaluation and reference checks, staff recommends award of the proposed construction contract to Cedro in the amount of \$2,507,772, plus a contingency amount for unexpected changes in conditions and necessary additional work. Given the magnitude, scope and complexity of the Project, staff is requesting a contingency amount of \$501,000. At approximately twenty percent (20%) of the total contract amount, the contingency is within a typical range for this size project and will allow staff to manage and authorize any necessary work to meet the Project objectives with minimal impact to the Project timeline. The Project is included in the Water System Revenue Bonds, 2020 Series A, and will be funded with bond proceeds.

The proposed construction contract has been reviewed and approved as to form by the City Attorney's Office.

**Fiscal Impact:**

The fiscal impact of the Project is \$2,507,772, plus the contingency amount of \$501,000, for a total not-to-exceed of \$3,008,772. The Project is included in the Water System Revenue Bonds, 2020 Series A, and will be funded with bond proceeds and paid from Account No. 020.1084.900000.

**Attachments:**

1. [Construction Contract with Cedro Construction, Inc.](#)

CONSTRUCTION CONTRACT BETWEEN  
CITY AND CONTRACTOR

This Agreement is made and entered into at Vernon, California this 1st day of March, 2022, by and between the CITY OF VERNON, a chartered municipal corporation (hereinafter "City") and Cedro Construction, Inc., a California corporation (hereinafter "Contractor"), for construction of Well No. 22 Equipment and Site Improvements.

THE PARTIES HERETO AGREE AS FOLLOWS:

1. CONTRACT DOCUMENTS

The "Contract Documents" except for modifications issued after execution of this Agreement, shall consist of the following documents which are either attached hereto as exhibits or are incorporated into this Agreement by this reference, with the same force and effect as if set forth at length herein:

- A. Governmental Approvals including, but not limited to, permits required for the Work
- B. This Agreement
- C. Exhibit A – General Conditions
- D. Exhibit A1 – Performance Bond
- E. Exhibit A2 – Payment Bond
- F. Exhibit A3 – Maintenance Bond
- G. Exhibit A4 – Insurance Requirements
- H. Exhibit A5 – Statement to Comply with Minimum Requirements of the Stormwater Permit
- I. Exhibit A6 – Statement of Intent to Comply with Minimum Requirements of the California Covid-19 Industry Guidance: Construction
- J. Exhibit B – Special Provisions Specific for this Project
- K. Exhibit C – Equal Employment Opportunity Practices Provisions
- L. Notice Inviting Bids
- M. Instructions to Bidders
- N. Bid Forms
- O. Designation of Subcontractors

2. REFERENCE DOCUMENTS

The following Reference Documents are not considered Contract Documents and were provided to the Contractor for informational purposes. Contractor may rely upon the technical data contained in such documents but not upon non-technical data, interpretations, opinions or provisional statements contained therein:

3. SCOPE OF WORK

Within the Contract Time and for the stated Contract Sum, subject to adjustments thereto, and pursuant to the Contract Documents, the Contractor shall perform and provide all necessary: labor; services; supervision; materials; tools; equipment; apparatus; facilities; supplies; tools; permits, inspections, plan checks, and similar Governmental Approvals; temporary utilities; utility connections; and transportation necessary to complete the Work in strict conformity with the Contract Documents for:

Well No. 22 Equipment and Site  
Improvements

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Contract No. LP-0654

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4. TIME FOR PERFORMANCE

Contract Time. Contractor shall achieve Substantial Completion of the Work within three hundred fifty (350) **calendar days from the Date of Commencement established in City's written Notice to Proceed ("Contract Time")**, subject to adjustment in accordance with the Contract Documents. Contractor shall achieve Final Completion of the Work, within the time established by the Certificate of Substantial Completion issued by the City. The Contract Time may only be adjusted as permitted by this Construction Contract and the General Conditions.

Time is of the essence of this Agreement. Except when the Contract Documents state otherwise, time is of the essence in the performance of the Work. Contractor acknowledges that the time limits and deadlines set forth in the Contract Documents are reasonable for Contractor to perform and complete the Work.

Liquidated Damages. If Contractor fails to achieve Substantial Completion of the entire Work within the Contract Time for Substantial Completion, Contractor shall pay City as liquidated damages the amount of one thousand dollars (\$1,000.00) per day for each calendar day occurring after the expiration of the Contract Time for Substantial

Completion until Contractor achieves Substantial Completion of the entire Work, as required by Article 3 of the General Conditions of Contract.

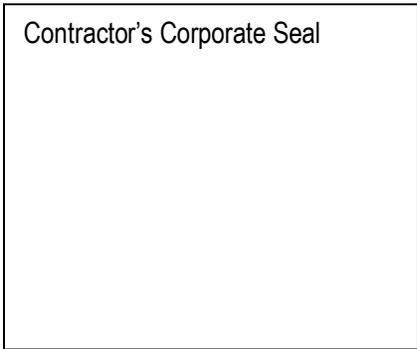
Contractor Initial here: \_\_\_\_\_.

5. CONTRACT SUM

In consideration of the Contractor's full, complete, timely, and faithful performance of the Work required by the Contract Documents, City shall pay Contractor the sum of two million five hundred seven thousand seven hundred seventy-two dollars/no cents (\$2,507,772.00), payable as set forth in the General Conditions ("Contract Sum"). The actual direct cost of all Permit Fees is excluded from the Contract Sum, however Contractor's cost of administration and coordination of all Governmental Approvals and Utility Fees is included in the Contract Sum.

IN WITNESS WHEREOF, the parties have caused this Contract to be executed the date and year first above written.

Executed at \_\_\_\_\_, California.



Cedro Construction, Inc.:

By: \_\_\_\_\_  
An Authorized Signatory

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Cedro Construction, Inc.:

By: \_\_\_\_\_  
An Authorized Signatory

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

CITY OF VERNON:

By: \_\_\_\_\_  
Name: Carlos Fandino  
Title: City Administrator  
Date: \_\_\_\_\_

APPROVED AS TO FORM:

By: \_\_\_\_\_  
Name: Zaynah N. Moussa  
Title: Interim City Attorney

ATTEST:

By: \_\_\_\_\_  
Name: Lisa Pope  
Title: City Clerk

CONTRACTOR'S SIGNATURE MUST BE NOTARIZED

EXHIBIT A  
GENERAL CONDITIONS

ARTICLE 1 - PRELIMINARY PROVISIONS

1.01 DEFINITIONS

The following words shall have the following meanings:

- A. Allowance. A line item cost estimate established by the City to be carried in the Base Bid sum, Contract Sum, and Schedule of Values for Payment for a particular item of Work, which cannot be sufficiently defined so as to allow the Contractor to adequately determine fair value before the Bid Deadline. Allowances include estimated amounts established by the City for certain construction elements that have not yet been fully designed or authorized for inclusion in the Work or to permit deferred approval or selection of actual materials and equipment to a later date when additional information is available for evaluation.
- B. As-Builts. The documents prepared by Contractor showing the condition of the Work as actually built, including, without limitation, all changes and the exact locations of all mechanical, electrical, plumbing, HVAC or other portions of the Work that are shown diagrammatically in the Contract Documents.
- C. Base Bid. The total sum stated in the Bid Form for which the Bidder offers to perform Work described in the Contract Documents as the base Contract Work (e.g. not designated as part of a Bid Alternate).
- D. Bid. A complete and properly executed offer by the Bidder on City-prescribed forms to perform the Work for the prices stated in response to the Notice Inviting Bids.
- E. Bid Alternate. An item of Work described in the Contract Documents as an Alternate Bid that will be **added to or deducted from the Base Bid and the Contractor's responsibility only if the City accepts** the Bid Alternate.
- F. Bid Forms: The City-prescribed forms which the Bidder shall complete and use to submit a Bid. **The Bid Forms include: (1) Bidder's Proposal; (2) Schedule of Bid Prices; (3) Incumbency Certificate; (4) Bid Bond; (5) Bidder's Statement of Qualifications; (6) Experience Form; (7) Trades Experience Form; (8) Contractor Safety Questionnaire; (9) Designation of Subcontractors; (10) Affidavit of Non-Collusion; (11) Insurance Requirements Affidavit; and (12) forms included in the Specification required by the type of project funding (e.g. federal, ARRA, HUD, etc.).**
- G. Bidder. The individual, partnership, firm, corporation, joint venture or other legal entity submitting a bid on these Contract Documents or any part thereof.
- H. Bidding Documents. Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of: (1) Notice Inviting Bids; (2) Instructions to Bidders; and (3) Bid Forms. The proposed Contract Documents consist of: (1) the Bidding Requirements; (2) the Construction Contract Between City and Contractor; (3) the Conditions of the Contract (General, Supplementary, and Special, if applicable); (4) all Exhibits to the Contract; (5) the Drawings; (6) the Specifications; (7) all Addenda issued prior to the execution of the Construction Contract; (8) all Modifications issued after the execution of the Construction Contract; and (9) Governmental Approvals, if any, including but not limited to, permits.

- I. Change Order. A Change Order is a written document prepared by the City reflecting the agreement between the City and Contractor for: a change in the terms or conditions of the Contract, if any; a specific Scope Change in the Work; the amount of the adjustment, if any, in the Contract Sum; and the extent of the adjustment, if any, in the Contract Time.
- J. Change Order Request (COR). A Change Order Request is a written document originated by the Contractor, which describes an instruction issued by the City after the effective date of the Contract, which Contractor believes to be a scope change that may result in changes to the Contract Sum or Contract Time or, which describes the need for or desirability of a change in the Work proposed by Contractor.
- K. City or Owner. The City of Vernon, California, acting through its City Council or other City officials authorized to act for the City, acting in its proprietary rather than regulatory capacity in connection with the Project.
- L. Construction Change Directive. A written order prepared and signed by the City directing a change in Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both.
- M. Contract Documents. The Contract Documents are enumerated in the Construction Contract between City and Contractor and consist of: (1) the Bidding Requirements; (2) the Construction Contract; (3) the Conditions of the Contract (General, Supplementary, and Special, if applicable); (4) all Exhibits to the Contract; (5) the Drawings; (6) the Specifications; (7) all Addenda issued prior to the execution of the Contract; (8) all Modifications issued after the execution of the Contract; and (9) Governmental Approvals, including, but not limited to, permits. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.
- N. Contract. The Contract Documents form the Contract for Construction. The Contract Represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified on by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than the Owner and the Contractor. There shall be no third party beneficiaries of the Contract Documents.
- O. Contract Sum. The total amount of compensation stated in the Construction Contract that is payable to Contractor for the complete performance of the Work in accordance with the Contract Documents.
- P. Contract Time. The total number of days set forth in the Construction Contract within which Substantial Completion of the Work must be achieved beginning with the Date of Commencement established in the Notice to Proceed, subject to adjustments in accordance with the terms of the Contract Documents. The Contract Time for Contractor's performance of the Work is measured in calendar days (not work days).
- Q. Contractor. The individual, partnership, firm, corporation, joint venture or other legal entity with whom the Contract is made by City, or the agent or legal representative who may be appointed to represent such individual, partnership, firm, corporation, joint venture or other legal entity in the execution of the Contract as general contractor for construction of the Work.

- R. Correction Period. Correction Period is synonymous with the terms of the correction guarantee period used in the Contract Documents.
- S. Date of Commencement. The date for commencement of the Work fixed by City in a Notice to Proceed to Contractor.
- T. Day. The terms “day” or “days” mean calendar days unless otherwise specifically designated in the Contract Documents. The term “Work Day” or “Working Day” shall mean any calendar day except Saturdays, Sundays and City recognized legal holidays. City Holidays are as follows:
1. January 1st – **New Year’s Day**
  2. The 3rd Monday in January – Martin Luther King, Jr. Day
  3. The 3rd Monday in February – Presidents Day
  4. March 31st – Cesar Chavez Day
  5. The last Monday in May – Memorial Day
  6. July 4th – Independence Day
  7. The first Monday in September – Labor Day
  8. The second Monday in October – **Indigenous Peoples’ Day**
  9. November 11th – Veterans Day
  10. The 4th Thursday in November – Thanksgiving Day
  11. December 24th – Christmas Eve
  12. December 25th – Christmas Day
  13. December 31st – **New Year’s Eve**
- U. Director. The Director of the Public Utilities Department of the City of Vernon or his/her duly appointed representative.
- V. Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
- W. Extra Work. New or unforeseen work will be classified as Extra Work when determined by the City that the work is not described in, or reasonably inferable from, the Contract Documents, the work is not covered by any Bid line item or Allowance, and the work causes Contractor to incur additional and unforeseen costs.
- X. **Field Directive. See, “Work Directive.”**
- Y. Final Completion. Final Completion is the stage of performance of the Work when (1) all Work required by the Contract Documents has been fully completed in compliance with the Contract Documents and all applicable laws including, but not limited to, correction or completion of all punch list items noted by City upon Substantial Completion; (2) Contractor has delivered to City an Application for Final Payment and all closeout documentation required by the Contract Documents; and (3) documentation of all final Governmental Approvals has been submitted to City including, but not limited to a final Certificate of Occupancy or equivalent Building Department sign-off has been issued covering the entire Project site without exception or conditions.
- Z. Force Majeure. **“Force Majeure” includes but is not limited to declared or undeclared war, sabotage, insurrection, riot, or other acts of civil disobedience, labor disputes, fires, explosions, floods, earthquakes or other acts of God.**

- AA. Fragnet. The sequence of new activities that are proposed to be added to an existing schedule.
- BB. Governmental Approval. Any approval, authorization, inspection, certification, consent, exemption, filing, permit, registration, plan check, ruling or similar authorization required by any federal, state or local law, regulation or procedures in order for Contractor to perform the Work.
- CC. Guarantee. Assurance to City by Contractor or product manufacturer or other specified party, as guarantor, that the specified warranty will be fulfilled by the guarantor in the event of default by the warrantor.
- DD. Modification. A Modification is: (1) a written amendment to Contract signed by both parties; (2) a Change Order; or (3) a Construction Change Directive.
- EE. Notice to Proceed. The Notice to Proceed is a document issued by the City fixing the date for Commencement for the Work.
- FF. Parties. The City and Contractor may be referred to in the Contract Documents from time to time as the Parties.
- GG. Permit Fees. The actual direct costs paid by Contractor for Governmental Approvals and Utility Fees.
- HH. Permit Fees Reimbursement. A payment made to the Contractor by the City in addition to the Contract Sum to compensate Contractor for the actual direct cost of all Permit Fees.
- II. Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the City or by separate contractors.
- JJ. Project Manual/Contract Package. The volumes of Contract Documents and reference documents assembled for the Work made available to Bidders.
- KK. Record Documents. The Drawings, Specifications, addenda, requests for information, bulletins, Change Orders and other modifications to the Contract Documents, approved shop drawings, product data, samples, mock-ups, permits, inspection reports, test results, daily logs, schedules, **subcontracts, and purchase orders. Records Documents shall include a set of "As-Built" Drawings and Specifications, which shall be continuously updated during the prosecution of the Work.**
- LL. Site. The physical area designated in the Contract Documents for Contractor's performance of the Work.
- MM. Specifications. The Specifications are the volume(s) assembled for the Work that includes, without limitation, the Bidding Documents, the Construction Contract and Exhibits, the General Conditions, **Supplementary and/or Special Conditions, if any, the "GREENBOOK" STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (2012 Edition), the Standard Plans for Public Works Construction (2009 Edition), State of California, Department of Transportation Standard Plans and Standard Specifications (2010 Edition), and the City of Vernon Standard Plans.**
- NN. Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards, and workmanship for the Work

and performance of related services, including, but not limited to, the Project Technical Specifications, Standard Specifications, if any, and any applicable Trade Association Specifications.

- OO. Substantial Completion. Substantial Completion is defined to mean the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents as determined by the City so that the City can occupy and utilize the Work for its intended use and as further defined in the Contract Documents.
- PP. **Unilateral Change Order. See "Work Directive."**
- QQ. Utility Fees. The fees charged by any public, private, cooperative, municipal and/or government line, facility or system used for the carriage, transmission and/or distribution of cable television, electric power, telephone, water, gas, oil, petroleum, steam, chemicals, sewage, storm water or similar commodity including, but not limited to fees for temporary utilities and refuse hauling.
- RR. Warranty. Assurance to City by contractor, installer, supplier, manufacturer or other party responsible as warrantor, for the quantity, quality, performance and other representations of a product, system service of the Work.
- SS. Work. The term "Work" means the construction and other services required by, and reasonably inferable from the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.
- TT. Work Directive. A Work Directive is a unilateral written order issued by the City directing Contractor to continue performance of the Work or to perform a disputed change in the Work prior to agreement or adjustment, if any, in the Contract Sum, Contract Time, or both.

## 1.02 REPRESENTATIVES

- A. The Director shall be the representative of the City and, except as otherwise expressly provided herein, shall make all decisions and interpretations to be made by the City under the provisions of the Contract Documents.
- B. The Contractor shall at all times be represented on the Work in person or by a duly designated agent. Instructions and information given by the Director to the Contractor's agent on the Work shall be considered as having been given to the Contractor.

## 1.03 PERMITS, INSPECTIONS, PLAN CHECKS, AND SIMILAR GOVERNMENTAL APPROVALS AND UTILITIES

- A. Except as otherwise provided in the Notice Inviting Bids, the Contractor shall apply for, obtain, and pay for all permits including, but not limited to, building or structure permits, plumbing system permits, mechanical system permits, electrical system permits, structural system permits, demolition permits, excavation permits, street use permits, driveway permits, sidewalk, curb, sewer, gutter, crosswalk, paving or other street work grading permits, street/utility use permits, OSHA permits, fire sprinkler permits, fence permits, blasting permits, landscaping/irrigation permits, and permits to demolish, remove, or make major alterations to any designated historic resource; inspections; and plan checks obtained after the Date of Commencement of the Work. The Notice Inviting Bids contains a list of permits and other Governmental Approvals and Utility Fees obtained and paid for by the City prior to the Date of Commencement; Contractor is responsible for obtaining all Governmental Approvals and

Utility Fees not listed in the Notice Inviting Bids.

- B. The City will reimburse Contractor monthly for the documented actual direct cost paid to governmental agencies or utilities for all Permit Fees according to the payment provisions of the Contract Documents **after submission to the City of the Contractor's and/or Subcontractors' original receipts from the governmental entities or utilities ("Permit Fee Reimbursement")**. Contractor shall deliver the original receipt to the City's Project Manager with each permit. All Permit Fees shall be separately itemized in each Application for Payment and copies of the receipt(s) and permit(s) must be attached. The Base Bid sum / Contract Sum shall include the cost of administration and coordination for all Governmental Approvals and Utility Fees.
- C. **All documents evidencing Contractor's satisfaction with all Governmental Approvals and Utility Fees** must be submitted to the City prior to submission of the Application for Final Payment.
- D. Where requirements of the Governmental Approvals differ from those of the Drawings and Specifications, the more stringent requirements shall apply.
- E. Unless otherwise specified in the Contract Documents, Contractor shall be responsible for payments **of all Utility Fees from the Date of Commencement until City's Final Acceptance of the Work**.

#### 1.04 LICENSES

The Contractor shall apply for, obtain, and pay for all licenses required by governing authorities for the Work. Contractor shall apply and pay for a City of Vernon business license.

#### 1.05 ALLOWANCES

- A. **Contractor shall include in the Contract Sum and Schedule of Values for Payment, the City's estimated cost established for each Work item covered by an Allowance stated in the Contract Documents.** See Paragraph 1.01 for definition of Allowance.
- B. The line item cost estimate established by the City for Work covered by an Allowance includes the cost to Contractor of: all materials and equipment, preparation of submittals; labor; transportation; delivery; handling; installation; supervision; overhead; profit; licenses; bonds; insurance; all sales, use and other taxes legally chargeable; and all other costs and expenses incidental to such Work.
- C. Work items covered by Allowances shall be supplied with such materials and equipment and for such **prices approved in advance by City**. Contractor shall notify and request City's approval of material equipment, and pricing information for Work covered by an Allowance before ordering the material or equipment and in sufficient time to avoid delay to the Work. City shall provide approval of materials, equipment, and prices with reasonable promptness. The material, equipment, and pricing information **submitted by the Contractor to the City's** Project Manager shall, at a minimum, include product data and detailed costs of material, equipment, and labor to complete such Work, itemized by costs incurred by Contractor and each subcontractor associated with the performance of such Work. Contractor shall not order materials or equipment or proceed with Work covered by an Allowance until the material, **equipment, and pricing information for such Work items have been submitted to the City's Project Representative for review and the Contractor has received City's approval to proceed with a Work item covered by an Allowance**.
- D. All expenditures for Allowance Work shall be separately itemized in each Application for Payment.

- E. To the extent that the cost of Work items covered by an Allowance is less than the Allowance cost estimate established by the City, the Contract Sum shall be reduced by Change Order or Construction Change Directive to reflect the actual cost of the Allowance item. Similarly, to the extent the cost of Work items covered by an Allowance is greater than the Allowance cost estimate, the Contract Sum shall be increased by Change Order or Construction Change Directive to reflect the actual cost of the Allowance item. If Work items covered by an Allowance are not performed or the City deletes such items from the Scope of Work, the Contract Sum shall be reduced by Change Order or Construction Change Directive to deduct the Cost of the unused Allowance item.

1.06 WAIVER

A waiver by City of any breach of any term, covenant, or condition contained in the Contract Documents shall not be deemed to be a waiver of any subsequent breach of the same or any other term, covenant, or condition contained therein, whether of the same or a different character.

1.07 DATA TO BE FURNISHED BY THE CONTRACTOR

The Contractor shall furnish the Director with such information as the Director may desire respecting the character of the materials and the progress and manner of the Work, including all information necessary to **determine the Contractor's costs, such as** the number of persons employed, their pay, the time during which they worked on the various classes of construction, and other pertinent data.

1.08 CONTRACT DRAWINGS

The City will accept no responsibility for errors resulting from misinterpretation or scaling of the Drawings.

1.09 SPECIFICATIONS AND DRAWINGS

- A. The Contractor shall keep on the Work Site a copy of all Specifications, Drawings, and Change Orders pertaining to the Work and shall at all times give the Director access thereto. Anything mentioned in the Specifications and not shown on the Drawings or shown on the Drawings and not mentioned in the Specifications shall be of like effect as though shown or mentioned in both.
- B. In general, the Drawings will show dimensions, positions, and kind of construction; and the Specifications will define materials, quality, and standards. Any Work not particularly detailed, marked or specified, shall be the same as similar parts that are detailed, marked or specified.
- C. The Drawings shall not be scaled to determine dimensions, and in all cases shall be calculated from figures shown on the Drawings. Any discrepancies between scale and figured dimensions, not **marked "not to scale," must be brought to the Director's attention before proceeding with the Work** affected by the discrepancy.
- D. Omissions from the Drawings and/or Specifications shall not relieve the Contractor from the responsibility of furnishing, making, or installing all items required by law or code, or usually furnished, made or installed in a project of the scope and general character indicated by the Drawings and Specifications.
- E. For convenience, the Drawings and Specifications may be arranged in various trade subparagraphs, but such segregation shall not be considered as limiting the Work of any subcontract or trade. The Contractor shall be solely responsible for all subcontract arrangements of the Work regardless of the

location or provision in the Drawings and Specifications.

- F. The City will furnish free of charge to the Contractor, a maximum of six (6) sets of Contract Drawings and Specifications. The Contractor shall pay for the costs of any additional sets or portions thereof. The Contractor shall be responsible to see that all sets are the same as the up-to-date approved set.

#### 1.10 PRECEDENCE OF CONTRACT DOCUMENTS

- A. In the event of conflict between any of the Contract Documents, the provisions placing a more stringent requirement on the Contractor shall prevail. The Contractor shall provide the better quality or greater quantity of Work and/or materials unless otherwise directed by City in writing. In the event none of the Contract Documents place a more stringent requirement or greater burden on the Contractor, the controlling provision shall be that which is found in the document with higher precedence in accordance with the following order of precedence:

1. Governmental Approvals including, but not limited to, permits required for the Work
2. Modifications issued after execution of the Contract (including modifications to Drawings and Specifications)
3. The Contract, including all exhibits, attachments, appendices and Addenda, with later Addenda having precedence over earlier Addenda
4. Special Conditions, if any
5. General Conditions
6. Specifications
7. Drawings
8. Bidding Requirements

- B. With reference to the Drawings, the order of precedence is as follows:

1. Change Order Drawings
2. Addenda Drawings
3. Contract Drawings
4. Project Drawings
5. Standard Drawings
6. Detail Drawings
7. General Drawings
8. Figures
9. Scaled dimensions

- C. Within the Specifications, the order of precedence is as follows:

1. Change Orders
2. Special Conditions
3. Project Technical Specifications
4. Standard Specifications, if any
5. Applicable Trade Association Specifications

#### 1.11 NOTICE OF CONFLICTS

If the Contractor, in the course of the Work, becomes aware of any claimed conflicts, errors or omissions in the Contract Documents or in the City's fieldwork or work of City's separate contractors, the Contractor shall immediately notify the Director in writing. The Director shall promptly review the matter, and if the Director

finds a conflict, error or omission, the Director shall determine the corrective actions and advise the Contractor accordingly. If the correction associated with a conflict, error or omission increases or decreases the amount of Work called for in the Contract, the City shall issue an appropriate Change Order in accordance with the Contract Documents. After discovery of an error or omission by the Contractor, any related additional work performed by the Contractor shall be done at the Contractor's risk unless authorized by the Director.

#### 1.12 REPORTS

A. Daily Construction Reports: The Contractor shall prepare a daily construction report recording the following information concerning events at Project site:

1. List of Subcontractors at Project site.
2. List of other contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.
20. List of visitors to Project Site.
21. List of personnel at Project Site including names and job classifications.
22. Description of Work for the day including locations, quantities and related bid items.

Immediately upon discovery of a difference between field conditions and the Contract Documents, the Contractor shall prepare and submit a detailed report through a Request for Information (RFI). Include a detailed description of the differing conditions, together with recommendations for a remedy.

The Daily Construction Report must be: signed by **Contractor's Superintendent, submitted within 24 hours** (next Working Day) to the Director, and shall be made available to others as directed by City.

#### 1.13 LINES, GRADES, AND MEASUREMENTS

A. All lines and grades will be established by the Contractor. The Contractors shall carefully preserve all survey stakes and reference points as far as possible. Should any stakes or points be removed or destroyed unnecessarily by any act of the Contractor or his/her employees, they must be reset to the satisfaction of the Director, at the Contractor's expense.

B. The Contractor shall inform the Director 48 hours (two Work Days) in advance of the times and places

at which he/she intends to Work in order that inspection may be provided, and that necessary measurements for records and payments may be made with minimum inconvenience.

- C. No direct payment will be made for the cost to the Contractor of any of the Work or delay occasioned by giving lines and grades, by making other necessary measurements, or by inspection.

1.14 RIGHT OF WAY

- A. The site for the installation of equipment or the right of way for the Work to be constructed under this Contract will be provided by the City.
- B. The City will provide the appropriate rights of way and property for pipelines and structures. Upon approval by the Director, the Contractor may, without cost, use portions of any of the City's rights of way or property which may be suitable for working space and for storage of equipment and materials. The Contractor will be held responsible for any damage to structures, streets, and roads, trees and landscaping, and for any damage that may result from his/her use of City property.
- C. In case areas additional to those available on the City's rights of way or property are required by the Contractor for his/her operations, he/she shall make arrangements with the property owners for the use of such additional areas at his/her own expense.

1.15 CONTRACTOR'S OPERATIONS/STORAGE YARD

In the event the Contractor requires space for the storage and/or staging of construction materials, supplies, equipment, stockpiling of debris, or any other needs required for construction operations, he/she shall acquire at his/her own expense such areas as he/she may desire. For properties within the City of Vernon, the staging **area must be enclosed at Contractor's expense with construction fencing covered with a mesh screen to limit** visibility to the site. Private property used for storage of construction material or debris shall be restored to a legal condition with regard to appearance and maintenance upon conclusion of the project. Property should be graded and free of weeds and debris when project is completed.

[END OF ARTICLE]

## ARTICLE 2 - PERFORMANCE OF THE WORK

### 2.01 PERFORMANCE OF WORK - GENERAL

Contractor shall, at its own cost and expense, furnish all necessary materials, labor, transportation, and equipment for doing and performing said Work and the materials used shall comply with the requirements of the Contract Documents. All Work shall be performed and completed as required in the Contract Documents, and subject to the approval of the Director, or his/her designated assistant.

### 2.02 NO ASSIGNMENT OR DELEGATION

Contractor shall not assign or delegate the duties or obligations under this Contract or his/her interest therein in whole or in part without the prior written consent of the City which may be withheld at the City's sole discretion.

### 2.03 STANDARD OF PERFORMANCE

Contractor agrees that all services performed hereunder shall be provided in a manner commensurate with the highest professional standards and shall be performed by qualified and experienced personnel; that any Work performed by Contractor under the Contract will be performed in the best manner; that any material furnished shall be subject to the approval of the Director; and that both Work and materials will meet fully the requirements of the Contract Documents. Any work deemed unacceptable by the Director, whether a cause is determined or not shall be repaired or replaced by **Contractor at Contractor's expense**.

The Contractor shall be responsible for the final product and shall make any quality control, adjustments and corrections necessary to obtain the final product accepted by the City Engineer. The Contractor shall perform process and quality control sampling and testing and exercise management control the work of his/her subcontractors, technicians and workers to ensure that the milling, transporting, recycling, spreading, compaction, and finishing processes conform to these Specifications. The proficiency of testing laboratories and sampling and testing personnel shall be reviewed and approved by the City Engineer prior to providing services to the project. The City Engineer shall have unrestricted access to the laboratory, sampling, testing sites, and all information resulting from mix design and quality control activities. All Quality Control testing results shall be submitted to the City Engineer on a daily basis.

### 2.04 DEFECTIVE WORK

Within the time periods that the City specifies, the Contractor shall correct all deficient, improperly executed, or unsatisfactory Work determined by the City.

The Contractor shall remove and shall repair or replace, at his/her own expense any part of the Work that is deficient, improperly executed, or unsatisfactorily executed, even though it has been included in the monthly **estimates**. **If he/she refuses or neglects to remove, repair, or replace such defective Work, prior to the City's acceptance of the Work, it may be replaced by the City at the expense of the Contractor, plus 15% for overhead expenses, and his/her sureties shall be liable therefor.** (See Paragraph 2.15 for curing defects after acceptance of the Work.)

### 2.05 CITY'S RIGHT TO CARRY OUT THE WORK

A. Notwithstanding other remedies available to the City, if the Contractor defaults, fails to perform Work required by the Contract Documents, or otherwise neglects to carry out the Work in accordance with the Contract Documents and fails within a 48 hour period after receipt of written notice from the City to commence and correct such default, failure to perform, or neglect with diligence and promptness, the

City, at its sole discretion and without obligation, may, with its own or outside forces, perform the Work Contractor has failed to perform and/or replace or correct deficiencies in the Work. In such case, a Change Order or Construction Change Directive shall be issued deducting from payments then or thereafter due to the Contractor the cost of completion, replacement or correction of such deficiencies, **including compensation for additional services by the City's project management staff, the Architect,** and their respective consultants made necessary by such default, failure to perform, or neglect, plus **15% for City's overhead expenses.** If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the City immediately. This remedy is cumulative.

- B. The City also has the right, but not the obligation, to self-perform or have outside forces perform portions of the Work previously assigned to Contractor. In such case a Change Order or Construction Change Directive shall be issued, reducing the Contract Sum by the Unit Price(s) applicable to such deleted Work or, in the absence of Unit Prices, an amount that reflects the reasonable cost of performing such deleted Work and the Allowable Mark-Up applicable to such deleted Work.

2.06 COMMUNICATIONS AND NOTICES REGARDING THE WORK

- A. Notices under the Contract Documents shall be in writing and (a) delivered personally, (b) sent by certified mail, return receipt requested, or (c) sent by a recognized overnight mail or courier service, with delivery receipt requested, to the following addresses (or to such other address as may from time to time be specified in writing by such Person):

All correspondence with Contractor shall be sent to the following address:

Cedro Construction, Inc.  
120 East Santa Maria Street  
Santa Paula, CA 93060  
Attention: Micheal Verner  
Phone: (805) 525-0599

**All communications shall be copied to City and shall be delivered to City's Director at the address set forth below, with copies to such additional persons as may be directed by City's Director.**

City of Vernon  
Public Utilities Department  
4305 Santa Fe Avenue  
Vernon, CA 90058  
Attention: Mark Aumentado, P.E.  
Phone: (323) 583-8811 x309  
E-mail: maumentado@cityofvernon.org

- B. Notices shall be deemed received when actually received in the office of the addressee (or by the addressee if personally delivered) or when delivery is refused, as shown on the receipt of the U. S. Postal Service, private carrier or other Person making the delivery. All notices received after 5:00 p.m. shall be deemed received on the first business day following delivery. Any technical or other communications pertaining to the Work shall be conducted by Contractor's Project Manager and technical representatives designated by City. Contractor's representatives shall be available at all

reasonable times for consultation, and shall be authorized to act on behalf of Contractor in matters concerning the Work.

- C. Contractor shall copy City on all written correspondence pertaining to the Contract between Contractor and any Person other than Contractor's Subcontractors, consultants and attorneys.
- D. Notification of Affected Residents/Businesses. The Contractor shall be responsible for distribution of the general information letter of the project to all affected residents and businesses. A project general information letter and sufficient copies thereof will be prepared by City staff for Contractor distribution to all residents, business establishments, and institutions fronting on or directly affected by the project.

The Contractor shall be responsible for distribution of said letter in handout form to all the appropriate residences and buildings in the subject area. Distribution shall be accomplished in a manner acceptable to the City Engineer and shall be five (5) working days prior to the beginning of construction operations in the immediate vicinity. In addition to the above, the Contractor shall be fully responsible for such other notifications as may be required related to necessary closures of streets, alleys, driveways, etc., or to unavoidable access or parking restrictions. These notifications shall apply where the closures and access or parking restrictions required in the performance of any work under this contract preclude any resident, tenant, or property owner from utilizing the premises or conducting business thereon in a reasonable and customary manner.

Additional notification to the affected businesses and residents shall be prepared by the City and distributed by the Contractor for roadway and driveway closures five (5) working days in advance of any construction work. No removal or excavation work is allowed until the additional notification has been distributed to the affected residents and businesses.

If a Contractor is unable to adhere to his schedule as indicated on his written notification, then all the affected residents and places of business shall be re-notified of the revised schedule, in writing, as indicated above.

Contractor costs for all of the above notifications shall be considered as included in the appropriate items of the Bid Proposal.

- E. Notification of Utilities – **The provisions of Section 5 entitled "Utilities" of the "Greenbook" Standard Specifications** shall apply. The Contractor shall contact the Underground Service Alert of Southern California (U.S.A.) at least two working days in advance of the construction work

## 2.07 INDEPENDENT CONTRACTOR

The Contractor in the performance of the Work hereunder will be acting in an independent capacity and not as an agent, employee, partner, or joint venture of the City.

## 2.08 EMERGENCY WORK

- A. During Working Hours:

In case of an emergency which threatens loss or injury of property, and/or safety of life during working hours, the Contractor shall act, without previous instructions from the City, as the situation may warrant. He/she shall notify the Director of the emergency and the action taken immediately thereafter.

Any compensation claimed by the Contractor, together with substantiating documents in regard to

expense, shall be submitted to the Director within 15 calendar days after the emergency. Compensation, if allowed, will be paid for as Extra Work.

B. Outside of Working Hours:

Whenever, in the opinion of the City, there shall arise outside of the regular Working hours on the Contract Work of an emergency nature which threatens loss or injury of property, or danger to public safety, the Contractor shall act, without previous instructions from the City as the situation may warrant. He/she shall notify the Director of the emergency and the action taken immediately thereafter. Any compensation claimed by the Contractor, together with substantiating documents in regard to expense, shall be submitted to the Director within 15 calendar days after the emergency. Compensation, if allowed, will be paid for as Extra Work. In the event the Contractor is not able to respond to an emergency outside of regular working hours, the City's forces will handle such emergency Work. If such emergency arises out of or is the result of operations by the Contractor, the cost of the corrective measures will be billed to the Contractor and deducted from his/her payment as provided in the Contract Documents. The performance of emergency Work by City forces will not relieve the Contractor of any of his/her responsibilities, obligations, or liabilities under the Contract.

2.09 SUBCONTRACTORS

- A. Each subcontract shall contain a reference to the Contract between the City and the principal Contractor, and the terms of the Contract and all parts thereof shall be made part of each subcontract **insofar as applicable to the Work covered thereby. If, in the Director's opinion, the Subcontractor fails to comply with the requirements of the principal Contract insofar as the same may be applicable to the Subcontractor's Work, the Director may disqualify the Subcontractor.**
- B. Nothing contained in these Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the City.
- C. The Contractor shall be considered the employer of the Subcontractors and shall be fully responsible to the City for the acts and omissions of Subcontractors and of persons employed by them as the Contractor is for the acts and omissions of persons directly employed by him/her.
- D. The Contractor shall be responsible for the coordination of the trades, Subcontractors, and material **suppliers engaged upon the Work. It shall be the Contractor's duty to see that all of his/her** Subcontractors commence their Work at the proper time and carry it on with due diligence so that they do not delay or injure either the Work or materials; and that all damage caused by them or their workers is made good at his/her expense.
- E. The City will not undertake to settle differences between the Contractor and his/her Subcontractors or between subcontractors.
- F. The Contractor shall utilize the services of specialty Subcontractors, without additional expense to the City, on those parts of the Work which are specified to be performed by specialty contractors.

2.10 USE OF FACILITIES PRIOR TO COMPLETION OF CONTRACT

- A. Whenever in the opinion of the Director any Work under the Contract, or any portion(s) thereof, is in a condition suitable for use by the City, the City may, after written notice and designation from the Director to the Contractor, use (which includes, but is not limited to, taking over or placing into

service) any portion(s) designated by the Director.

- B. The use of any portion(s) by the City shall not be construed as, and will not constitute acceptance in any sense, of any portion(s) of the Work of the Contractor nor will such use trigger the running of any warranty and/or guarantee periods.
- C. All necessary repairs, renewals, changes, or modifications in the Work or any portion thereof so used, not due to ordinary wear and tear, but due to defective materials or workmanship, the operations of the Contractor, or any other cause, shall be made at the expense of the Contractor.
- D. The use of any portion(s) by the City shall not relieve the Contractor of any of his/her responsibilities or liabilities under the Contract nor constitute a waiver by the City of any of the conditions thereof. Said use shall not cancel liquidated damages as of the first date of use, or any continuance thereof, nor impair, reduce, or change the amount of liquidated damages.

#### 2.11 COOPERATION WITH OTHER WORK FORCES

- A. The City reserves the right to perform other Work at or near the site at any time by the use of its own forces or other contractors.
- B. Other contractors, other utilities and public agencies or their contractors, other City contractors, and City personnel may be working in the vicinity during the project construction period. There may be some interference between these activities and the Work under the Contract Documents. The Contractor shall cooperate and coordinate his/her Work with that of other Work forces to assure timely Contract completion.

#### 2.12 AGREEMENTS WITH PROPERTY OWNERS

Agreements with property owners for storing excavated material, storing any other materials, or for any other purpose related to the Work shall be made in writing and a copy submitted to the Director for his/her information. **All storage charges shall be at the Contractor's sole expense.**

#### 2.13 PROTECTION OF PROPERTY

All public and private property, pavement or improvement, shall be safely guarded from damage or loss in connection with this Contract by the Contractor at all times. Should any facility, structure, or property be damaged during operations of the Contractor, he/she shall immediately notify the property owners or authorities. All damages and losses incurred shall be paid by the Contractor.

#### 2.14 CONTRACTOR'S RESPONSIBILITIES FOR LOSSES OR LIABILITIES

- A. Risk of Loss

Except as otherwise provided in the Contract Documents and except as to the cost of repair or restoration of damage to the Work caused by force majeure, the Contractor shall bear all losses resulting to him/her on account of the amount or character of the Work, or from any unforeseen obstructions or difficulties which may be encountered, or from any encumbrances on the line of the Work, or because the nature of the ground in or on which the Work is done is different from what is assumed. The Contractor shall bear the risk for any City equipment, material, or supplies with which he/she has been entrusted.

B. Materials and Facilities

The Contractor shall be responsible for materials and facilities as hereinafter provided and in the event of his/her failure to carry out said responsibilities, the same may be carried out by the City at the expense of the Contractor:

1. The Contractor shall be responsible for any materials so furnished and for the care of all Work until its completion and final acceptance, and he/she shall at his/her own expense replace damaged or lost materials and repair damaged parts of the Work.
2. The Contractor shall protect City facilities from damage resulting from his/her Work. City facilities damaged by, or as a result of, the Contractor's Work under this Contract shall be repaired or replaced, as directed by the Director, at the Contractor's expense.
3. The Contractor shall remove from the vicinity of the completed Work all buildings, rubbish, unused material, concrete forms, and other materials belonging or used under his/her direction during construction. If Contractor fails to completely remove such items within a **reasonable time the City may do so at the Contractor's expense.**

C. Laws and Regulations

1. The Contractor shall obey all laws, ordinances, and regulations in any manner affecting those engaged or employed on the Work, or the materials used in the Work, or in any way affecting the conduct of the Work, and of all court orders and decrees having any jurisdiction or authority over the same. If any discrepancy or inconsistency should be discovered in this Contract, or in the Drawings or Specifications herein referred to, in relation to any such law, ordinance, regulation, order, or decree, he/she shall immediately report the same in writing to the Director.
2. Contractor shall, at all times, cause all his/her agents and employees to observe and comply with all such applicable laws, ordinances, regulations, orders, and decrees in effect or which may become effective before Final Completion of this Contract.
3. Nothing in the Contract Documents shall be construed to permit Work not conforming to such laws, ordinances, and regulations. If the Contractor ascertains at any time that any requirement of this Contract is at variance with such applicable law requirement, he/she shall immediately notify the Director.
4. If such applicable law requirement was not in effect on the date of submission of bids, any necessary adjustment of the Contract price shall be made as provided in Article 6 herein. If such applicable law requirement was in effect on said date of bid submission, no adjustment of Contract price will be considered.
5. The Contractor, at his/her own expense, shall pay all taxes properly assessed against his/her equipment, materials, or property used or required in connection with the Work.

2.15 WARRANTY AND CORRECTIONS

A. Warranty

1. Warranty. The Contractor warrants to the City that: (i) materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by

the Contract Documents; (ii) the Work will be of good quality and free from defects; (iii) the Work will conform to the requirements of the Contract Documents; and (iv) Contractor will deliver the Project free of stop notice claims. Work not conforming to these requirements, **including substitutions not accepted by the City, will be deemed defective. The Contractor's** warranty excludes improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the City, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the correction obligation of Paragraph 2.04 herein.

2. Overlap. Where any warranties provided under the Contract Documents overlap, conflict, or are duplicative, Contractor will be bound by the more stringent requirements.
3. Procurement and Assignment of Warranties: Contractor shall obtain in the name of City, or **transfer or assign to City or City's designee prior to the time of Final Completion of the Work,** any and all warranties or guarantees which Contractor is required to obtain pursuant to the contract Documents and which Contractor obtained from any other person or entity other than Contractor including, but not limited to, Subcontractors and manufacturers, and further agrees to perform the Work in such a manner so as to preserve any and all such warranties. Contractor shall secure written warranties from all Subcontractors. Contractor and its Subcontractors shall offer any warranty upgrades or extensions that are offered by manufacturers of any equipment or system installed in the Work to the City. Contractor shall deliver to City all warranty and guarantee documents and policies.
4. Survival of Warranties: **The provisions of this paragraph 2.15 will survive Contractor's completion of the Work or termination of Contractor's performance of the Work.**

B. Correction of Work

1. Before or After Final Completion. The Contractor shall promptly correct Work rejected by **the City or City's designee, as failing to conform to the requirements of the Contract Documents,** whether discovered before or after Final Completion and whether or not fabricated, installed, or completed. Costs of correcting such rejected Work, including **additional testing, inspections, and compensation for the City's services and expenses made necessary thereby, will be at the Contractor's expense within the Contract Price.**
2. After Final Completion.
  - (a) **In addition to the Contractor's warranty obligations under Paragraph 2.15-A,** if, within one (1) year after the date of Final Completion of the Work or within the time period established by any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall commence correction or replacement of such Work within forty-eight (48) hours after receipt of written notice from the City to do so. The Contractor shall perform such corrective work without charge or cost to the City after Final Completion of the Work. The City shall give such notice promptly after discovery of the condition.
  - (b) If the Contractor fails to commence correction or replacement of non-conforming Work within forty-eight (48) hours after receipt of written notice, the City will proceed to have defects repaired or replaced at the expense of the Contractor and its Performance Bond surety, plus **fifteen percent (15%) for the City's overhead**

and administrative expense. The City may charge such costs against any payment due Contractor. If, in the opinion of the City, defective work creates a dangerous or hazardous condition or requires immediate correction or attention to prevent further loss to the City or to prevent interruption of operations of the City, the City may take immediate action, give notice, make such correction, or provide such attention and the cost of such correction or attention will be charged against the Contractor. Such action by the City will not relieve the Contractor of the warranties provided in this Article or elsewhere in the Contract Documents.

3. Replacement or Removal of Defective or Unauthorized Work. The Contractor shall remove from the Site and replace those portions of the Work which are not in accordance with the requirements of the Contract Documents in a manner acceptable to and as ordered by the Director. No compensation shall be allowed for such removal or replacement. Director shall have authority to cause defective work to be remedied, removed or replaced and to deduct the costs from monies due or to become due to the Contractor.
4. Destruction or Damage. In the event the Contractor destroys or damages any construction of the City or another contractor while correcting or removing Work which is not in accordance with the requirements of these Contract Documents, the Contractor shall bear the cost of repairing or reconstructing that other construction as well.
5. No Limitation. Nothing contained in Paragraph 2.15-B will be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Paragraph 2.15-B relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the limitations periods established by statute for any construction defect or other causes of action.

## 2.16 CLEANING AND ENVIRONMENTAL CONTROLS

The Contractor, Subcontractors and employees shall comply with all litter and pollution laws and it shall be the responsibility of the Contractor to ensure compliance. The Contractor shall do all of the following:

- A. Maintain the Site free of waste materials, debris, and rubbish and in a clean and orderly condition; and Remove waste materials, debris and rubbish from site and dispose off-site legally.
- B. The Contractor shall maintain at his/her disposal any and all equipment necessary to prevent and remediate any sanitary sewer overflow arising out of the Work. The Contractor shall furnish and operate a self-loading motor sweeper with spray nozzles, as directed by the Director, to maintain the affected **areas in a condition of cleanliness acceptable to the City at all locations affected by the Contractor's** operations. For purposes of this Paragraph, the affected areas include the project Site as well as all haul routes to and from the project Site and all areas of construction and restoration which have not been completed.
- C. The Contractor shall take appropriate action to ensure that no dust originates from the project Site.
- D. Any equipment or vehicles driven and/or operated within or adjacent to a street gutter, storm drain, runoff conveyance or ocean shall be checked and maintained daily to prevent leaks of materials that if introduced to water could be deleterious to aquatic life.
- E. No debris, soil, silt, sand, bark, trash, sawdust, rubbish, cement or concrete or washings thereof, oil or

petroleum products or other organic or earthen material from any construction, or associated activity or whatever nature shall be allowed to enter into or placed where same may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess materials or debris shall be removed from the Work area.

2.17 WATER POLLUTION CONTROL

- A. The Contractor shall meet all applicable City of Vernon, state and federal clean water laws, rules and regulations including but not limited to all conditions set forth in the Vernon Municipal Code Chapter 21, Article 5 regarding stormwater and urban runoff controls as it relates to public agency activities including, but not limited to storm and/or sanitary sewer system inspection and repair, street sweeping, trash pick-up and disposal, and street and right-of-way construction and repair are required to implement and maintain the activity specific Best Management Practices (BMPs) listed in Table 2-1 below in compliance with the National Pollutant Discharge Elimination System (NPDES) requirements. Contractor shall not discharge any water containing trash, debris, pollutants, fuels, oils, soaps or other non-allowable constituents from its sweeping vehicles upon any city street, to any storm drain or any non-permitted outlet. As part of its submission, contractor shall describe its methods for preventing NPDES violations during sweeping operations within the City. In addition, Contractor shall comply with all NPDES requirements at its maintenance facilities, storage yards and company facilities. Failure to comply with this section may result in termination for cause by the City of any contract resulting from this solicitation.

Table 2-1. BMPs for Public Agency Facilities and Activities

General and Activity Specific BMPs	
General BMPs	Scheduling and Planning
	Spill Prevention and Control
	Sanitary/Septic Waste Management
	Material Use
	Safer Alternative Products
	Vehicle/Equipment Cleaning, Fueling and Maintenance
	Illicit Connection Detection, Reporting and Removal
	Illegal Spill Discharge Control
	Maintenance Facility Housekeeping Practices
Flexible Pavement	Asphalt Cement Crack and Joint Grinding/ Sealing
	Asphalt Paving
	Structural Pavement Failure (Digouts) Pavement Grinding and Paving
	Emergency Pothole Repairs
	Sealing Operations
Rigid Pavement	Portland Cement Crack and Joint Sealing
	Mudjacking and Drilling
	Concrete Slab and Spall Repair
Slope/Drains/Vegetation	Shoulder Grading
	Nonlandscaped Chemical Vegetation Control
	Nonlandscaped Mechanical Vegetation Control/Mowing
	Nonlandscaped Tree and Shrub Pruning, Brush Chipping, Tree and Shrub Removal

	Fence Repair
	Drainage Ditch and Channel Maintenance
	Drain and Culvert Maintenance
	Curb and Sidewalk Repair
Litter/ Debris/ Graffiti	Sweeping Operations
	Litter and Debris Removal
	Emergency Response and Cleanup Practices
	Graffiti Removal
Landscaping	Chemical Vegetation Control
	Manual Vegetation Control
	Landscaped Mechanical Vegetation Control/ Mowing
	Landscaped Tree and Shrub Pruning, Brush Chipping, Tree and Shrub Removal
	Irrigation Line Repairs
	Irrigation (Watering), Potable and Nonpotable
Environmental	Storm Drain Stenciling
	Roadside Slope Inspection
	Roadside Stabilization
	Stormwater Treatment Devices
	Traction Sand Trap Devices
Bridges	Welding and Grinding
	Sandblasting, Wet Blast with Sand Injection and Hydroblasting
	Painting
	Bridge Repairs
Other Structures	Pump Station Cleaning
	Tube and Tunnel Maintenance and Repair
	Tow Truck Operations
	Toll Booth Lane Scrubbing Operations
Electrical	Sawcutting for Loop Installation
Traffic Guidance	Thermoplastic Striping and Marking
	Paint Striping and Marking
	Raised/ Recessed Pavement Marker Application and Removal
	Sign Repair and Maintenance
	Median Barrier and Guard Rail Repair
	Emergency Vehicle Energy Attenuation Repair
Storm Maintenance	Minor Slides and Slipouts Cleanup/ Repair
Management and Support	Building and Grounds Maintenance
	Storage of Hazardous Materials (Working Stock)
	Material Storage Control (Hazardous Waste)
	Outdoor Storage of Raw Materials
	Vehicle and Equipment Fueling
	Vehicle and Equipment Cleaning
	Vehicle and Equipment Maintenance and Repair
	Aboveground and Underground Tank Leak and Spill Control

B. Water Quality Protection Requirements for Construction Projects with Less than One (1) Acre of Disturbed Soil.

All construction projects, regardless of size, will be required to implement best management practices (BMPs) necessary to reduce pollutants to the Maximum Extent Practicable (MEP) to meet the minimum water quality protection requirements and implement all applicable set of BMPs as defined in Table 2-2.

Table 2-2 Minimum Water Quality Protection Requirements and Applicable Set of BMPs for All Construction Projects		
Category	Minimum Requirements	BMPs
1. Sediment Control	Sediments generated on the project site shall be retained using adequate Treatment Control or Structural BMPs.	Sediment Control
2. Non-Stormwater Management, Waste Management and Materials Pollution Control	Construction-related materials, wastes, spills or residues shall be retained at the project site to avoid discharge to streets, drainage facilities, receiving waters, or adjacent properties by wind or runoff. Non-storm water runoff from equipment and vehicle washing and any other activity shall be contained at the project sites.	Stormwater Management; Waste Management
3. Erosion Control	Erosion from slopes and channels shall be controlled by implementing an effective combination of BMPs, such as the limiting of grading scheduled during the wet season; inspecting graded areas during rain events; planting and maintenance of vegetation on slopes; and covering erosion susceptible slopes.	Erosion Control

Please refer to the California Stormwater Quality Association’s Construction Handbook (available on their website: [www.cabmphandbooks.com](http://www.cabmphandbooks.com)) for further information regarding the BMPs listed in Table 2-2.

All construction projects with Less than One (1) Acre of Disturbed Soil shall submit to the City a signed Statement of Intent to Comply with Minimum Requirements of the Stormwater Permit (Exhibit 5).

The Contractor may self-certify that the following training was completed on an annual basis providing they certify they have received all applicable training:

- The Contractor shall train all of their employees in targeted positions (whose interactions, jobs, and activities affect stormwater quality) on the requirements of the overall stormwater management program.
- When the Work includes the use or have the potential to use pesticides or fertilizers, the Contractor shall train all of their employees (whether or not they normally apply pesticides or fertilizers as part of their work). Training programs shall address:
  - 1) The potential for pesticide-related surface water toxicity
  - 2) Proper use, handling, and disposal of pesticides

- 3) Least toxic methods of pest prevention and control, including Integrated Pest Management
  - 4) Reduction of pesticide use
- C. Water Quality Protection Requirements for Construction Projects with One (1) Acre (or greater) of Disturbed Soil. In addition to the minimum BMPs required in Paragraphs A and B, all construction projects where at least one (1) acre of soil will be disturbed, construction activity that results in land surface disturbances of less than one acre if the activity is part of a larger common plan of development, or the sale of one or more acres of disturbed land surface requires a Construction Activities Storm Water General Permit (2009-0009-DWQ Permit).

Prior to commencement of construction activities, the Permit Registration Documents (PRDs) must be submitted electronically in the Storm Water Multi-Application Report Tracking System (SMARTS) (<http://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.jsp>). PRDs consist of the Notice of Intent, Risk Assessment, Post-Construction Calculations, a Site Map, the Storm Water Pollution Prevention Plan (SWPPP), a signed certification statement by the Legally Responsible Person (LRP), and the first annual fee.

See: [http://www.swrcb.ca.gov/water\\_issues/programs/stormwater/construction.shtml](http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml) for more information. A Waste Discharger Identification (WDID) will be emailed to the LRP after the PRDs have been submitted and are deemed complete. Construction activities cannot begin until a WDID is issued by the State Water Resources Control Board. Contractor shall bear the costs of any delays to the Project caused by a delay in obtaining its WDID.

The SWPPP shall include:

1. The name, location, period of construction, and a brief description of the project;
2. Contact information for the owner and contractor;
3. The building permit number for the project;
4. The grading permit number for the project (where applicable);
5. A list of major construction materials, wastes, and activities at the project site;
6. A list of best management practices to be used to control pollutant discharges from major construction materials, wastes, and activities;
7. A site plan (construction plans may be used) indicating the selection of BMPs and their location where appropriate;
8. Non-storm water discharges, their locations, and the BMPs necessary to prevent the discharge;
9. A maintenance and self-inspection schedule of the BMPs to determine the effectiveness and necessary repairs of the BMPs; and
10. A certification statement that all required and selected BMPs will be effectively implemented.

Within seven (7) days after the City awards the Contract, the Contractor shall submit seven (7) copies of the proposed SWPPP to the City. The City shall review the SWPPP within 14 days of receipt of the plan. If revisions are required, the Contractor shall revise and re-submit the document within seven (7) days of its receipt of the City's comments. **The City shall then have seven (7) days to consider the revisions made by the Contractor and approve the SWPPP.**

The Contractor shall maintain a minimum of two (2) readily accessible copies of the SWPPP at the Project site. The SWPPP shall be made available upon request of a representative of the Los Angeles Regional Water Quality Control Board (LARWQCB) or the U.S. Environmental Protection

Agency (U.S. EPA). Requests by environmental groups and the public shall be directed to the City.

D. Best Management Practices

The objective of the SWPPP is to identify potential sources of pollution that may reasonably affect the quality of storm water discharge associated with construction activities. The plan will describe and ensure the implementation of Best Management Practices (BMPs) which will be used to reduce pollutants in the storm water discharges from the construction site. A Best Management Practice is defined as any program, technology, process, operating method, measure, or device that controls, prevents, removes, or reduces pollution. The Contractor shall select appropriate BMPs from the California Stormwater BMP Handbook, Municipal, Industrial, New Development, and Construction Volumes ([www.cabmphandbooks.com](http://www.cabmphandbooks.com)) in conjunction with all activities and construction operations. Copies of the California Stormwater BMP Handbooks may be obtained from:

California Stormwater Quality Association  
P.O. Box 2313  
Livermore, CA 94551  
[www.cabmphandbooks.com](http://www.cabmphandbooks.com)

Cashier  
Los Angeles County DPW  
900 South Fremont Avenue  
Alhambra, CA 91803  
Tel. No. (626) 458-6959

E. Implementation

The Contractor will be responsible throughout the duration of the Project for the installation, monitoring, inspection and maintenance of the BMPs included in the SWPPP and for removing and disposing of temporary BMPs. The Contractor may be required to implement additional BMPs as a **result of changes in actual field conditions, contractor's activities, or construction operations.**

The Contractor shall demonstrate the ability and preparedness to fully deploy these SWPPP control measures to protect soil-disturbed areas of the project site before the onset of precipitation and shall maintain a detailed plan for the mobilization of sufficient labor and equipment to fully deploy these control measures.

Throughout the winter season, active soil-disturbed areas of the project site shall be fully protected at the end of each day with these control measures unless fair weather is predicted through the following day. The Contractor shall monitor daily weather forecasts. If precipitation is predicted prior to the end of the following workday, construction scheduling shall be modified, as required, and the Contractor shall deploy functioning control measures prior to the onset of the precipitation.

The City may order the suspension of construction operations which are creating water pollution if the Contractor fails to conform to the requirements of this Paragraph 2.17. Unless otherwise directed **by the City, the Contractor's responsibility for SWPPP implementation shall continue throughout any temporary suspension of the Work.**

F. **Sewage Spill Prevention. The Contractor's attention is directed to the sewer bypass operation required during any sewer construction pursuant to the 2012 edition of the "Greenbook" Standard Specifications for Public Works Construction, Section 500.1.2.4 or as that section is subsequently amended.**

The Contractor shall exercise extraordinary care to prevent the cause of events that may lead to a sewage spill. In the event of a sewage spill, the Contractor shall make arrangements for an emergency response unit comprised of emergency response equipment and trained personnel to be immediately dispatched to the project site.

The Contractor shall be fully responsible for preventing and containing sewage spills as well as recovering and properly disposing of raw sewage. In addition, the Contractor is responsible for any fines, penalties and liabilities arising from negligently causing a sewage spill. Any utility that is **damaged by the contractor shall be immediately repaired at the Contractor's expense.** The Contractor shall take all measures necessary to prevent further damage or service interruption and to contain and clean up the sewage spills.

G. Sewage Spill Telephone Notification

Should a sewage spill occur, the Contractor shall immediately report the incident to both of these two City Departments:

Sewer Maintenance Services .....City of Vernon Control Center (323) 826-1461

**Fire Department Dispatch Center ..... (323) 262-2111**

The Contractor is encouraged to obtain telephone numbers, pager numbers and cellular telephone numbers of City representatives such as Project Managers and Inspectors. However, if these City representatives are not available, then the Contractor shall immediately call:

**Mark Aumentado ..... (323) 855-1087**

H. Sewage Spill Written Notification

The Contractor shall prepare and submit a written report to the Director within three (3) Working Days from the occurrence of a spill to the City. This report shall describe all of the following:

1. The exact location on the Thomas Guide map.
2. The nature and volume.
3. The date, time and duration.
4. The cause.
5. The type of remedial and/or cleanup measures taken and date and time implemented.
6. The corrective and preventive action taken.
7. The water body impacted and results of necessary monitoring.

I. Enforcement

The City is subject to enforcement actions by the LARWQCB, U.S. EPA, environmental groups and private citizens. The Contractor shall indemnify, defend and hold City, its officers, agents and **employees harmless from Contractor's failure to comply and/or fulfill the requirements set forth in this Paragraph 2.17.** Contractor shall be responsible for all costs and liabilities imposed by law as result of **Contractor's failure to comply and/or fulfill the requirements set forth in this Paragraph 2.17.** The costs and liabilities include, but are not limited to fines, penalties and damages whether assessed against the City or the Contractor.

In addition to any remedy authorized by law, any money due to the Contractor under this contract shall be retained by the City until all costs and liabilities imposed by law against the City or Contractor have been satisfied.

J. Maintenance

The Contractor shall ensure the proper implementation and functioning of BMP control measures and shall regularly inspect and maintain the construction site for the BMPs identified in the SWPPP. The Contractor shall identify corrective actions and time frames in order to properly address any damaged measure, or reinstate any BMPs that have been discontinued.

If the City identifies a deficiency in the deployment or functioning of identified control measures, the deficiency shall be corrected by the Contractor immediately or by a later date and time if agreed to by Director and if requested in writing, but not later than the onset of the subsequent precipitation events. The correction of deficiencies shall be at no additional cost to the City.

K. Payment

All costs involved in the implementation of the SWPPP, including furnishing all labor, materials, tools, equipment and all incidentals; and for doing all the work involved in installing, constructing, maintaining, removing, and disposing of control measures, except those that were installed as a part of another structure, shall be included in the unit prices bid for the various related items of work and no additional compensation will be made therefor.

2.18 SOLID WASTE DISPOSAL AND DIVERSION

The Contractor shall submit to the Director the following summary of solid waste generated by the Work, disposed in Class III landfills, or diverted from disposal through recycling. Report disposal in inert fill separately. This form must be accompanied by legible copies of weight tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that are acceptable to the Director. Further, the documents must be submitted to the Director with each application for progress payment. Failure to submit the form and its supporting documentation will render the application for progress payment incomplete and delay progress payments.

SUMMARY OF SOLID WASTE DISPOSAL AND DIVERSION

Project Title: \_\_\_\_\_ Specification No. \_\_\_\_\_

Type of Material	(a) Disposed in Class III Landfills	(b) Diverted from Class III Landfills by	(c) [Leave This Column Blank]	(d) Disposed in Inert Fills
	Tons/CY	Tons/CY	Tons/CY	Tons/CY
Asphalt				
Concrete				
Metal				
Other Segregated Materials (Describe):				
Miscellaneous Construction Waste				
Total				

Form to be submitted to the City

SIGNATURE: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

2.19 RECYCLED, REUSABLE AND RECYCLABLE PRODUCTS

The Contractor is encouraged to propose recycled, reusable and recyclable products for use by the City. Those items should be clearly identified. The City may require further information or documentation to ascertain the suitability/appropriateness of a proposed product.

[END OF ARTICLE]

## ARTICLE 3 - TIME OF COMMENCEMENT AND COMPLETION

### 3.01 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK

#### A. Notice to Proceed

The Contractor is not authorized to perform any Work the Contract Documents until he/she has received from the City an official notification to commence Work. The date on which the notification is received by the Contractor is herein referred to as the Notice to Proceed. The Contractor shall commence Work on the Date of Commencement established in the Notice to Proceed is issued. The Notice to Proceed shall be issued after the Contract is properly executed, bonds are furnished and approved, and insurance has been submitted and approved.

#### B. Prosecution of the Work

Work shall be continued at all times with such force and equipment as will be sufficient to complete it within the specified time. The Contractor expressly proposes that he/she has taken into consideration and made allowances for all ordinary delays and hindrances to the Work to be performed and that he/she will complete the Work within the specified time.

#### C. Required Contract Completion

Time is of the essence in the completion of this Contract. The Work shall be completed in its entirety and made ready for service within three hundred fifty (350) calendar days following the Date of **Commencement established in the Notice to Proceed ("Contract Time")**. **By executing the Contract**, Contractor confirms that the Contract Time is a reasonable period for performing the Work.

### 3.02 CITY'S DISCRETION TO EXTEND CONTRACT TIME

In the event the Work required hereunder is not satisfactorily completed in all parts and in compliance with the Contract Documents, City shall have the right, in its sole discretion, to increase the number of Working Days or not, as may seem best to serve the interest of City. A change order extending the Contract Time only will be issued by the City should the City decide to increase the number of Working Days.

### 3.03 SUBSTANTIAL COMPLETION

#### A. Contractor Request for Inspection and Punch List

When the Contractor considers that it has achieved Substantial Completion of the Work, or designated portion thereof, Contractor shall prepare and submit to the Director a request for inspection and a comprehensive punch list of items to be completed or corrected prior to Final Payment. Failure to include an item on such punch list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

#### B. City Inspection

Upon receipt of the Contractor's punch list, the Director will make an inspection to determine whether the Work or designated portion thereof is Substantially Complete. If the inspection discloses any item, whether or not included on the Contractor's punch list, which is not sufficiently complete in accordance with the Contract Documents so that the City can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before City's issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by City.

The Contractor shall then submit a request for another inspection by City to determine Substantial Completion.

C. Certificate of Substantial Completion

When the Work or designated portion thereof is substantially complete, the Director will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the City and Contractor for security, maintenance, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall finish all items on the **Contractor's punch list** accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work. Contractor shall deliver to City all warranty and guarantee documents and policies.

3.04 DELAYS AND EXTENSIONS OF TIME FOR CONTRACTOR

- A. The Contractor shall take reasonable precautions to foresee and prevent delays to the Work. In the event of any delay to the Work, the Contractor shall revise his/her sequence of operations, to the extent possible under the terms of the Contract, to offset the delay.
- B. If any delay to the Work is caused by circumstances within the Contractor's control, it is not excusable and not compensable, and the Contractor will not be entitled to any extension of time or to any other compensation for damages resulting directly or indirectly therefrom.
- C. If any delay having a direct effect on the Work is caused by circumstances beyond the control of the Contractor except for causes of delay specified in Paragraph 3.04-D., such delay may be excusable and may entitle the Contractor to an equivalent extension of time, but not to any other compensation. Excusable but not compensable causes include but are not limited to labor disputes, weather conditions unfavorable for prosecution of the Work, and force majeure.
- D. If any delay having a direct effect on the Work is caused by failure of the City to provide information as specified, or necessary instructions for carrying on the Work, or to provide the necessary right of way or site for installation, or failure of a utility to remove or relocate an existing facility such delay may be compensable and may entitle the Contractor to an equivalent extension of time, and to compensation for damages resulting directly from any of the causes of delay specified in this paragraph.
- E. The Contractor shall notify the Director in writing of any delay having a direct effect on the Work and the causes thereof within 15 days from the beginning of such delay.
- F. Any claim for an extension of time or for compensation for damages resulting from delay shall be made in writing to the Director not more than 30 days after the ending of such delay. The Contractor shall provide a written report evaluating the impact of the delay which shall include, at a minimum, all of the following:
  - 1. a narrative description of the delay and its impact on the critical path to Substantial Completion of the Work or a portion of the Work designated by City;
  - 2. a detailed breakdown of the Allowable Costs, if any, sought by Contractor due to the delay;
  - 3. the number of days of extension sought by Contractor as an adjustment to the Contract time;
  - 4. a statement that Contractor has complied with the requirements of the General Conditions for written notice of delays, along with the dates and copies of such notices;
  - 5. the measures taken by Contractor and Subcontractors to prevent or minimize the delay; and

6. **the Contactor's recommendations for reordering or re-sequencing** the Work to avoid or minimize further delay.

No extension of time or compensation for damages resulting from delay will be granted unless the delay affects the timely completion of the overall Work under the Contract or the timely completion of a portion of the Work for which a time of completion is specified.

- G. The Director will investigate the facts and ascertain the extent of the delay, and his/her findings thereon shall be final and conclusive.
- H. Failure of the Contractor to give written notice of a delay, or to submit or document a claim for an extension of time or for damages resulting from delay in the manner and within the times stated above shall constitute a waiver of all claims thereto.
- I. When a Contractor experiences two concurrent delays, one compensable and the other excusable, no compensation other than an extension of time will be allowed.
- J. An extension of time must be approved by the Director to be effective, but an extension of time whether with or without consent of the sureties, shall not release the sureties from their obligations, which shall remain in full force until the discharge of the Contract.

### 3.05 CLIMATIC CONDITIONS

- A. The Director may suspend the Work whenever weather conditions or conditions resulting from inclement weather are unfavorable for the prosecution of the Work. The delay caused by such suspension may entitle the Contractor to an extension of time but not to any other compensation.
- B. If the Contractor believes that Work should be suspended under this Paragraph 3.05, he/she may request such suspension. The delay caused by such suspension may entitle the Contractor to an extension of time but not to any other compensation.
- C. No extension of time will be granted for suspension of Work unless the suspension affects the timely completion of all Work under the Contract or the timely completion of a portion of the Work for which a time of completion is specified. Determination that the suspension for inclement weather conditions or conditions resulting from inclement weather affects timely completion and entitles the Contractor to an extension of time shall be made and agreed to in writing by the Director and the Contractor on each day that Work is suspended. In the event of failure to agree, the Contractor may protest under the provisions of Paragraph 7.07.
- D. If Work is suspended and an extension of time is granted under this Paragraph 3.05 the Contractor will be entitled to a one day extension of time for each day that he/she is unable to Work at least one-half of his/her current normal Work day; and if the Work is suspended at the regular starting time on any Work day and the Contractor's Workforce is dismissed as a result thereof, then he/she will be entitled to a one day extension of time whether or not conditions change thereafter and the major portion of the day is suitable for Work.

### 3.06 COMPLETION AND ACCEPTANCE

- A. Upon request by the Contractor, the Director shall conduct a final inspection of the Work. If, in the **Director's opinion, Final Completion has been achieved, the Director will accept the Work by issuing a "Notice of Completion" of the Work to the Contractor.** Upon the issuance of the Notice of Completion the Contractor will be relieved from responsibility to protect the Work.
- B. Within 15 calendar days after issuing the Notice of Completion, the Director will record the Notice of Completion with the County Recorder.

3.07 LIQUIDATED DAMAGES

- A. Contractor and City agree to liquidate damages in the amount of one thousand dollars (\$1,000.00) per day, with respect to Contractor's failure to achieve Substantial Completion of the Work within the Contract Time. The Parties intend for the liquidated damages set forth herein to apply to this Contract as set forth in Government Code Section 53069.85. The Contractor acknowledges and agrees that the liquidated damages are intended to compensate City solely for the Contractor's failure to meet the deadline for Substantial Completion and shall not excuse Contractor from liability from any other breach, including any failure of the Work to conform to the requirements of the Contract Documents.
- B. In the event that Contractor fails to achieve Substantial Completion of the Work within the Contract Time, Contractor agrees to pay City the amount specified in the Contract form for each calendar day that Substantial Completion is delayed.
- C. Contractor and City acknowledge and agree that the foregoing liquidated damages have been set based on an evaluation of damages that the City will incur in the event of late completion of the Work. Contractor and City acknowledge and agree that the amount of such damages are impossible to ascertain as of the effective date hereof and have agreed to such liquidated damages to fix City's damages and to avoid later disputes. It is understood and agreed by Contractor that liquidated damages payable pursuant to this Agreement are not a penalty and that such amount are not manifestly unreasonable under the circumstances existing as of the effective date of this Agreement.
- D. It is further mutually agreed that City shall have the right to deduct liquidated damages against progress payments or retainage and that the City will issue a Construction Change Directive and reduce the Contract Sum accordingly. In the event the remaining unpaid Contract Sum is insufficient to cover the full amount of liquidated damages. Contractor shall pay the difference to City.

[END OF ARTICLE]

## ARTICLE 4 - CONSTRUCTION SCHEDULES

### 4.01 BASELINE PROJECT SCHEDULE

The Contractor shall submit his/her work Baseline Project Schedule, in electronic as well as hard-copy format, to the Director at the pre-construction meeting showing in detail how the Contractor plans to execute and coordinate the Work. The construction schedule shall show the sequence of work, critical path and estimated time for completion of each segment of work. This schedule must be reviewed and accepted by the Director before the Contractor will be permitted to begin work. In addition, the Contractor shall submit a detailed schedule **forecasting two (2) weeks of work describing each day's work. This schedule shall be updated and submitted to the City every other Monday during the construction period.** The Contractor shall give 48 hours notice to the City Engineer prior to the start of the work.

#### A. Format

1. At a minimum, the Baseline Project Schedule activities shall be coded on a work discipline basis and by geographic area or location on the Project. The Baseline Project Schedule shall include a detailed description of each activity code. The Baseline Project Schedule shall be based on and incorporate contract milestone and completion dates specified in the Contract Documents. It shall depict events, jobs, and their interrelationships and shall recognize the progress that must be made on one task before subsequent tasks can begin. The schedule shall be comprehensive and shall include all logical interdependencies and interactions required to perform the Work of the Project.
2. Overall time of completion and time of completion for each milestone shown on the Schedule shall adhere to the specified Contract Time, unless an earlier (advanced) time of completion is requested by Contractor, agreed to by the City and formalized by Change Order.
3. Contractor shall use the latest version of Microsoft Project or equivalent software agreed to by the parties.
4. The City will review the submitted Baseline Project Schedule for conformance with these scheduling requirements. Within fourteen (14) calendar days after receipt, the City will accept the proposed Baseline Project Schedule or will return it with comments. If the proposed Baseline Project Schedule is accepted by the City, it shall be deemed part of the Contract Documents. If the Baseline Project Schedule is not accepted by City, Contractor shall revise the Baseline Project Schedule, in accordance with the recommendations of the City, and re-submit same for acceptance, no later than seven (7) calendar days after receipt of said recommendation.
5. Acceptance of Baseline Project Schedule by City, failure to include an element of work, or inaccuracy in Baseline Project Schedule shall not relieve Contractor from the responsibility for accomplishing the Work in accordance with the Contract Documents.

#### B. Float

1. Critical Work activities are defined as Work activities which, if delayed or extended, will delay the scheduled completion of the milestones and/or time of completion. All other Work activities are defined as non-critical Work activities and are considered to have float. Float is defined as the time that a non-critical Work activity can be delayed or extended without delaying the scheduled completion of the milestones and/or time of completion. Float is considered a Project resource available to either party or both parties as needed. Once identified, Contractor shall monitor, account for, and maintain float in accordance with Critical Path Methodology.

2. Delays of any non-critical Work shall not be the basis for an extension of Contract Time until the delays consume all float associated with that non-critical Work activity and cause the Work activity to become critical.
  3. It is acknowledged that City-caused time savings (i.e., critical path submittal reviews returned in less time than allowed by the Contract Documents, approval of substitution requests which result in a savings of time for Contractor, etc.) create shared float. Accordingly, City-caused delays may be offset by City-caused time savings.
- C. Weather (This section applies only to projects of one (1) year duration or longer)

The completion time contemplated by this Contract anticipates zero lost days (Work Days) due to normal weather conditions annually and prorated for any duration less than twelve months. Only unusual or extreme weather conditions, as determined by the National Oceanic and Atmospheric Administration, for the time of year will be considered as justification for an extension of time to complete the Project, and only after the zero weather days have been utilized. Annual weather days are not cumulative, and unused days shall **become "float" for the benefit of the project, and the schedule** adjusted accordingly. The use of weather days by the Contractor shall be subject to all the conditions of claim for an extension of time. The Contractor shall notify the City in writing within ten (10) days of the commencement of each rain event.

D. Early Completion

While the Contractor may schedule completion of the Project earlier than the date established by the Contract Documents, no additional compensation shall become due the Contractor for the use of float **time between the Contractor's projected early completion date and the date for Substantial Completion** established by the Contract Documents, unless an earlier (advanced) time of completion is requested by Contractor, agreed to by the City, and formalized by Change Order.

#### 4.02 SCHEDULE UPDATES

- A. With each Application for Payment submitted by Contractor (other than the final Application for Payment), the Contractor shall submit to the City an updated Project Schedule revised to indicate the Work completed, status of Work in progress, all progress slippages, corrective actions taken, or slippage carry-over, for all anticipated delays or difficulties, and all other information required to accurately present the actual status of the progress of the Work as of the date of the Application for Payment. If the Contractor does not submit an updated Project Schedule with an Application for Payment, City may withhold payment, in whole or in part, until the updated Project Schedule is submitted. In the event that an update to the Project Schedule indicates a delay to the Contract Time the Contractor shall propose an affirmative plan to correct each such delay, including overtime and/or additional labor, if necessary. In no event shall any Project Schedule update constitute an adjustment in the Contract Time, any deadline, or the Contract Sum unless any such adjustment is agreed to by the City and authorized pursuant to Change Order or Work Directive.
- B. At no time shall historical data contained within the updated Project Schedule (i.e. completed activities) be removed and/or altered in any way. This historical data is to be preserved within each of the updated Project Schedules and submitted with the final schedule update to reflect the actual start and finish dates for each activity within the Schedule.
- C. Any work stoppages within individual work activities that exceed seven (7) calendar days in duration shall be clearly indicated within the updated Project Schedule. In cases where unplanned activity work

stoppages exceed seven (7) calendar days activities shall be added to the Project Schedule to clearly indicate the work stoppage period and identify forecasted resumption and completion of the activity where work has stopped. Contractor shall clearly note all schedule revisions when Project Schedule updates are submitted, as required in this Paragraph 4.02 above.

#### 4.03 NONCOMPENSABLE EXTRAORDINARY MEASURES

- A. Should the City determine, in its sole judgment, that the performance of the Work has not progressed to the level of completion required by the Contract Documents, City shall have the right to order the Contractor to take corrective measures to expedite the progress of construction, at no additional cost to the City, including, without limitation, the following:
1. Working additional shifts of overtime.
  2. Supplying additional manpower, equipment, and/or facilities.
  3. Reschedule activities to maximize practical concurrence of accomplishment of activities.
  4. Submitting a Recovery Schedule discussed above, for resequencing performance of the Work or other similar measures.
  5. Any other actions that may be necessary to mitigate delays.
- B. Such Extraordinary Measures shall continue until the progress of the Work is no longer behind schedule and/or reaches the stage of completion required by the Contract Documents. Contractor shall not be entitled to an adjustment in the Contract Sum in connection with the performance of any such Extraordinary Measures required by the City under this Paragraph. The City may exercise the rights furnished the City pursuant to this Paragraph as frequently as the City deems necessary to ensure that the Contractor's performance of the Work will comply with the Contract Time or interim completion dates set forth in the Contract Documents. If Contractor or its Subcontractors fail to implement or commence Extraordinary Measures within ten (10) calendar days of City's written demand, City may, without prejudice to other remedies, take corrective action at the expense of the Contractor which shall reduce the Contract Sum accordingly.

#### 4.04 CONDITION OF PAYMENT

Compliance by Contractor with the requirements of the Contract Documents pertaining to preparation, **submission, revising and updating of the Schedule is a condition precedent to City's obligation to make payment** to Contractor of any or all sums that might otherwise be due to Contractor in the absence of such noncompliance. Payment by City under circumstances in which City, for any reason, fails or elects not to assert its right to withhold payment for noncompliance with this Paragraph shall not be construed as a waiver of the right to withhold future payments on account of such noncompliance or any other noncompliance.

[END OF ARTICLE]

## ARTICLE 5 - SUSPENSION OR TERMINATION OF CONTRACT

### 5.01 TERMINATION BY THE CONTRACTOR

- A. Contractor shall have the right to terminate its performance of the Contract only upon the occurrence of one of the following:
1. The Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor, any Subcontractor, Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, due to:
    - a. the issuance of an order of a court or other public authority having jurisdiction; or
    - b. an act of government, such as a declaration of national emergency making material unavailable;and Contractor has given City written notice within ten (10) days of the occurrence of such ground for termination, then the Contractor may, upon thirty (30) additional calendar days written notice to City, unless the reason has theretofore been cured, terminate its performance of the Work.
  2. The Work is stopped for a period of 120 consecutive days through no act or fault of Contractor, any Subcontractor, Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, because the City has persistently failed to perform any material obligation under the Contract Documents and fails to cure such default within ninety (90) days after the receipt of notice from Contractor stating the nature of such default.
- B. If Contractor terminates its performance of the Contract in accordance with this Paragraph 5.01, the City shall pay Contractor for the Work executed through the date of termination as set forth in Paragraph 5.04-C below.

### 5.02 TERMINATION BY THE CITY FOR CAUSE

- A. Grounds

**The City shall have the right to terminate the Contractor's performance of the Contract, in whole or in part, without liability to City if:**

1. Contractor fails promptly to begin the Work under the Contract Documents; or
2. Contractor refuses or fails to supply enough properly skilled workers or proper materials; or
3. Contractor fails to perform the Work in accordance with the Contract Documents, including conforming to applicable standards set forth therein in constructing the Project, or refuses to remove and replace rejected materials or unacceptable Work; or
4. Contractor discontinues the prosecution of the Work (exclusive of work stoppage: (a) due to termination by City; or (b) due to and during the continuance of a Force Majeure event or suspension by City); or

5. Contractor fails to resume performance of Work which has been suspended or stopped, within a reasonable time after receipt of notice from City to do so or (if applicable) after cessation of the event preventing performance; or
6. Any representation or warranty made by Contractor in the Contract Documents or any certificate, schedule, instrument, or other document delivered by Contractor pursuant to the Contract Documents shall have been false or materially misleading when made; or
7. Contractor fails to make payment to Subcontractors or Material Suppliers for materials or labor in accordance with the respective Contract Documents and applicable law; or
8. Contractor disregards laws, ordinances, or rules, regulations, or orders of a public authority having jurisdiction; or
9. Contractor is guilty of breach of a provision of the Contract Documents; or
10. Contractor becomes insolvent, is adjudicated bankrupt, or makes a general assignment for the **benefit of creditors and fails to provide City with adequate assurances of Contractor's ability to satisfy its contractual obligations.**

A receiver, trustee, or other judicial officer shall not have any right, title, or interest in or to the Contract. **Upon that person's appointment, City has, at its option and sole discretion, the right to immediately cancel the Contract and declare it null and void.**

**B. City's Rights.**

When any of the reasons specified in Paragraph 5.02-A exist, the City may, in addition to and without prejudice to any other rights or remedies of the City, and after giving the Contractor five (5) calendar **days written notice, terminate Contractor's performance of the Work, in whole or in part, and may:**

1. Take possession of the site and all materials, equipment, tools, construction equipment, and machinery thereon owned by the Contractor;
2. Withhold from Contractor amounts unpaid hereunder and to offset such amounts against damages or losses incurred by City;
3. Accept assignment of subcontracts from Contractor, at the sole discretion of City, and
4. Finish the Work by whatever reasonable method the City may deem expedient.

Upon request of the Contractor, the City shall furnish to the Contractor a detailed accounting of the costs incurred by the City in finishing the Work.

**C. Costs**

**If City's costs to complete and damages incurred due to Contractor's default exceed the unpaid Contract balance, the Contractor shall pay the difference to the City.**

**D. Wrongful Termination**

If it has been adjudicated or otherwise determined that City has wrongfully terminated the Contractor

for cause, then said termination shall be deemed converted to a termination for convenience as set forth in Paragraph 5.04 and **Contractor's remedy for wrongful termination in such event shall be limited** to the recovery of the payments permitted for termination for convenience as set forth in Paragraph 5.04.

5.03 PARTIAL DELETION OR SUSPENSION OF WORK BY THE CITY

- A. Contractor agrees that the City may determine whether any or all of the Work described in the Contract **Documents shall be deleted or performance suspended without electing to terminate the Contractor's** performance under the Contract and without any penalty being incurred by the City.
- B. Any such partial deletion or suspension of the Work shall in no way void or invalidate the Contract nor shall it provide Contractor with any basis for seeking payment from City for Work deleted or suspended except to the extent such Work has already been performed and is otherwise compensable under the Contract.
- C. The City shall have the right to later have any such suspended or deleted Work performed by Contractor or others without any penalty to the City.
- D. In the event of any partial or complete deletion or suspension of Work, the City shall furnish Contractor with prompt written notice thereof, and the City shall be entitled to take possession of and have as its property all Record Documents, Accounting Records, and other data prepared by Contractor or its Subcontractors.
- E. Suspension for Convenience.
  - 1. The City may at any time and from time to time, without cause, order the Contractor, in writing, to suspend, delay, or interrupt the Work in whole or in part for such period of time as the City may determine. **Such order shall be specifically identified as a "Work Suspension Directive" under this Section.**
  - 2. **Upon receipt of a Work Suspension Directive, Contractor shall, at the City's expense, comply with** its terms and take all reasonable steps to minimize costs allocable to the Work covered by the Work Suspension Directive during the period of Work stoppage.
  - 3. Within the period of suspension, or such extension to that period as is agreed upon by Contractor and the City, the City shall either cancel the Work Suspension Directive or delete the Work covered by such Work Suspension Directive by issuing a Change Order or Construction Change Directive.
  - 4. If a Work Suspension Directive is cancelled or expires, Contractor shall continue the Work. A Change Order or Construction Change Directive will be issued to cover any adjustments of the Contract Sum and Contract Time necessarily caused by such suspension. No adjustment shall be made to the extent:
    - (a) That performance is, was, or would have been so suspended, delayed, or interrupted by another cause for which the Contractor is responsible; or
    - (b) That an equitable adjustment is made or denied under another provision of the Contract.
- F. Suspensions for Cause

City has the authority by written order to suspend the Work, in whole or in part, without liability to City

**for Contractor's failure to:**

1. Correct conditions unsafe for the Project personnel or general public, or
2. Carry out the Contract; or
3. Carry out orders of City.

G. Responsibilities of Contractor During Suspension Periods

During periods that Work is suspended, Contractor shall continue to be responsible for the Work and shall prevent damage or injury to the Project, provide for drainage, and shall erect necessary temporary structures, signs or other facilities required to maintain the Project and continue to perform according to the Contract Documents.

5.04 TERMINATION BY THE CITY FOR CONVENIENCE

A. Grounds

Without limiting any rights which City may have by reason of any default by Contractor hereunder, City **may terminate Contractor's performance of the Contract, in whole or in part, at any time, for convenience upon fifteen (15) calendar days written notice to Contractor.**

B. Contractor Actions

Upon receipt of such notice, Contractor shall perform the duties required by Paragraph 5.05 below. At the election of and as directed by the City, any or all of the subcontracts and purchase orders entered in to by Contractor prior to the effective date of termination shall be terminated or shall be assigned to City.

C. Compensation

1. If the Parties are unable to agree on the amount of a termination settlement, the City shall pay the Contractor the following amounts:
  - a. For Work performed before the effective date of termination, the total (without duplication of any items) of:
    - i. The cost of the Work; and
    - ii. A sum, as overhead and profit on the cost of the Work, determined by the City to be fair and reasonable. In no event shall Contractor be entitled to recover overhead or profit on Work not performed.
  - b. The reasonable costs of settlement of the Work terminated, including:
    - i. Accounting, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data, if any; and
    - ii. Storage, transportation, and other costs reasonably necessary for the preservation, protection, or disposition of inventory.

2. **Such payment shall be Contractor's exclusive remedy for termination for convenience and will be due and payable on the same conditions as set forth for final payment to the extent applicable. Upon receipt of such payment, the Contractor and City shall have no further obligations to each other except for Contractor's obligations with respect to warranties, representations, indemnity, maintenance of insurance, and other obligations that survive termination or Final Completion as provided for herein.**
3. It is understood and agreed that no fee, anticipated profit, compensation for lost opportunity costs, or other compensation or payment of any kind or character shall be due or payable for unperformed Work regardless of the basis of termination and the inclusion of this provision within this subparagraph shall in no way limit its application to termination under this Paragraph.
4. Contractor agrees that each of its subcontracts will reserve for the Contractor the same right of termination for convenience provided by this Paragraph 5.04.

D. No Consequential Damages

Under no circumstances shall Contractor be entitled to anticipatory or unearned profits or consequential or other damages as a result of a termination or partial termination under this Article 5. The payment to Contractor determined in accordance with this Article constitutes Contractor's exclusive remedy for a termination hereunder.

5.05 CONTRACTOR'S DUTIES UPON TERMINATION FOR CAUSE OR CONVENIENCE

**If the City terminates Contractor's performance of Work under the Contract, for cause or convenience or if Contractor terminates a Subcontractor with the City's approval, Contractor shall:**

- (1) cease performance of the Work to the extent specified in the notice;
- (2) take actions necessary or that the City may direct, for the protection and preservation of the Work;
- (3) settle outstanding liabilities, as directed by City;
- (4) transfer title and deliver to City Work in progress, specialized equipment necessary to perform the Work;
- (5) submit all Record Documents, Accounting Records and other data prepared pursuant to the Contract by Contractor and/or its Subcontractors, as applicable, to the City with fifteen (15) calendar days **after the City's** notice of termination in an organized, usable form, in both hard copy and electronic/digital form, with all items properly labeled to the degree of detail specified by the City; and,
- (6) except for Work directed by City to be performed prior to the effective date of termination stated in the notice, incur no further costs or expenses and enter into no further subcontracts and purchase orders.

No compensation shall be due Contractor, if any, until Contractor complies with the requirements of this Paragraph.

[END OF ARTICLE]

## ARTICLE 6 – CHANGES

### 6.01 CITY'S RIGHT TO ORDER CHANGES

The City, without invalidating the Contract, may authorize changes in the Work consisting of additions, deletions, or other revisions, with the Contract Sum and Contract Time being adjusted accordingly, if necessary. All such changes in the Work shall be authorized by Change Order or Construction Change Directive and Contractor shall perform such changes in the Work according to the applicable requirements of the Contract Documents.

### 6.02 APPLICABLE PROVISIONS

Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly and diligently with the change, unless otherwise provided in the Change Order or Construction Change Directive. It is of the essence to this Contract that all scope changes in the Work that form the basis of an adjustment of the Contract Sum or Contract Time must be authorized in advance in writing through either a Change Order or Construction Change Directive. A change in the Contract Sum or the Contract Time shall be accomplished only by Change Order or Construction Change Directive. Accordingly, no verbal directions, course of conduct or dealings between the Parties, express or implied acceptance of alterations or additions to the Work, or claim that the Contract has been abandoned or the City has been unjustly enriched by any alteration or addition to the Work shall be the basis of any claim for an increase in any amounts due under the Contract Documents or a change in any time period provided in the Contract Documents.

### 6.03 NOTICE OF SCOPE CHANGE

Contractor shall submit written notice of any change in **scope to the Director if, in the Contractor's opinion**, any instruction, request, Drawings, Specifications, action, condition, omission, default, or other situation occurs that the Contractor believes constitutes a scope change or other matter resulting in Extra Work, for which Contractor believes it is entitled to an adjustment of the Contract Sum or Contract Time. Such notice shall be provided prior to performance of the Work affected by such occurrence and within seven (7) calendar days after the discovery date of the circumstances of such scope change or other matters. The written notice shall state the date, circumstances, extent of adjustment to the Contract Sum or the Contract Time, if any, requested. The mere presentation of such notice shall not establish the existence of any right by Contractor to adjustment of the Contract Sum or Contract Time. Failure to provide such timely written notice described herein shall constitute a waiver by Contractor of the right to any adjustment to the Contract Sum or Contract Time on account thereof.

### 6.04 CHANGE ORDERS

#### A. Computation

Methods used in determining adjustments to the Contract Sum by Change Order may include those listed in Paragraph 6.06 below.

#### B. Accord and Satisfaction

Agreement on any Change Order shall be a full compromise and settlement of all adjustments to Contract Time and Contract Sum, and compensation for any and all delay, extended or additional field and home office overhead, disruption, acceleration, inefficiencies, lost labor or equipment productivity, differing Site conditions, construction interferences and other extraordinary or

consequential damages (hereinafter called "Impacts"), including any ripple or cumulative effects of said Impacts on the overall Work under the Contract arising directly or indirectly from the performance of Work described in the Change Order. By execution of any Change Order, Contractor agrees that the Change Order constitutes a complete accord and satisfaction with respect to all claims for schedule extension, Impacts, or any costs of whatever nature, character or kind arising out of or incidental to the Change Order. No action, conduct, omission, product failure or course of dealing by the City shall act to waive, modify, change, or alter the requirement that (i) Change Order's must be in writing, signed by the City and Contractor and; (ii) that such written Change Orders are the exclusive method for effectuating any change to the Contract Sum and/or Contract Time.

#### 6.05 CONSTRUCTION CHANGE DIRECTIVE (FIELD DIRECTIVE)

- A. A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order. The City may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletion, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.
- B. If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be calculated in accordance with Paragraph 6.06 herein (Pricing Changes in the Work).
- C. Upon receipt of the Construction Change Directive, the Contractor shall promptly proceed with the **change in the Work involved and advise the City of the Contractor's agreement** or disagreement with the method, if any, provided in the Construction Change Directive, for determining the proposed adjustment in the Contract Sum or Contract Time.
- D. If Contractor believes a Construction Change Directive constitutes a basis for adjustment to the Contract Sum or Contract Time, then Contractor shall give a Notice of Scope Change provided in Paragraph 6.03, followed by a submission of a Change Order Request as required by Paragraph 6.08. Contractor shall, if requested by City in such Construction Change Directive or in a subsequent Construction Change Directive, proceed with the performance of the Work as described in the Construction Change Directive. Failure of Contractor to proceed with the performance of Work, as described in the Construction Change Directive shall give the City the right to carry out the Work, as set forth in Paragraph 2.05.
- E. **A Construction Change Directive signed by the Contractor indicates the Contractor's agreement** therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.
- F. If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the City on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, Allowable Mark-Ups in accordance with Paragraph 6.06(E) herein.

#### 6.06 PRICING CHANGES IN THE WORK

- A. Alternative Methods of Pricing

The amount of any adjustment by Change Order or Construction Change Directive increasing or decreasing the Contract Sum shall be determined by the Director using one or a combination of the following methods:

1. Lump Sum. By mutual acceptance of a lump sum proposal from Contractor properly itemized and supported by sufficient substantiating data to permit evaluation. Such proposal shall be based solely on Allowable Costs, as defined in Subparagraph 6.06-C, and Allowable Mark-Ups, as defined in Subparagraph 6.06-E, and shall not include any costs or expense that is not permitted by the terms of any provision of the Contract Documents.
2. Unit Prices. By unit prices **contained in Contractor's original Bid and incorporated in the Contract Documents** or fixed by subsequent agreement between City and Contractor. Unless otherwise stated in the Bidding Documents, unit prices stated in the Contract Documents or agreed upon by the County and Contractor shall be deemed to include and encompass all Allowable Markups.
3. Time and Materials. By calculating the actual Allowable Costs directly incurred, plus a sum for Allowable Mark-Ups on such Allowable Costs.
4. Deletion of Work. By **Unit Prices contained in Contractor's original Bid and incorporated in the Contract Documents**, or by using the Schedule of Values to determine the value of the decrease of the Contract Sum, less the value of any Work performed, plus a reasonable percentage of **the decrease for the Contractor's saved overhead unless the Schedule of Values allocates** general conditions costs to individual line items, in which case no percentage of the decrease shall be added. When a change consists of both addition and deletion of Work, the added costs and deleted costs shall be calculated separately, and then added together, resulting in the net cost for the change. The Allowable Mark-Up shall be applied to this net cost.

B. Contractor Maintenance of Daily Records for Changes

1. In the event that Contractor is directed to perform any Extra Work, or should Contractor encounter conditions which the Contractor believes would obligate the City to adjust the Contract Sum and/or the Contract Time, Contractor shall maintain detailed records of the cost of such changes on a daily basis summarized in a daily report supplemented by back-up records. Such records shall include without limitation:
  - a. Labor. At the close of each day on which such Extra Work is performed, Contractor shall submit an Extra Work labor report, on forms provided by Director, to Director that sets forth a list of the actual hours spent in performing the Extra Work, that clearly differentiates between the labor expended on the Extra Work and other Work, and the Allowable Costs for such Extra Work performed that day showing the names of workers, their classifications, hours worked and hourly rates.
  - b. Materials, Equipment. A list of Allowable Costs of materials and equipment consumed in the performance of the Extra Work on the day on which such Extra Work is performed, together with copies of applicable delivery tickets and unit prices for all materials and for all equipment used the type of equipment, identification number, hours of operation (including loading and transportation) and hourly/daily rates involved for that day.
  - c. Other Services or Expenditures. A list of other services and expenditures constituting Allowable Costs incurred in performance of the Extra Work on the day on which such Extra Work is performed, along with documentation verifying the amounts thereof in such detail as Director may require.

2. In the event that more than one change to the Work is performed by the Contractor in a calendar day, Contractor shall maintain separate records of labor, construction equipment, materials, and equipment for each such change. In the event that any Subcontractor of any tier shall provide or perform any portion of any change to the Work, Contractor shall require that each such Subcontractor maintain records in accordance with this Section.
3. Each daily record maintained hereunder shall be signed by Contractor; such signature shall be **deemed Contractor's representation and warranty that all information contained therein is true**, accurate, complete, and relates only to the change referenced therein. All records maintained by Subcontractors of any tier, relating to the costs of a change in the Work shall be signed by **such Subcontractor's authorized project manager or superintendent**.

All such records shall be forwarded to the Director on the day the Work is performed (same day) for independent verification. The Director shall attempt to review and reconcile costs for changes on a daily basis. Records not available on the day on which the Extra Work is performed, such as, but not limited to, material invoices, shall be submitted as soon as they are available but not later than five (5) calendar days after the earlier of the day of delivery or incorporation of the particular item of Extra Work at the Site.

4. The Director may additionally require authentication of all time and material tickets and invoices by persons designated by the Director for such purpose. In the event that Contractor shall fail or refuse, for any reason, to maintain or make available for inspection, review, and/or reproduction such records, adjustments to the Contract Sum or Contract Time, if any, on account **of any change to the Work may be deemed waived for that day**. Contractor's obligation to maintain back-up records hereunder is in addition to, and not in lieu of, any other Contractor obligation under the Contract Documents with respect to changes to the Work.
5. Waiver by Contractor. Failure to submit such records as are required by this Paragraph daily shall waive any rights for recovery of Allowable Costs incurred for Extra Work performed that day. The failure of the Contractor to secure any required authentication shall, if the City elects in its sole discretion to treat it as such, constitute a waiver by the Contractor of any right to adjustment of the Contract Sum for the Allowable Cost of all or that portion of the Extra Work covered by such non-authenticated ticket or invoice.

C. Allowable Costs

**The term "Allowable Costs" shall mean in the case of Extra Work actual costs incurred by Contractor and/or any Subcontractor, regardless of tier, and necessarily involved in direct performance of the Extra Work, or in the case of deleted work the actual costs that would have been incurred in performing deleted work by Contractor and/or any Subcontractor, regardless of tier, and shall be limited to the following costs:**

1. Labor. Straight-time wages or salaries, and overtime wages and salaries specifically authorized by City in writing, for employees employed at the site, or at fabrication sites off the site, in the direct performance of the Extra Work or that would have been incurred in the direct performance of the deleted work, based on the actual cost for wages prevailing locally for each craft or type of workers at the time the Extra Work is done or the deleted work is ordered eliminated. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental. The use of labor classification which would increase the Allowable Cost for Extra Work will not be permitted unless Contractor establishes the necessity for such additional costs.

2. Benefits. Payroll taxes, insurance, health and welfare, pension, vacation, apprenticeship funds and benefits required by lawful collective bargaining agreements for employees on straight-time wages or salaries, and on overtime wages and salaries specifically authorized by City in writing, for employees employed at the site, or at fabrication sites off the site, in the direct performance of the Extra Work or that would have been incurred in the direct performance of the deleted work.
3. Materials, Consumables. Costs of materials and consumable items which are furnished and incorporated into the Work, as approved by City, or that would have been incorporated into the Work in the case of deleted work shall be at the lowest price available to Contractor but in no event shall such costs exceed competitive wholesale prices obtainable from other Subcontractors, suppliers, manufacturers and distributors in the general vicinity of the site. If City determines, in its discretion, that the cost of materials is excessive, or if Contractor fails to furnish satisfactory evidence of the cost from the actual supplier thereof, then in either case the cost of the materials shall be deemed to be the lowest wholesale price at which similar materials are available in the quantities required at the time they were needed. The City reserves the right to furnish such materials as it deems advisable, and Contractor shall have no claim for costs or profits on materials so furnished. Material invoices must be included with the extra work report to obtain payment.
4. Taxes. Sales taxes on the costs of materials and consumable items described in Paragraph 5.04-C.3 above.
5. Tool, Equipment Rental. Rental charges for necessary machinery and equipment, whether owned or hired, as authorized in writing by City, exclusive of hand tools, used directly in the performance of the Extra Work or that would have been used in the direct performance of the deleted work. Regardless of ownership, such rental charges shall not exceed the hourly rate **derived from the most recently published "Rental Rate Blue Book for Construction Equipment" or the "Rental Rate Blue Book for Older Construction Equipment," as published by K-111, San Jose, California, which is in effect at the time of commencement of the changed work.** The Contractor shall attach a copy of the rate schedule to the daily reports required by Paragraph 6.06-B, above. The charges for any machinery and equipment shall cease when the use thereof is no longer necessary for the Extra Work or deleted work. No charge shall be allowed for use of equipment or tools which have a replacement value of \$500 or less. The allowable rental rates shall include the cost of fuel, power oil, lubrication, supplies, small tools, necessary attachments, loading, transportation, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals. Notwithstanding the provisions of Paragraph 6.06-E below, no mark-up shall be allowed for overhead, profit or bond premiums for use of equipment if the equipment is supplied by an equipment rental firm. If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to City than holding it at the Site, it shall be returned, unless Contractor elects to keep it at the Site at no expense to City. Costs incurred while equipment is inoperative due to breakdowns, regular maintenance, or for non-Working Days shall not be allowed. The rental time shall include the time required to move the equipment to the Work from the nearest available source for rental of such equipment and to return it to the source. If such equipment is not moved by its own power, then loading and transportation will be allowed. Neither moving time nor loading and transportation costs will be paid if the equipment is for use on the Project unrelated to the Extra Work. All equipment shall be acceptable to City, in good working condition, and suitable for the purpose for which it is to be used.

6. Royalties. Additional or saved costs of royalties due to the performance of the Extra Work or deleted work.
7. Insurance, Bonds. Additional or saved costs of insurance and bonds, provided, however, that for Extra Work such costs shall not exceed one percent (1%) of Items 1 through 6 above.

D. Costs Not Allowed

Allowable Costs shall not include any of the following:

1. **Wages, salaries, fringe benefits and payroll taxes of Contractor's and all Subcontractor's non-craft labor (above a Foreman level);**
2. Overhead (including home office overhead), administrative or general expenses of any kind including engineering, estimating, scheduling, drafting, detailing, etc., incurred in connection with Extra Work;
3. Vehicles not dedicated solely for the performance of the extra of deleted work;
4. Small tools (replacement value not exceeding \$500);
5. Office expenses, including secretarial and administrative staff, materials and supplies;
6. On-site and off-site trailer and storage rental and expenses;
7. Site fencing;
8. Utilities, including gas, electric, sewer, water, telephone, telefax, copier equipment;
9. Computer and data processing personnel, equipment and software;
10. Federal, state or local business income and franchise taxes;
11. Losses of efficiency or productivity; and
12. Costs and expenses of any kind or item not specifically and expressly included in Paragraph 6.06-C.

E. Allowable Mark-Up

If the Net Cost of Extra Work is less than or equal to \$25,000, the Allowable Mark-Up shall be computed as follows:

- (a) For Extra Work performed directly by the **Contractor's forces, the added cost for all expenses of overhead, profit, bond and insurance ("Allowable Mark-Up") shall not exceed fifteen percent (15%) of the net cost of the Extra Work.**
- (b) For Extra Work performed by a Subcontractor, the added cost of combined expenses, Allowable Mark-Up for Contractor and all Subcontractor(s) shall not exceed twenty (20%) of **the net cost of all Subcontractor(s)'s Extra Work.**

1. If the net cost of Extra Work is greater than \$25,000 and less than or equal to \$100,000, the Allowable Mark-up shall be computed as follows:
  - (a) **For Extra Work performed directly by the Contractor's forces the added cost for Allowable Mark-Up shall not exceed twelve (12%) of the net cost of the Extra Work.**
  - (b) For Extra Work performed by a Subcontractor, the added cost of combined expenses for Allowable Mark-Up for Contractor and all Subcontractor(s) shall not exceed seventeen (17%) **of the net cost of all Subcontractor(s)'s Extra Work.**
2. If the net cost of Extra Work is greater than \$100,000, the Allowable Mark-up shall be computed as follows:
  - (a) **For Extra Work performed directly by the Contractor's forces the added cost for Allowable Mark-Up shall not exceed ten percent (10%) of the net cost of the Extra Work.**
  - (b) For Extra Work performed by a Subcontractor, the added cost of combined expenses for Allowable Mark-Up for Contractor and all Subcontractor(s) shall not exceed fifteen (15%) of **the net cost of all Subcontractor(s)'s Extra Work.**

F. Net Allowable Costs

If anyone scope change involves both Extra Work and deleted work in the same portion of the Work and the additive allowable costs exceed the deductive allowable costs, the Allowable Markups on the Extra Work will be only the difference between the two amounts.

6.07 CITY ORIGINATED REQUEST FOR ITEMIZED CHANGE ORDER PROPOSAL REQUEST

City may issue a Construction Change Directive or other written request to Contractor describing a proposed change to the Work and requesting the Contractor submit an itemized change order proposal in a format acceptable to City within ten (10) calendar days after City issues the request. The Contractor's change order proposal shall include an analysis of impacts to cost and time, if any, to perform additional work, change Work or delete Work, as applicable, including the effects and impacts, if any, on unchanged Work, estimates of costs (broken down by the cost categories listed in this Paragraph), and Contractor's proposed methods to minimize costs, delay, and disruption to the performance of the Work. If Contractor fails to submit a written change order proposal within such period of time, it shall be presumed that the change described in the City's original proposal request will not result in an increase to the Contract Sum or Contract Time and the change shall be performed by Contractor without additional compensation to Contractor. City's request for itemized change order proposal request does not authorize the Contractor to commence performance of the change. If City desires that the proposed change be performed, the Work shall be authorized according to the Change Order or Construction Change Directive procedures set forth herein.

6.08 CONTRACTOR ORIGINATED CHANGE ORDER REQUEST (COR)

If the Contractor believes that instructions issued by the City after the effective date of the Contract will result in changes to the Contract Sum or Contract Time or if the Contractor otherwise becomes aware of the need for or desirability of a change in the Work, Contractor may submit a written Change Order Request ("COR") to the City in writing, in a format acceptable to City and in accordance with the notice provisions and other requirements of Article 7 below for Claims. The COR must specify the reasons for the proposed change, cost impacts and relevant circumstances and impacts on the Construction Schedule. The document shall be complete in its description of the Work, its material and labor quantities and detail, and must support and justify the costs and credits claimed by the Contractor. A Critical Path Method schedule Fragnet is required

to support and justify any additional time of performance requested by the Contractor. The City will not review any COR which is incomplete. The Contractor may request additional compensation and/or time through a COR but not for instances that occurred more than ten (10) calendar days prior to the notice date. Contractor's failure to initiate a COR within this ten-day period or to provide detailed back-up documentation to substantiate the COR within thirty (30) calendar days of the initial written notice shall be deemed a waiver of the right to adjustment of the Contract Sum or the Contract Time for the alleged change. Any COR that is approved by the City shall be incorporated in a Change Order or Construction Change Directive. If the COR is denied but the Contractor believes that it does have merit, the Contractor shall proceed with the disputed Work and may submit a Claim in accordance with the procedures set forth herein.

6.09 ISSUANCE OF WORK DIRECTIVE (UNILATERAL).

In the event of a dispute as to whether or not Extra Work is required, City shall have the right to unilaterally issue a Work Directive; Contractor shall continue performance of disputed Work pending resolution and shall maintain and submit to City all accounting and cost data **necessary to substantiate Contractor's cost of such** disputed Work.

[END OF ARTICLE]

## ARTICLE 7 - CONTRACT PAYMENTS AND CLAIMS

### 7.01 GENERAL

- A. Payment will be made at the price for each item listed on the bidding form or as Extra Work as provided in the General Conditions.
- B. Initial progress payment will not be made prior to approval by the Director of the Schedule of Values, the Construction Progress Schedule, and the Schedule of Submittals.
- C. No subsequent progress payment will be made prior to receipt by the Director of the monthly revision of the Construction Progress Schedule.

### 7.02 SCHEDULE OF VALUES FOR PAYMENTS

- A. Submission

**Upon City's request, the three (3) lowest bidders shall complete and submit a Preliminary Schedule of Values, within seven (7) calendar days.**

In addition, Contractor shall complete and furnish within seven (7) calendar days after receiving the Notice of Award of the Construction Contract a Final Schedule of Values giving a complete breakdown of the Contract Sum for each component of the Work.

- B. Content

The Schedule of Values shall be in sufficient detail as the Director may, in its discretion, deem necessary to evaluate progress at any point in the performance of the Work. Unless otherwise specified in the Contract Documents, the Schedule of Values shall include, without limitation, a breakdown of the general categories of Subcontractor work, direct overhead, profit and contingency, and a further breakdown of the general categories of Subcontractor work into separate trade line items of costs for Subcontractor services, labor and material, which is based on actual Subcontractor contract, subcontract, purchase order or vendor prices. If requested by Director, Contractor shall revise the Schedule of Values to allocate sums for Contractor overhead, profit and/or contingency among the individual line items for trade portions of the Work. No amounts shall be reflected in the Schedule of Values or Application for Payment for Extra Work or Deleted Work for which a Change Order has not been executed by Contractor and City or for which a Construction Change Directive has not been issued by City. Amounts that have been mutually agreed to by Change Order or unilaterally determined by City pursuant to a Construction Change Directive shall be segregated from the cost of the base Contract Work and separately listed by line item in the Schedule of Values. The Schedule of Values must be prepared in sufficient detail and supported by sufficient data to substantiate its accuracy as the Director may require.

- C. Applications for Payment

The Schedule of Values, when approved by the Director, shall be used as a basis for Contractor's Applications for Payment and may be considered as fixing a basis for adjustments to the Contract Sum.

D. Revisions

If, at any time, it is determined that the Schedule of Values does not allocate the Contract Sum in a manner that reasonably and fairly reflects the actual costs anticipated to be progressively incurred by Contractor, it shall be revised and resubmitted for the Director's approval.

7.03 APPLICATIONS FOR PAYMENT

A. Marked Schedule of Values

Five (5) Days prior to the date set forth in Paragraph 7.03-B below for the monthly progress payment meeting, Contractor shall submit to Director a copy of the proposed Schedule of Values, marked to show the percentage of completion certified by Contractor for each line item in the Schedule of Values, including any stored materials approved for payment by City pursuant to Paragraph 7.03-D, below and any withholdings from Contractor proposed by Director.

B. Monthly Review

For the purpose of expediting the progress payment procedure, Contractor shall meet with the Director on or before the twentieth (20th) day of each month to review the Contractor's marked Schedule of Values prepared in accordance with Paragraph 7.03-A, above. The Director shall revise as appropriate and sign the marked Schedule of Values to verify such review. If any item in the marked Schedule of Values submitted for payment is disputed during this review, Contractor agrees to use its best efforts to resolve the disputed items with the Director before submitting its Application for Payment. If the Director and Contractor cannot agree, then the percentage completion shall be established at such percentage as the Director, in good faith, determines is appropriate to the actual progress of the Work. **No inaccuracy or error in the Director's good faith estimate shall operate to release Contractor or Surety from any responsibility or liability arising from or related to performance of the Work.** The Director shall have the right subsequently to correct any error and dispute any item submitted in Contractor's Application for Payment, regardless of whether an item was identified as disputed in the review process provided for herein.

C. Certification

Each Application for Payment shall be signed and certified by Contractor under penalty of perjury to City that:

1. The data comprising the Application for Payment is accurate and the Work has progressed to the point indicated;
2. To the best of Contractor's knowledge, information and belief, the Work is in accordance with the Contract Documents;
3. Contractor is entitled to payment in the amount certified; and
4. All sums previously applied for by Contractor on account of Work performed by Subcontractors and that have been paid by City have been paid to the Subcontractors performing such Work, without any retention, withholding or backcharge by Contractor.

D. Stored Materials

Payments may be made by City, at its discretion, on account of materials or equipment not incorporated into the Work but delivered on the ground at the Site and suitably stored by Contractor or stored off-Site under the control of City. Such payments shall only be considered upon submission by Contractor of satisfactory evidence that it has acquired title to same, that the material or equipment will be utilized in the Work and that the material is satisfactorily stored, protected and insured, and that such other procedures are in place satisfactory to City to protect City's interests. To be considered for payment, materials or equipment stored off-Site shall, in addition to the above requirements and unless otherwise specifically approved by City in writing, be stored in a bonded warehouse, fully insured, and available to City for inspection. City shall have sole discretion to determine the amount of material and equipment that may be stored on the Site at any given time.

7.04 PROGRESS PAYMENTS

A. Conditions to Progress Payments

Contractor shall submit its Application for Payment to the Director, using such forms as required by City, once a month on or before the first (1st) Day of the month following the month in which the Work that is the subject of such Application for Payment was performed. Without limitation to any other provisions of the Contract Documents, the following shall be conditions precedent to a proper submission and to the Director approval of each Application for Payment:

1. Submission of a Schedule of Values that reflects the percentages of completion either agreed to or determined by Director in accordance with Paragraph 7.03-B, above;
2. Submission of the Contractor's certification required by Paragraph 7.03-C, above;
3. Submission of conditional releases of stop notice, if any, and bond rights upon progress payment, complying with California Civil Code Section 8132, for all Work performed during the time period covered by the current Application for Payment, signed by Contractor, its Subcontractors of every tier, and all material suppliers to each, and (2) forms of unconditional release of stop notice and bond rights upon progress payment, complying with California Civil Code Section 8134 for all Work performed during the time period covered by the previous Application for Payment, signed by Contractor, its Subcontractors of every tier and all material suppliers to each;
4. Compliance by Contractor with its obligation for maintenance of As-Builts as required by the Contract Documents;
5. Compliance by Contractor with its obligation for submission of monthly and daily reports as required by the Contract Documents;
6. Compliance by Contractor with its obligations for submission of scheduling information and updating of the Construction Schedule as required by Article 4, above and other provisions of the Contract Documents pertaining to preparation or updating of schedule information;
7. Submission of certified payroll records as required by the Contract Documents;
8. Submission of certifications by Contractor and each Subcontractor as required by applicable collective bargaining agreements certifying that all employee benefit contributions due and

owed pursuant to any applicable collective bargaining agreement have been paid in full; and

9. Compliance by Contractor with all of its other obligations for submission of documentation or performance of conditions which, by the terms of the Contract Documents, constitute conditions to Contractor's right to receive payment for Work performed.

B. Payments by City

Pursuant to California Public Contract Code Section 20104.50, City shall make progress payment of undisputed sums due within thirty (30) Days after receipt by Director of an undisputed and properly submitted Application for Payment, calculated on the basis of ninety-five percent (95%) of value determined pursuant to Paragraph 7.03-B above of the following:

1. The portion of the Work permanently installed and in place;
2. Plus, the value of materials delivered on the ground or in storage as approved by City pursuant to Paragraph 7.03-D, above,
3. Less, the aggregate of previous payments, and
4. Less, any other withholdings authorized by the Contract Documents.

C. Rejection by City

Any Application for Payment determined not to be undisputed, proper and suitable for payment shall be returned to Contractor as soon as practicable, but not later than seven (7) Days, after receipt by City accompanied by an written explanation of the reasons why the payment request was rejected. Failure by City or Director to either timely reject an Application for Payment or specify any grounds for rejection shall not constitute a waiver of any rights by City. Applications for Payment that are rejected shall be corrected and resubmitted within seven (7) Days after receipt by Contractor.

D. Interest

If City fails to make a progress payment to Contractor as required by Paragraph 7.04-B, above, City shall pay interest to Contractor equivalent to the legal rate set forth in subdivision (a) of California Code of Civil Procedure Section 685.010. The number of Days available to City to make payment pursuant to Paragraph 7.04-B, above without incurring interest pursuant to this Paragraph shall be reduced by the number of Days by which City exceeds the seven (7) Day return requirement applicable to City as set forth in Paragraph 7.04-C, above.

7.05 FINAL PAYMENT

A. Retention

In addition to withholdings permitted by Paragraph 7.09 below, a sum equal to five percent (5%) of all sums otherwise due to Contractor as progress payments shall be withheld by city pursuant to Paragraph 7.04-B from each progress payment ("**Retention**") and retained until such time as it is due as described herein. A higher Retention amount may be approved by the City Council where project is deemed "**substantially complex**" by City Council.

B. Conditions to Final Payment

Contractor shall submit its Application for Final Payment, using such forms as required by Director, prior to requesting a final inspection of the Work in accordance with Paragraph 3.06 above. Such Application for Final Payment shall be accompanied by all the following:

1. An affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Project for which City or City's property or funds might be liable have been paid or otherwise satisfied;
2. **Contractor's certification as required by Paragraph 7.03-C**, above;
3. Consent of surety, if any, to Final Payment;
4. A certificate evidencing that the insurance required by the Contract Documents is in force;
5. Conditional Waiver and Release Upon Final Payment in the form required by California Civil Code Section 8136 executed by Contractor, all Subcontractors of every tier and by all material suppliers of each, covering the final payment period;
6. Unconditional Waiver and Release Upon Progress Payment in the form required by California Civil Code Section 8136 executed by Contractor, all Subcontractors of every tier and by all material suppliers of each, covering the previous payment period;
7. All Record Documents (including, without limitation, complete and accurate As-Built drawings which shall be kept up to date during the performance of the Work);
8. Documentation that Contractor has inspected, tested, and adjusted performance of every system or facility of the Work to ensure that overall performance is in compliance with the terms of the Contract Documents;
9. Four (4) copies of all warranties from vendors and Subcontractors, operation and maintenance manuals, instructions and related agreements, and equipment certifications and similar documents;
10. Certifications by Contractor and each Subcontractor as required by applicable collective bargaining agreements that all employee benefit contributions due and owing pursuant to any applicable collective bargaining agreement have been paid in full;
11. Releases of rights and claims relating to patents and trademarks, as required by the Contract Documents; and
12. Any other documents or information required by the Contract Documents as a condition of Final Payment or Final Completion.

C. Final Payment

Pursuant to the Public Contract Code Section 7107, within sixty (60) Days after City issues the Notice

of Completion to Contractor, the Final Payment, including Retention, shall be released to Contractor, **subject to the City's right to withhold 150% of any disputed amounts.**

D. Disputed Amounts

Pursuant to California Public Contract Code 7107, City may deduct and withhold from the Final Payment due under Paragraph 7.05-C, above, an amount up to 150% of any disputed amounts, including, without limitation, amounts to protect City against any loss caused or threatened as a result of Contractor's failing to fully perform all of those obligations that are required to be fulfilled by Contractor as a condition to Final Completion and Final Payment. Alternatively, City may elect, in its sole discretion, to accept the Work without correction or completion and adjust the Contract Sum pursuant to the Contract Documents.

E. Acceptance of Final Payment

Acceptance of Final Payment by Contractor shall constitute a waiver of all rights by Contractor against City for recovery of any loss, excepting only those Claims that have been submitted by Contractor in the manner required by the Contract Documents prior to or at the time of the Final Payment.

7.06 MISCELLANEOUS

A. Joint Payment

City shall have the right, if deemed necessary in its sole discretion, to issue joint checks made payable to Contractor and any Subcontractor(s) of any Tier. The joint check payees shall be solely responsible for the allocation and disbursement of funds included as part of any such joint payment. Endorsement on such check by a payee shall be conclusively presumed to constitute receipt of payment by such payee. In no event shall any joint check payment be construed to create any contract between City and a Subcontractor of any Tier, any obligation from City to such Subcontractor or any third party rights against City or Director.

B. Withholding/Duty to Proceed

The payment, withholding or retention of all or any portion of any payment claimed to be due and owing to Contractor shall not operate in any way to relieve Contractor from its obligations under the Contract Documents. Contractor shall continue diligently to prosecute the Work without reference to the payment, withholding or retention of any payment. The partial payment, withholding or retention by City in good faith of any disputed portion of a payment, whether ultimately determined to be correctly or incorrectly asserted, shall not constitute a breach by City of the Construction Contract and shall not be grounds for an adjustment of the Contract Sum or Contract Time.

C. No Acceptance

No payment by City or partial or entire use of the Work by City shall be construed as approval or acceptance of the Work, or any portion thereof.

D. Contractor Payment Warranty

Submission of an Application for Payment shall constitute a representation and warranty by Contractor that:

1. Title to Work covered by an Application for Payment will pass to City either by incorporation into the construction or upon receipt of payment by Contractor, whichever occurs first; and
2. Work covered by previous Applications for Payment are free and clear of liens, stop notices, claims, security interests or encumbrances imposed by the Contractor or any other person.

E. Corrections

No inaccuracy or error in any Application for Payment provided by Contractor shall operate to release Contractor from the error, or from losses arising from the Work, or from any obligation imposed by the Contract Documents. City retains the right to subsequently correct any error made in any previously approved Application for Payment, or progress payment issued, by adjustments to subsequent payments.

7.07 PAYMENTS BY CONTRACTOR

Contractor shall not include in its Applications for Payment sums on account of any Subcontractor's portion of the Work that it does not intend to pay to such Subcontractor. Upon receipt of payment from City, Contractor shall pay the Subcontractor performing Work on the Project, out of the amount paid to Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled in accordance with the terms of its contract with Contractor and applicable laws, including, without limitation, California Public Contract Code Section 7107. Contractor shall remain responsible notwithstanding a withholding by City pursuant to the terms of these Contract Documents, to promptly satisfy from its own funds sums due to all Subcontractors who have performed Work that is included in Contractor's Application for Payment. Contractor shall, by appropriate agreement, require each Subcontractor to make payments to its subcontractors and material suppliers in similar manner. City shall have no obligation to pay or be responsible in any way for payment to a Subcontractor of any tier or material supplier.

7.08 PAYMENTS WITHHELD

A. Withholding by City

In addition to any other amounts which City may have the right to retain under the Contract Documents, City may withhold a sufficient amount of any payment otherwise due to Contractor as City, in its sole discretion, may deem necessary to cover actual or threatened loss due to any of the following:

1. Third Party Claims. Third-party claims or stop notices filed or reasonable evidence indicating probable filing of such claims or stop notices. City shall promptly inform Contractor of any third party claims related to this Contract; [NOTE: PUBLIC ENTITIES ARE REQUIRED TO INCLUDE PROVISIONS IN PUBLIC WORKS CONTRACTS FOR TIMELY NOTIFICATION TO THE CONTRACTOR OF THE RECEIPT OF ANY THIRD PARTY CLAIM RELATED TO THE CONTRACT, PC C §9201(b).
2. Defective Work. Defective Work not remedied;
3. Nonpayment. Failure of Contractor to make proper payments to its Subcontractors for services, labor, materials or equipment;
4. Inability to Complete. Reasonable doubt that the Work can be completed for the then unpaid balance of the Contract Sum or within the Contract Time;

5. Violation of Applicable Laws. Failure of Contractor or its Subcontractors to comply with applicable laws or lawful orders of governmental authorities;
6. **Penalty. Any claim or penalty asserted against City by virtue of Contractor's failure to comply with applicable laws or lawful orders of governmental authorities (including, without limitation labor laws);**
7. Failure to Meet Contract Time. Any damages which may accrue as a result of Contractor failing to meet the Construction Schedule or failing to perform within the Contract Time;
8. Setoff. Any reason specified elsewhere in the Contract Documents as grounds for a withholding offset or set off or that would legally entitle City to a set-off or recoupment;
9. Consultant Services. Additional professional, consultant or inspection services required due to **Contractor's failure to comply with the Contract Documents;**
10. Liquidated Damages. Liquidated damages assessed against Contractor;
11. Materials. Materials ordered by City pursuant to the Contract Documents;
12. Damages. Loss caused by Contractor or Subcontractor to City, Separate Contractors or any other person or entity under contract to City;
13. Clean Up. Clean up performed by City and chargeable to Contractor pursuant to the Contract Documents;
14. Employee Benefits. Failure of Contractor to pay contributions due and owing to employee benefits funds pursuant to any applicable collective bargaining agreement or trust agreement;
15. Required Documents. Failure of Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, **Construction Schedule updates, 'look ahead' schedules, Submittals, Schedules of Values, information on Subcontractors, Change Orders, certifications and other required reports or documentation;** and
16. Other Breach. A breach of any obligation or provision of the Contract Documents.

B. Release of Withholding

If and when City determines, in its sole discretion, that the above grounds for withholding have been removed and that all losses incurred or threatened have been paid, credited or otherwise satisfied, then payment shall be made for amounts withheld because of them.

C. Application of Withholding

City may apply sums withheld pursuant to Paragraph 7.08-A above, in payment of any loss or threatened loss as City determines, in its sole discretion, to be appropriate. Such payments may be **made without a prior judicial determination of City's actual rights with respect to such loss.** Contractor agrees and hereby designates City as its agent for such purposes, and agrees that such payments shall be considered as payments made under Construction Contract by City to Contractor. City shall not be liable to Contractor for such payments made in good faith. City shall submit to Contractor an accounting of such funds disbursed on behalf of Contractor. As an alternative to such payment, City

may, in its sole discretion, elect to exercise its right to adjust the Contract Sum as provided in the Contract Documents.

D. Continuous Performance

Provided City pays the undisputed portion, if any, of funds withheld in good faith, Contractor shall maintain continuous and uninterrupted performance of the Work during the pendency of any disputes or disagreements with City.

7.09 SUBSTITUTION OF SECURITIES

A. Public Contract Code

**Pursuant to the requirements of California Public Contract Code Section 22300, upon Contractor's request, City will make payment to Contractor of any funds withheld from payments to ensure performance under the Contract Documents if Contractor deposits with City, or in escrow with a California or federally chartered bank in California acceptable to City ("Escrow Agent"), securities eligible for the investment of State Funds under Government Code Section 16430, or bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the City, upon the following conditions:**

1. Contractor shall be the beneficial owner or any securities substituted for monies withheld for the purpose of receiving any interest thereon.
2. All expenses relating to the substitution of securities under Public Contract Code Section 22300 **and under this Paragraph 7.04, including, but not limited to City's overhead and administrative expenses, and expenses of Escrow Agent shall be the responsibility of Contractor.**
3. Securities or certificates of deposit substituted for monies withheld shall be of a value of at least equivalent to the amounts of retention to be paid to Contractor pursuant to the Contract Documents.
4. If Contractor chooses to deposit securities in lieu of monies withheld with an Escrow Agent, Contractor, City and Escrow Agent shall, as a prerequisite to such deposit, enter into an escrow **agreement, using the City's form, "Escrow Agreement for Deposit of Securities in Lieu of Retention."**
5. Contractor shall obtain the written consent of Surety to such agreement.
6. Securities, if any, shall be returned to Contractor only upon satisfactory Final Completion of the Work.

B. Substitute Security

To minimize the expense caused by such substitution of securities, Contractor shall, prior to or at the time Contractor requests to substitute security, deposit sufficient security to cover the entire amount to be withheld. Should the current market value of such substituted security fall below the amount for which it was substituted, or any other amounts which the City withholds pursuant to the Contract Documents, **Contractor shall immediately and at Contractor's expense and at no cost to City deposit additional security qualifying under Public Contract Code Section 22300 until the current market value of the total security deposited is no less than the amount subject to withholding under the Contract**

Documents. Securities shall be valued as often as conditions of the securities market warrant, but in no case less frequently than once per month.

C. Deposit of Retentions

Alternatively, subject to the conditions set forth in Paragraph 7.04-A above, upon request of Contractor, City shall make payment of retentions directly to Escrow Agent at the expense of Contractor, provided that Contractor, City and Escrow Agent shall, as a prerequisite such payment, enter into an escrow agreement in the same form as prescribed in Part 4 of Paragraph A, above. At the expense of Contractor and at no cost to City, Contractor may direct the investment of the payments into securities and interest bearing accounts, and Contractor shall receive the interest earned on the investments. Escrow Agent shall hold such direct payments by City under the same terms provided herein for securities deposited by Contractor. Upon satisfactory Final Completion of the Work, Contractor shall receive from Escrow Agent all securities, interest and payments received by Escrow Agent from City, less escrow fees and charges of the Escrow Account, according to the terms of Public Contract Code Section 22300 and the Contract Documents.

D. Time for Election of Substitution of Securities

Notwithstanding the provision of 7.04 A, B, and C above and California Public Contract Code Section 22300, the failure of Contractor to request the Substitution of eligible securities for monies to be withheld by City within ten (10) days of the award of Contract to Contractor shall be deemed to be a waiver of all such rights.

7.10 CLAIMS

A. Arising of Claim.

1. Scope Change. When Contractor has a claim for an increase in the Contract Sum or Contract Time due to a scope change which has not yet become **final**, a **"claim" will be deemed to arise once the Director has issued a decision denying, in whole or in part, the Contractor's Change Order Request.**
2. Other Claims. In the case of a Claim by Contractor that does not involve an adjustment to the Contract Sum or Contract Time due to a scope change and which has not become final, the Claim may be asserted if, and only if, Contractor gives written notice to City of intent to file the Claim within three (3) days of the date of discovery relative to such circumstances (even if Contractor has not yet been damaged or delayed). Such written notice of intent to file a Claim shall be valid if, and only if, it identifies the event or condition giving rise to the Claim, states its probable effect, if any with respect to Contractor's entitlement to an adjustment of the Contract Sum or Contract Time and complies with the requirements of Paragraph 7.11-B, below. For purposes of this Paragraph 7.11, a Claim for which such written notice is required and has been given by Contractor shall be deemed to arise on the date that such written notice is received by City.

B. Content of Claim

A Claim by Contractor must include all of the following:

1. A statement that it is a Claim and a request for a decision on the Claim;

2. A detailed description of the act, error, omission, unforeseen condition, event or other circumstance giving rise to the Claim.
3. If the Claim involves an adjustment to the Contract Sum or Contract Time due to a change in scope, a statement demonstrating that all requisite notices were provided, including, without limitation, timely written notice and a Change Order Request as required by Article 6 of these General Conditions and timely notice of delay and request for extension of time in accordance with Article 3. If the Claim does not involve an adjustment to the Contract Sum or Contract Time due to a change in scope, a statement demonstrating that a notice of intent to file the Claim was timely submitted as required by Paragraph 7.10-A.2, above;
4. A detailed justification for any remedy or relief sought by the Claim including without limitation, a detailed cost breakdown in the form' required for submittal of Change Order Requests and actual job cost records demonstrating that the costs have been incurred;
5. If the Claim involves a request for adjustment of the Contract Time, written documentation demonstrating that Contractor has complied with the requirements of the Contract Documents and written substantiation (including, without limitation, a Time Impact Analysis) demonstrating that Contractor is entitled to an extension of time under the Contract Documents; and
6. A written certification signed by a managing officer of Contractor's organization, who has the authority to sign contracts and purchase orders on behalf of Contractor and who has personally investigated and confirmed the truth and accuracy of the matters set forth in such certification, in the 'following form:

"I hereby certify under penalty of perjury that I am a managing officer of (Contractor's name) and that I have reviewed the Claim presented herewith on Contractor's behalf and/or on behalf of (Subcontractor's name) and that, to the best of my knowledge after conducting a diligent inquiry into the facts of the Claim, the following statements are true and correct:

The facts alleged in or that form the basis for the Claim are, to the best of my knowledge following diligent inquiry, true and accurate; and,

- (a) I do not know of any facts or circumstances, not alleged in the Claim, that by reason of their not being alleged render any fact or statement alleged in the Claim materially misleading; and,
- (b) I have, with respect to any request for money or damages alleged in or that forms the basis for the Claim, reviewed the job cost records (including those maintained by Contractor and by any Subcontractor, of any tier, that is asserting all or any portion of the Claim) and confirmed with reasonable certainty that the losses or damages suffered by Contractor and/or such Subcontractor were in fact suffered in the amounts and for the reasons alleged in the Claim; and,
- (c) I have, with respect to any request for extension of time or claim of delay, disruption, hindrance or interference alleged in or that forms the basis for the Claim, reviewed the job schedules (including those maintained by Contractor and the Subcontractor, of any tier, that is asserting all or any portion of the Claim) and confirmed on an event-by-event basis that the delays or disruption suffered by Contractor and/or such Subcontractor were in fact experienced for the durations, in the manner, and with the consequent effects on the time and/or sequence of

performance of the Work, as alleged in the Claim; and,

- (d) I have not received payment from City for, nor has Contractor previously released **City from, any portion of the Claim."**

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Company \_\_\_\_\_

C. Noncompliance

Failure to submit any of the information, documentation or certifications required by Paragraph 7.10-B, above, shall result in the Claim being returned to Contractor without any decision.

D. Submission of Claims

1. Director. Claims shall be first submitted to the City for decision by the Director.
2. Continuous Work. Notwithstanding the making of any Claim or the existence of any dispute regarding any Claim, unless otherwise directed by City, Contractor shall not delay, slow or stop performance of the Work, but shall diligently proceed with performance in accordance with the Contract Documents and City will continue, to make undisputed payments as by the Contract Documents.
3. Time for Filing. All Claims and supporting documentation and certifications must be filed within thirty (30) days after the Claim arises. No Claims shall be filed after Final Payment.
4. Conditions Precedent. No Claim may be asserted unless Contractor has strictly complied with the requirements of this Paragraph 7.10-D, which shall be considered conditions precedent to **Contractor's right to assert the Claim and to initiate the Dispute Resolution Process with respect to such Claim.**

E. Response to Claims, Meet and Confer

1. Claims less than \$50,000. Claims less than \$50,000 shall be responded to by City in writing within forty-five (45) days of receipt of the Claim, unless City requests additional information or documentation of the Claim within thirty (30) days of receipt of the Claim, in which case City shall respond to the Claim within fifteen (15) days after receipt of the further information or documentation or within a period of time no greater than that taken by Contractor in producing the additional information or documentation, whichever is greater.
2. Claims \$50,000 or more. Claims \$50,000 or more shall be responded to by City in writing within (60) days of receipt of the Claim, unless City requests additional information or documentation of the Claim within thirty (30) days of receipt of the Claim, in which case City shall respond to the Claim within thirty (30) days after receipt of the further information or documentation or within a period of time no greater than that taken by Contractor in producing the additional information or documentation, whichever is greater.

3. Meet and Confer. If Contractor disputes City's response, or if City fails to respond within the prescribed time set forth in Paragraph 7.10-E.1 and 7.10-E.2, above, Contractor may so notify **City, in writing, within fifteen (15) days of City's response, or within fifteen (15) days of City's response due date** in the event of a failure to respond, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon such demand, City shall schedule a meet and confer conference within thirty (30) days of such demand, for discussion of settlement of the dispute.

F. Finality of Decision

**If Contractor disputes the Director's decision under this Article, it shall commence the Dispute Resolution Process as set forth in Article 15 of these General Conditions by filing a Statement of Dispute within seven (7) days after receipt of the Director's response.**

G. Continuing Contract Performance/Duty to Proceed with Disputed Work

Contractor shall not delay or postpone any Work pending resolution of any claims, disputes or disagreements. Pending final resolution of a claim, the Contractor shall proceed diligently with performance of the Contract and the City shall continue to make payments for undisputed Work in accordance with the Contract Documents. In the event of disputed Work, City shall have the right to unilaterally issue a Work Directive and Contractor shall continue performance pending resolution of the dispute and shall maintain the accounting and cost data to substantiate the cost of such disputed work.

[END OF ARTICLE]

## ARTICLE 8 - MATERIALS AND EQUIPMENT

### 8.01 GENERAL

- A. The Contractor shall furnish all materials and equipment needed to complete the Work and installations required under the terms of this Contract, except those materials and equipment specified to be furnished by the City.
- B. The Contractor shall submit satisfactory evidence that the materials and equipment to be furnished and used in the work are in compliance with the Specifications. Materials and equipment incorporated in the Work and not specifically covered in the Specifications shall be the best of their kind. Unless otherwise specified, all materials and equipment incorporated in the Work under the Contract shall be new.

### 8.02 QUALITY AND WORKMANSHIP

All material and equipment furnished by the Contractor shall be new, high grade, and free from defects and imperfections, unless otherwise hereinafter specified. Workmanship shall be in accordance with the best standard practices. All materials and equipment must be of the specified quality and equal to approved samples, if samples have been required. All Work shall be done and completed in a thorough, workmanlike manner, notwithstanding any omission from the Specifications or Drawings, and it shall be the duty of the Contractor to call attention to apparent errors or omissions and request instructions before proceeding with the Work. The Director may, by appropriate instructions, correct errors and supply omissions, which instructions shall be binding upon the Contractor as though contained in the original Specifications or Drawings. All Work performed under the Specifications will be inspected by the Director as provided in Paragraph 8.04. All materials and equipment furnished and all Work done must be satisfactory to the Director. Work, material, or equipment not in accordance with the Specifications, in the opinion of the Director shall be made to conform thereto. Unsatisfactory materials and equipment will be rejected, and if so ordered by the Director, shall, at the Contractor's expense, be immediately removed from the vicinity of the Work.

### 8.03 TRADE NAMES AND "OR APPROVED EQUAL" PROVISION

Whenever in the Specifications or Drawings the name or brand of a manufactured article is used it is intended to indicate a measure of quality and utility or a standard. Except in those instances where the product is designated to match others in use on a particular improvement either completed or in the course of completion, the Contractor may substitute any other brand or manufacture of equal appearance, quality, and utility on approval of the Director, provided the use of such brand or manufacture involves no additional cost to the City.

### 8.04 APPROVAL OF MATERIALS

- A. The Contractor shall furnish without additional cost to the City such quantities of construction materials as may be required by the Director for test purposes. He/she shall place at the Director's disposal all available facilities for and cooperate with him in the sampling and testing of all materials and workmanship. The Contractor shall prepay all shipping charges on samples. No samples are to be submitted with the bids unless otherwise specified.
- B. Each sample submitted shall be labeled. A letter, in duplicate, submitting each shipment of samples shall be mailed to the Director by the Contractor. Both the label on the sample and the letter of transmittal shall indicate the material represented, its place of origin, the names of the producer and the Contractor, the Specifications number and title, and a reference to the applicable Drawings and Specifications paragraphs.

- C. Materials or equipment of which samples are required shall not be used on the Work until approval has been given by the Director in writing. Approval of any sample shall be only for the characteristics of the uses named in such approval and no other. No approval of a sample shall be taken in itself to change or modify any Contract requirement.
- D. Failure of any material to pass the specified tests, including life cycle maintenance data may be sufficient cause for refusal to consider under this Contract, any further sample of the same brand or make of that material.

#### 8.05 ORDERING MATERIALS AND EQUIPMENT

One copy of each of the Contractor's purchase orders for materials and equipment forming a portion of the Work must be furnished to the Director, if requested. Each such purchase order shall contain a statement that the materials and equipment included in the order are subject to inspection by the City. Materials and equipment purchased locally **will, at the City's discretion, be inspected at the point of manufacture or supply, and materials** and equipment supplied from points outside the Los Angeles area will be inspected upon arrival at the job, except when other inspection requirements are provided for specific materials in other sections of the Contract Documents.

#### 8.06 AUTHORITY OF THE DIRECTOR

- A. On all questions concerning the acceptability of materials or machinery, the classification of materials, the execution of the Work, and conflicting interests of Contractors performing related work, the decision of the Director shall be final and binding.
- B. The Director will make periodic observations of materials and completed work to observe their compliance with Drawings, Specifications, and design and planning concepts, but he/she is not responsible for the superintendence of construction processes, site conditions, operations, equipment, personnel, or the maintenance of a safe place to work or any safety in, on, or about the site of work.

#### 8.07 INSPECTION

All materials furnished and work done under this Contract will be subject to rigid inspection. The Contractor shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining them, as requested by the Director. The Director, or his/her authorized agent or agents, at all times shall have access to all parts of the shop and the works where such materials under his/her inspection is being manufactured or the work performed. Work or material that does not conform to the Specifications, although accepted through oversight, may be rejected at any stage of the Work. Whenever the Contractor is permitted or directed to do night work or to vary the period during which work is carried on each day, he/she shall give the Director due notice, so that inspection may be provided. Such work shall be done under regulations to be furnished in writing by the Director.

#### 8.08 INFRINGEMENT OF PATENTS

The Contractor shall hold and save the City, its officers, agents, servants, and employees harmless from and against all and every demand or demands, of any nature or kind, for or on account of the use of any patented invention, process, equipment, article, or appliance employed in the execution of the Work or included in the materials or supplies agreed to be furnished under this Contract, and should the Contractor, his/her agents, servants, or employees, or any of them, be enjoined from furnishing or using any invention, process, equipment, article, materials, supplies or appliance supplied or required to be supplied or used under this Contract, the Contractor shall promptly substitute other inventions, processes, equipment, articles, materials, supplies, or

appliances in lieu thereof, of equal efficiency, quality, finish, suitability, and market value, and satisfactory in all respects to the Director. Or in the event that the Director elects, in lieu of such substitution, to have, supplied, and to retain and use, any such invention, process, equipment, article, materials, supplies, or appliances, as may by this Contract be required to be supplied and used, in that event the Contractor shall at his/her expense pay such royalties and secure such valid licenses as may be requisite and necessary to enable the City, its officers, agents, servants, and employees, or any of them, to use such invention, process, equipment, article, materials, supplies, or appliances without being disturbed or in way interfered with by any proceeding in law or equity on account thereof. Should the Contractor neglect or refuse promptly to make the substitution hereinbefore required, or to pay such royalties and secure such licenses as may be necessary and requisite for the purpose aforesaid, then in that event the Director shall have the right to make such substitution, or the City may pay such royalties and secure such licenses and charge the cost thereof against any money due the Contractor from the City, or recover the amount thereof from him/her and his/her surety, notwithstanding final payment under this Contract may have been made.

[END OF ARTICLE]

## ARTICLE 9 – SUBMITTALS

### 9.01 GENERAL

- A. The Contractor shall submit samples, drawings, and data for the Director's approval which demonstrate fully that the construction, and the materials and equipment to be furnished will comply with the provisions and intent of the Drawings and Specifications.
- B. Specific items to be covered by the submittals shall include, as a minimum, the following:
  - 1. For structures, submit all shop, setting, equipment, miscellaneous iron and reinforcement drawings and schedules necessary.
  - 2. For conduits, submit a detailed layout of the conduit with details of bends and fabricated specials and furnish any other details necessary. Show location of shop and field welds.
  - 3. For equipment which requires electrical service, submit detailed information to show power supply requirements, wiring diagrams, control and protection schematics, shop test data, operation and maintenance procedures, outline drawings, and manufacturer's recommendation of the interface/interlock among the equipment.
  - 4. For mechanical equipment submit all data pertinent to the installation and maintenance of the equipment including shop drawings, manufacturer's recommended installation procedure, detailed installation drawings, test data and curves, maintenance manuals, and other details necessary.
  - 5. Samples
  - 6. Colors
  - 7. Substitutions
  - 8. Manuals
  - 9. As-built drawings
  - 10. Safety plans required by Article 10

### 9.02 PRODUCT HANDLING

- A. Submittals shall be accompanied by a letter of transmittal and shall be in strict accordance with the provisions of this Article.
- B. Submit priority of processing when appropriate.

### 9.03 SCHEDULE OF SUBMITTALS

- A. The Contractor shall prepare and submit a schedule of submittals. The schedule of submittals shall be in the form of a submittal log. Refer to Paragraph 9.12.

9.04 SHOP DRAWINGS

- A. All shop drawings shall be produced to a scale sufficiently large to show all pertinent features of the item and its method of connection to the Work.
- B. All shop drawing prints shall be made in blue or black line on white background. Reproductions of City/Contract Drawings are not acceptable.
- C. The overall dimensions of each drawing submitted to the Director shall be equal to one of the City's standard sheet sizes as listed below. The title block shall be located in the lower right hand corner of each drawing and shall be clear of all line Work, dimensions, details, and notes.

Sheet Sizes
<u>Height X Width</u>
11" X 8 1/2"
11" X 17"
24" X 36"
<b>30" X 42"</b>

9.05 COLORS

Unless the precise color and pattern are specified elsewhere, submit accurate color charts and pattern charts to the Director for his/her review and selection whenever a choice of color or pattern is available in a specified product. Label each chart naming the source, the proposed location of use on the project, and the project.

9.06 MANUFACTURERS' LITERATURE

Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

9.07 SUBSTITUTIONS

- A. The Contract is based on the materials, equipment, and methods described in the Contract Documents. Any Contractor **proposed substitutions are subject to the Director's approval.**

The Director will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data, and all other information, including life cycle maintenance data, required by the Director to evaluate the proposed substitution.

- B. Any requests for substitutions by the Contractor must be made within forty-five (45) calendar days from the Issuance Date on the Notice to Proceed. Otherwise, such requests will not be considered.
- C. Trade names and "or approved equal" provision as set forth in Paragraph 8.03.

9.08 MANUALS

- A. When manuals are required to be submitted covering items included in this Work, prepare and submit such manuals in approximately 8-1/2" X 11" format in durable plastic binders. In addition, manuals shall be submitted in electronic format. Manuals shall contain at least the following:

1. Identification on, or readable through, the front cover stating general nature of the manual.

2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the installation.
  3. Complete instructions regarding operation and maintenance of all equipment involved.
  4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.
  5. Copy of all guarantees and warranties issued.
  6. Copy of drawings with all data concerning changes made during construction.
- B. Where contents of manuals include manufacturers' catalog pages, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.

#### 9.09 AS-BUILT DRAWINGS

- A. When required to be submitted covering items included in this Work, the Contractor shall deliver to the City one complete set of final As-Built hard copy drawings together with a set of AutoCAD drawing files in electronic format showing completed building, **"as-built" for City records before the Contract will be accepted** by the City.
- B. The drawings shall be duplicates and at the same size and dimensional scale as the originals. They shall be on a polyester translucent base material with a minimum sheet thickness of .003 inch (.08mm).
- C. The legibility and contrast of each drawing submitted to the City shall be such that every line, number, letter, and character is clearly readable in a full size blow back from a 35 mm microfilm negative of the drawing.

#### 9.10 SUBMITTALS QUANTITIES

- A. Submit seven (7) copies of all data and drawings unless specified otherwise.
- B. Submit all samples, unless specified otherwise, in the quantity to be returned, plus two, which will be retained by the Director.

#### 9.11 IDENTIFICATION OF SUBMITTALS

Completely identify each submittal and re-submittal by showing at least the following information:

- A. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
- B. Name of project as it appears in the Contract Documents and Specification No.
- C. Drawing number and Specifications section number other than this section to which the submittal applies.
- D. Whether this is an original submittal or re-submittal.
- E. For samples, indicate the source of the sample.

9.12 SCHEDULE OF SUBMITTALS

- A. Submit initial schedule of submittals within five (5) Working Days after the Issuance Date on Notice to Proceed.
- B. Submit revised schedule of submittals within five (5) Working Days after date of request from the Director.
- C. The Director will review schedule of submittals and will notify Contractor that schedule is acceptable or not acceptable within five (5) Working Days after receipt.

9.13 COORDINATION OF SUBMITTALS

- A. **Prior to submittal for the Director's review, use** all means necessary to fully coordinate all material, including the following procedures:
  - 1. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
  - 2. Coordinate as required with all trades and with all public agencies involved.
  - 3. Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.
  - 4. Clearly indicate all deviations from the Specifications.
- B. Unless otherwise specifically permitted by the Director, make all submittals in groups containing all associated items; the Director may reject partial submittals as not complying with the provisions of the Specifications.

9.14 TIMING FOR SUBMITTALS

- A. Make all submittals far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and re-submittal, and for placing orders and securing delivery.
- B. In scheduling, allow at least 15 Working Days for the Director's review, plus the transit time to and from the City office.
- C. Manuals shall be submitted prior to performing functional tests.

9.15 APPROVAL BY CITY

- A. Up to three (3) copies of each submittal, except manuals, schedule of costs for progress payments, and as-built drawings will be returned to the Contractor marked "No Exceptions Taken," "Make Corrections Noted - Do Not Resubmit," or "Make Corrections Noted - Resubmit." Manuals, schedule of costs, and as-built drawings will be returned for re-submittal if incomplete or unacceptable.
- B. Submittals marked "Approved as Noted" need not be resubmitted, but the notes shall be followed.
- C. If submittal is returned for correction, it will be marked to indicate what is unsatisfactory.

- D. Resubmit revised drawings or data as indicated, in five (5) copies.
- E. Approval of each submittal by the Director will be general only and shall not be construed as:
  - 1. Permitting any departures from the Specifications requirements.
  - 2. Relieving the Contractor of the responsibility for any errors and omissions in details, dimensions, or of other nature that may exist.
  - 3. Approving departures from additional details or instructions previously furnished by the Director.

9.16 CHANGES TO APPROVED SUBMITTALS

- A. A re-submittal is required for any proposed change to an approved submittal. Changes which require re-submittal include, but are not necessarily limited to, drawing revisions, changes in materials and equipment, installation procedures and test data. All re-submittals shall include an explanation of the necessity for the change.
- B. Minor corrections to an approved submittal may be accomplished by submitting a "Corrected Copy".

[END OF ARTICLE]

## ARTICLE 10 – SAFETY

### 10.01 PROTECTION OF PERSONS AND PROPERTY

- A. Contractor's Responsibility: Notwithstanding any other provision of the Contract Documents, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property, during performance of the Work. This requirement will apply continuously and will not be limited to normal working hours. Safety and sanitary provisions shall conform to all applicable Federal, State, County, and local laws, regulations, ordinances, standards, and codes. Where any of these are in conflict, the more stringent requirement shall be followed.
- B. Sanitary Facilities. The Contractor shall furnish and maintain sanitary facilities by the worksites for the entire construction period.
- C. Protection of the Public. The Contractor shall take such steps and precautions as his/her operations warrant to protect the public from danger, loss of life, loss of property or interruption of public services. Unforeseen conditions may arise which will require that immediate provisions be made to protect the public from danger or loss, or damage to life and property, due directly or indirectly to prosecution of work under this contract. Whenever, in the opinion of the Director, a condition exists which the Contractor has not taken sufficient precaution of public safety, protection of utilities and/or protection of adjacent structures or property, the Director will order the Contractor to provide a remedy for the condition. If the Contractor fails to act on the situation within a reasonable time period as determined by the Director, or in the event of an emergency situation, the Director may provide suitable protection by causing such work to be done and material to be furnished as, in the opinion of the Director, may seem reasonable and necessary. The cost and expense of all repairs (including labor and materials) as are deemed necessary, shall be borne by the Contractor. All expenses incurred by the City for emergency repairs will be deducted from the final payment due to the Contractor.

### 10.02 PROTECTION FROM HAZARDS

#### A. Trench Excavation

Excavation for any trench four (4) feet or more in depth shall not begin until the Contractor has received approval from the Director of the Contractor's detailed plan for worker protection from the hazards of caving ground during the excavation of such trench. Such plan shall show the details of the design of shoring, bracing, sloping or other provisions to be made for worker protection during such excavation. No such plan shall allow the use of shoring, sloping or protective system less effective than that required by the Construction Safety Orders of the Division of Occupational Safety and Health, and if such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared and signed by an engineer who is registered as a Civil or Structural Director in the State of California.

#### B. Confined Spaces

Contractor shall comply with all of the provisions of General Industry Safety Orders of the California Code of Regulations. Entry of a confined space shall not be allowed until the Contractor has received **approval from the Director of the Contractor's program for confined space entry. Confined space means** a space that (1) Is large enough and so configured that an employee can bodily enter and perform assigned Work; and (2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and (3) Is not designed for continuous employee occupancy. Failure to submit a confined space entry program

may result in actions as provided in Article 5: "Suspension or Termination of Contract."

C. Material Safety Data Sheet

Contractor shall comply with all of the provisions of General Industry Safety Orders of the California Administrative Code. The Contractor shall submit to the Director a Material Safety Data Sheet (MSDS) for each hazardous substance proposed to be used, ten (10) days prior to the delivery of such materials to the job site or use of such materials at a manufacturing plant where the Director is to perform an inspection. For materials which are to be tested in City laboratories, the MSDS shall be submitted with the sample(s). Hazardous substance is defined as any substance included in the list (Director's List) of hazardous substances prepared by the Director, California Department of Industrial Relations, pursuant to Labor Code Section 6382. Failure to submit an MSDS for any hazardous substance may result in actions as provided in Article 5, "Suspension or Termination of Contract".

10.03 DIFFERING SITE CONDITIONS

- A. Differing Site Conditions Defined. The Contractor shall promptly, and before such conditions are disturbed, notify the Director in writing of any Differing Site Conditions. Differing Site Conditions are those conditions, located at the project site or in existing improvements and not otherwise ascertainable by Contractor through the exercise of due diligence in the performance of its inspection obligations in the Contract Documents, encountered by Contractor in digging trenches or other excavations(s) that extend deeper than four feet below the surface of the ground that constitute:
1. Material that the Contractor believes may be material that is hazardous waste as defined in Section 25117 of the Health and Safety Code, which is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.
  2. Subsurface or latent physical conditions at the site differing materially from those indicated in these Contract Documents.
  3. Unknown physical conditions at the site, of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in these Contract Documents.
- B. Notice by Contractor. If the Contractor encounters conditions it believes constitute Differing Site Conditions, then notice of such conditions shall, before such conditions are disturbed, be promptly reported to the Director followed within twenty-four (24) hours by a further written notice stating a detailed description of the conditions encountered.
- C. The Director will promptly investigate the conditions and If he/she finds that such conditions do materially differ, or do involve hazardous waste, and do cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work under this Contract, an equitable adjustment will be made, as determined by the Director.
- D. Change Order Request. If Contractor intends to seek an adjustment to the Contract Sum or Contract Time based upon Differing Site Conditions, it must, within ten (10) Days after the Discovery Date relative to such conditions, submit a Change Order Request setting forth a detailed cost breakdown and Time Impact Analysis, in the form required by Article 6 of these General Conditions, of the additional Allowable Costs and Excusable Delay resulting from such Differing Site Conditions.
- E. Failure to Comply. Failure by Contractor to strictly comply with the requirements of this Paragraph

10.03 concerning the timing and content of any notice of Differing Site Conditions or request for adjustment in Contract Sum or Contract Time based on Differing Site Conditions shall be deemed waiver of any right by the Contractor for an adjustment in the Contract Sum or Contract Time by reason of such conditions.

- F. Final Completion. No claim by the Contractor for additional compensation for Differing Site Conditions shall be allowed if asserted after Final Payment.
- G. In the event of disagreement between the Contractor and the Director whether the conditions do materially differ or whether a hazardous waste is involved or whether the conditions cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any completion date required by the Contract, but shall proceed with all Work to be performed under the Contract Documents.
- H. The Contractor shall retain all rights provided by, and shall be subject to all requirements of, this Contract which pertain to the resolution of disputes and protests.
- I. Contractor Responsibility. Except as otherwise provided in this Paragraph 10.03 for Differing Site Conditions, Contractor agrees to solely bear the risk of additional cost and Delay due to concealed or unknown conditions, surface or subsurface, at the Site or in Existing Improvements, without adjustment to the Contract Sum or Contract Time.

#### 10.04 TRAFFIC REGULATION

- A. During the performance of the Work the Contractor shall erect and maintain necessary temporary fences, bridges, railings, lights, signals, barriers, or other safeguards as shall be appropriate under the circumstance in his/her judgment for the prevention of accidents; and he/she shall take other precautions as necessary for public safety including, but not limited to, traffic control. Traffic control **shall be conducted in accordance with the latest edition of the Work Area Traffic Control ("WATCH")** handbook, published by BNi Books, and as directed and approved by the City Traffic and Transportation Administrator.
- B. Contractor shall submit at least ten (10) Working Days prior to Work a detailed traffic control plan, that is approved by all agencies having jurisdiction and that conforms to all requirements of the Specifications.
- C. No changes or deviations from the approved detailed traffic control plan shall be made, except temporary changes in emergency situations, without prior approval of the City Traffic and Transportation Administrator and all agencies having jurisdiction.  
  
Contractor shall immediately notify the Director, the City Traffic and Transportation Administrator and the agencies having jurisdiction of occurrences that necessitate modification of the approved traffic control plan.
- D. **Contractor's failure to comply with this provision may result in actions as provided in Article 5: "Suspension or Termination of Contract" of these General Conditions.**

#### 10.05 TRAFFIC CONTROL DEVICES

- A. Traffic signs, flashing lights, barricades and other traffic safety devices used to control traffic shall

conform to the requirements of the WATCH handbook or the manual of traffic control, whichever is more stringent, and as approved by the City Traffic and Transportation Administrator.

1. Portable signals shall not be used unless permission is given in writing by the agency having jurisdiction.
  2. Warning signs used for nighttime conditions shall be reflectorized or illuminated. "Reflectorized signs" shall have a reflectorized background and shall conform to the current State of California Department of Transportation specification for reflective sheeting on highway signs.
- B. If the Contractor fails to provide and install any of the signs or traffic control devices required hereby or ordered by the City staff, staff may cause such signs or traffic control devices to be placed by others, charge the costs therefore against the Contractor, and deduct the same from the next progress payment.

#### 10.06 EXECUTION

- A. The Contractor shall provide written notification to the Police Department, Traffic Bureau (323) 587-5171, at least two (2) weeks prior to the beginning of construction at any particular location. Notification will include the specific location, project dates, what lanes of the roadway will be closed and when. Also **the construction project manager's name and business phone number and the construction inspector's name and business phone number.**
- B. The Contractor shall notify, by telephone, the Police Department, (323) 587-5171 at the completion of any posting of temporary no parking signs. Notification will include the times, dates and locations of the posting. When vehicles must be towed for violation of temporary no parking signs, the person who actually posted the signs, or on-view supervisor of that posting, will be present to answer pertinent questions that may be asked by the parking enforcement officer or police officer towing the vehicles.
- C. The Contractor shall notify the Fire Department, on a daily basis during the entire period that construction is in progress whenever roadways are reduced in width or blocked. Notification shall be made to the Fire Dispatch (323) 881-6183 and the Contractor shall provide the information required to identify which roadways would have accessibility problems due to his/her operations. The Contractor shall submit to Fire Department schedule of Work for their use and files.
- D. Roads subject to interference from the Work covered by this Contract shall be kept open, and the fences subject to interference shall be kept up by the Contractor until the Work is finished. Except where public roads have been approved for closure, traffic shall be permitted to pass through designated traffic lanes with as little inconvenience and delay as possible.
- E. Where alternating one-way traffic has been authorized, the maximum time that traffic will be delayed shall be posted at each end of the one-way traffic section. The maximum delay time shall be approved by the agency having jurisdiction.
- F. Contractor shall install temporary traffic markings where required to direct the flow of traffic and shall maintain the traffic markings for the duration of need. Contractor shall remove the markings by abrasive blasting when no longer required.
- G. Convenient access to driveways and buildings in the vicinity of Work shall be maintained as much as

possible. Temporary approaches to, and crossing of, intersecting traffic lanes shall be provided and kept in good condition.

- H. When leaving a Work area and entering a roadway carrying public traffic, the Contractor's equipment, whether empty or loaded, shall in all cases yield to public traffic.

#### 10.07 FLAGGING

- A. Contractor shall provide flaggers to control traffic where required by the approved traffic control plan.
  - 1. Flaggers shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instructions to Flaggers" of the California Department of Transportation.
  - 2. Flaggers shall be employed full time on traffic control and shall have no other duties.

#### 10.08 PEDESTRIAN CANOPIES OR BARRICADE IMPROVEMENTS

Refer to City of Vernon for requirements for building or access road safety improvements that the Contractor shall construct during construction period. These devices or improvements, as the City deems necessary or prudent, shall be at the expense of the Contractor.

[END OF ARTICLE]

## ARTICLE 11 - INDEMNITY

### 11.01 INDEMNITY

To the maximum extent permitted by law, the Contractor shall fully indemnify, hold harmless, protect, and defend **the City, its officers, employees, agents, representatives and their successors and assigns ("Indemnitees")** from and against any and all demands, liability, loss, suit, claim, action, cause of action, damage, cost, judgment, settlement, decree, arbitration award, stop notice, penalty, loss of revenue, and expense (including any fees of accountants, attorneys, experts or other professionals, and costs of investigation, mediation, arbitration, litigation and appeal), in law or in equity, of every kind and nature whatsoever, arising out of or in connection with, resulting from or related to, or claimed to be arising out of the Work performed by Contractor, or any of its officers, agents, employees, Subcontractors, Sub-Subcontractors, design consultants or any person for whose acts any of them may be liable, regardless of whether such claim, suit or demand is caused, or alleged to be caused, in part, by an Indemnitee, including but not limited to:

- A. Bodily injury, emotional injury, sickness or disease, or death to any persons;
- B. Infringement of any patent rights, licenses, copyrights or intellectual property which may be brought **against the Contractor or City arising out of Contractor's Work, for which the Contractor is** responsible;
- C. Stop notices and claims for labor performed or materials used or furnished to be used in the Work, including all incidental or consequential damages resulting to City from such stop notices and claims;
- D. Failure of Contractor or its Subcontractors to comply with the provisions for insurance;
- E. Failure to comply with any Governmental Approval or similar authorization or order;
- F. Misrepresentation, misstatement, or omission with respect to any statement made in or any document furnished by the Contractor in connection therewith;
- G. Breach of any duty, obligation, or requirement under the Contract Documents;
- H. Failure to provide notice to any Party as required under the Contract Documents;
- I. Failure to protect the property of any utility provider or adjacent property owner; or
- J. Failure to make payment of all employee benefits.

This indemnity provision is effective regardless of any prior, concurrent, or subsequent active or passive negligence by Indemnitees, except that, to the limited extent mandated by California Civil Code Section 2782, the Contractor shall not be responsible for liabilities which arise from the sole negligence or willful misconduct of Indemnitees or arise from the active negligence of City.

### 11.02 ENFORCEMENT

**Contractor's obligations under this Article extend to claims occurring after termination of the Contractor's performance of the Contract or Final Payment to Contractor.** The obligations apply regardless of any actual or alleged negligent act or omission of Indemnitees. Contractor, however, shall not be obligated under this Agreement to indemnify an Indemnitee for claims arising from the sole active negligence or willful misconduct of the Indemnitee or independent contractors who are directly responsible to Indemnitees. **Contractor's obligations** under this Article are in addition to any other rights or remedies which the Indemnitees may have under the law

or under the Contract Documents. In the event of any claim, suit or demand made against any Indemnitees, the City may in its sole discretion reserve, retain or apply any monies due to the Contractor under the Contract for the purpose of resolving such claims; provided, however, that the City may release such funds if the Contractor provides the City with reasonable assurance of **protection of the City's interests**. **The City shall in its sole discretion determine whether such assurances are reasonable.**

11.03 NO LIMITATIONS

**Contractor's indemnification and defense obligations set forth in this Article are separate and independent from the insurance provisions set forth in Article 12 herein; and do not limit, in any way, the applicability, scope, or obligations set forth in those insurance provisions. In claims, suits, or demands against any Indemnitee by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the Contractor's indemnification and defense obligations shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefits acts, or other employee benefits acts.**

[END OF ARTICLE]

## ARTICLE 12 – INSURANCE

### 12.01 CONDITION TO COMMENCEMENT

Contractor shall not commence Work under this Contract until Contractor has obtained all insurance required hereunder from a company or companies acceptable to City, nor shall the Contractor allow any Subcontractor to commence Work on a subcontract until all insurance required of said Subcontractor has been obtained. Proof of insurance including insurance certificates and endorsements as set forth in Exhibit 4 must be submitted by **the Contractor prior to the City's execution of the Contract.**

### 12.02 MINIMUM COVERAGE AND LIMITS

Contractor shall maintain the insurance coverage as set forth in Exhibit 4 throughout the term of the Contract.

### 12.03 CONDITIONS REGARDING INSURANCE COVERAGE AND LIMITS

City and Contractor agree as follows:

- A. All insurance coverage and limits provided pursuant to the Contract Documents shall apply to the full extent of the policies involved, available or applicable. Nothing contained in the Contract Documents or any other agreement relating to City or its operations limits the application of such insurance coverage.
- B. None of the policies required by this Contract shall be in compliance with these requirements if they include any limiting endorsement that has not been first submitted to City and approved in writing by **the City's Risk Manager.**

### 12.04 INSURANCE OBLIGATION IS SEPARATE FROM INDEMNITY OBLIGATION

**This Agreement's insurance provisions:**

- A. Are separate and independent from the indemnification and defense provisions in Article 12 of the Agreement; and
- B. Do not limit, in any way, the applicability, scope, or obligations of the indemnification and defense provisions in Article 12 of the Agreement.

[END OF ARTICLE]

## ARTICLE 13 – BONDS

### 13.01 REQUIRED BONDS

A. Contractor shall furnish the following bonds:

1. A Performance Bond in an amount equal to one hundred percent (100%) of the total Contract price in the form shown in Exhibit "1" attached hereto.
2. A Payment Bond (Labor and Material) in an amount equal to one hundred percent (100%) of the total Contract price in the form shown in Exhibit "2" attached hereto.
3. A Maintenance Bond in an amount equal to ten percent (10%) of the total Contract price in the form shown in Exhibit "3" attached hereto.

### 13.02 POWER OF ATTORNEY

All bonds shall be accompanied by a power of attorney from the surety company authorizing the person executing the bond to sign on behalf of the company. If the bonds are executed outside the State of California, all copies of the bonds must be countersigned by a California representative of the surety. The signature of the person executing the bond on behalf of Surety shall be acknowledged by a Notary Public as the signature of the person designated in the power of attorney.

### 13.03 APPROVED SURETY

All bonds must be issued by a California admitted surety insurer with the minimum A.M Best Company **Financial strength rating of "A: VII", or better. Bonds issued by a California admitted surety not listed on Treasury Circular 570 will be deemed accepted unless specifically rejected by the City.** Bonds issued from admitted surety insurers not listed in Treasury Circular 570 must be accompanied by all documents enumerated in California Code of Civil Procedure Section 995.660. All such bonds must be accompanied by a power of attorney from the surety company authorizing the person executing the bond to sign on behalf of the company. If the bonds are executed outside the State of California, all copies of the bonds must be countersigned by a California representative of the surety. The signature of the person executing the bond on behalf of Surety must be acknowledged by a Notary Public as the signature of the person designated in the power of attorney.

### 13.04 REQUIRED PROVISIONS

**Every bond must display the surety's bond number and incorporate the Contract for construction of the Work by reference.** The terms of the bonds shall provide that the surety agrees that no change, extension of time, alteration, or modification of the Contract Documents or the Work to be performed thereunder shall in any way affect its obligations and shall waive notice of any such change, extension of time, alteration, or modification of the Contract Documents.

### 13.05 NEW OR ADDITIONAL SURETIES

If, during the continuance of the Contract, any of the sureties, in the opinion of the City, are or become non-responsible or otherwise unacceptable to City, City may require other new or additional sureties, which the Contractor shall furnish to the satisfaction of City within ten (10) days after notice, and in default thereof the Contract may be suspended and the materials may be purchased or the Work completed as provided in Article 5 herein.

13.06 WAIVER OF MODIFICATIONS AND ALTERATIONS

No modifications or alterations made in the Work to be performed under the Contract or the time of performance shall operate to release any surety from liability on any bond or bonds required to be given herein. Notice of such events shall be waived by the surety.

13.07 APPROVAL OF BONDS

The Contract will not be executed by City nor the Notice to Proceed issued until the required bonds have been received and approved by City. City's decision as to the acceptability of all sureties and bonds is final. No substitution of the form of the documents will be permitted without the prior written consent of City.

[END OF ARTICLE]

## ARTICLE 14 - LABOR PROVISIONS

### 14.01 WORKING HOURS

- A. Work or activity of any kind shall be limited to the hours from 7:00 a.m. to 7:00 p.m. No construction noise shall be permitted between the hours of 7:00 p.m. and 7:00 a.m. of the next day.
- B. Work in excess of eight (8) hours per day, on Saturdays, Sundays, or on City holidays requires prior consent of the Director and is subject to Cost of Overtime Construction Inspection.
- C. Night, Sunday and Holiday Work. No Work shall be performed at night, Sunday, or the ten (10) legal holidays **to wit: New Year's Day, Martin Luther King, Jr. Day, President's Day, Cesar Chavez Day, Memorial Day, Independence Day, Labor Day, Indigenous People's Day, Veteran's Day, Thanksgiving Day, Christmas Eve, Christmas Day and New Year's Eve**, except Work pertaining to the public safety or with the permission of the Director, and accordance with such regulations as he/she shall furnish in writing. Before performing any Work at said times, except Work pertaining to the public safety, the Contractor shall give written notice to the Director so that proper inspection **may be provided**. **"Night" as used in this paragraph shall be deemed to include the hours from 7:00 P.M. to 7:00 A.M. of the next succeeding day.**

### 14.02 COST OF OVERTIME CONSTRUCTION SERVICES AND INSPECTIONS

- A. Overtime construction Work performed at the option of, or for the convenience of, the Contractor will be inspected by the City at the expense of the Contractor. For any such overtime beyond the regular 8-hour day and for any time worked on Saturday, Sunday, or holidays the charges will be determined by the City, and submitted to the Contractor for payment.
- B. Equipment, materials, or services provided by the City, in connection with Contractor-initiated overtime construction Work described in Paragraph 14.02(A), will also be at the expense of the Contractor. The charges will be determined by the City, and submitted to the Contractor for payment.
- C. There will be no charges to the Contractor for the inspection of overtime Work ordered by the Director or required by the Contract Documents.

### 14.03 COMPLIANCE WITH STATE LABOR CODE

- A. Contractor shall comply with the provisions of the Labor Code of the State of California and any amendments thereof.
  - 1. The time of service of any worker employed upon the Work shall be limited and restricted to eight (8) hours during any one-calendar day, and 40 hours during any one-calendar week.
  - 2. Work performed by employees of the Contractor in excess of eight (8) hours per day, and 40 hours during any one calendar week, shall be permitted upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.
  - 3. The Contractor and every Subcontractor shall keep an accurate record showing the name of and the actual hours worked each calendar day and each calendar week by each worker employed by him/her in connection with the Work; the record shall be kept open at all reasonable hours to the inspection of the City and to the Division of Labor Standards Enforcement of the State of California.

4. In the event City deems Contractor is in violation of this Paragraph 14.03, the Contractor shall, as a penalty, forfeit Fifty Dollars (\$50.00) for each worker employed in the execution of the Contract by the Contractor or by any Subcontractor for each calendar day for which the employee was underpaid in addition to an amount sufficient to recover underpaid wages. For each subsequent violation, a (one hundred dollar) \$100 penalty shall apply for each underpaid employee for each pay period for which the employee was underpaid in addition to an amount sufficient to cover underpaid wages. This subparagraph is effective to the extent it does not directly conflict with the overtime penalty provision of California Labor Code Section 558. In the event of such conflict, the California Labor Code governs over this Paragraph 14.03(A)(4).

#### 14.04 WAGE RATES

##### A. Prevailing Wages

1. Contractor shall comply with the general prevailing rates of per diem wages and the general prevailing rates for holiday and overtime Work in the locality in which the Work is to be performed, for each craft, classification, or type of worker needed to execute the Contract. The Director of the Department of Industrial Relations of the State of California (pursuant to California Labor Code) and the United States Secretary of Labor (pursuant to the Davis-Bacon Act) have determined the general prevailing rates of wages in the locality in which the Work is to be performed. The rates are available online at [www.dir.ca.gov/DLSR/PWD/](http://www.dir.ca.gov/DLSR/PWD/). To the extent that there are any differences in the federal and state prevailing wage rates for similar classifications of labor, the Contractor and its Subcontractors shall pay the highest wage rate.
2. The Contractor shall post a copy of the general prevailing rate of per diem wages at the job site.
3. The Contractor and any Subcontractor under him/her shall pay not less than the specified prevailing rate of wages to all workers employed in the execution of the Contract.
4. The holidays upon which such rates shall be paid shall be all holidays recognized in the collective bargaining Contract applicable to the particular craft, classification, or type of worker employed on the project.
5. The Contractor shall, as a penalty to the State or the City, forfeit not more than Fifty Dollars (\$50) for each calendar day, or portion thereof, for each worker paid less than the prevailing rates for the Work or craft in which the worker is employed under the Contract by the Contractor or by any Subcontractor under him. The difference between the prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which such worker was paid less than the stipulated prevailing wage rate shall be paid to such worker by the Contractor.
6. The specified wage rates are minimum rates only and the City will not consider and shall not be liable for any claims for additional compensation made by the Contractor because of payment by him/her of any wage rate in excess of the general prevailing rates. All disputes in regard to the payment of wages in excess of those specified herein shall be adjusted by the Contractor at his/her own expense.

##### B. Payroll Records

1. Pursuant to California Labor Code Section 1776, the Contractor and each Subcontractor shall keep an accurate payroll record, showing the name, address, social security number, Work classification, straight time and overtime hours worked each day and week, and the actual per

diem wages paid to each journeyman, apprentice, worker or other employee employed in connection with the Work. The payroll records shall be certified and shall be available for inspection.

2. The Contractor shall inform the City of the location of the payroll records, including the street address, city and county, and shall, within five (5) Working Days, provide a notice of change in location and address.
3. Upon request by the Director, the Contractor shall provide a copy of the certified payroll records along with a statement of compliance.

#### 14.05 APPRENTICESHIP STANDARDS

- A. Compliance with California Labor Code Section 1777.5 requires all public works contractors and subcontractors to:
  1. Prior to commencing work on a public works contract, submit Contract Award information to the applicable joint apprenticeship committee, including an estimate of the journeyman hours to be performed under the Contract, the number of apprentices to be employed, and the approximate dates the apprentices will be employed. Use Form DAS-140 from the State Department of Industrial Relations. The City reserves the right to require Contractor and Subcontractors to submit a copy of said forms to the City.
  2. Employ apprentices for the public work at a ratio of no less than one (1) hour or apprentice work for every five (5) hours or labor performed by a journeyman. To request dispatch of apprentices, use Form DAS-142 from the State Department of Industrial Relations. The City reserves the right to require Contractor and Subcontractors to submit a copy of said forms to the City.
  3. Pay the apprentice rate on public works projects only to those apprentices who are registered, as defined in Labor Code Section 3077.
  4. Contribute to the training fund in the amount identified in the Prevailing Wage Rate publication for journeyman and apprentices. Contractors who choose not to contribute to the local training trust fund must make their contributions to the California Apprenticeship Council, P.O. Box 420603, San Francisco, CA 94142.
- B. Failure to comply with the provisions of California Labor Code Section 1777.5 may result in the loss of the right to bid or perform work on all public works projects for a period of one to three years and the imposition of a civil penalty of One Hundred Dollars (\$100.00) for each calendar day of noncompliance for the first violation and up to Three Hundred Dollars (\$300.00) for each calendar day of noncompliance for a second or subsequent violation. Contractor should make a separate copy of this material for each of his/her Subcontractors.
- C. Payroll Records. The Contractor and each Subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman apprentice, worker or other employee employed in connection with the work. The payroll records shall be certified and shall be submitted to the Project Manager every two weeks.

- D. Statement of Employer Fringe Benefit Payments. Within five (5) calendar days of signing the Contract or Subcontract, as applicable, the Statement of Employer Payments (DLSE Form PW 26 from the State Department of Industrial Relations) shall be completed for each Contractor and Subcontractor of any tier who pays benefits to a third party trust, plan or fund for health and welfare benefits, vacation funds or makes pension contributions. The form must contain, for each worker classification, the fund, plan or trust name, address, administrator, the amount per hour contributed and the frequency of contributions. Training fund contributions shall also be reported in this form. City reserves the right to require Contractors and Subcontractors to submit a copy of said forms to the City.

14.06 EMPLOYMENT OF APPRENTICES

- A. In the performance of this Contract, the Contractor and any Subcontractor shall comply with the provisions concerning the employment of apprentices in the Labor Code of the State of California and any amendments thereof.
- B. In the event the Contractor or any Subcontractor willfully fails to comply with the aforesaid provisions of the Labor Code, such Contractor or Subcontractor shall be subject to the penalties for noncompliance in the Labor Code of the State of California and any amendments thereof.

14.07 REGISTRATION WITH THE STATE DEPARTMENT OF INDUSTRIAL RELATIONS

In the performance of this Contract, Contractor and/or any Subcontractor must be currently registered and qualified (including payment of any required fee) with the State Department of Industrial Relations pursuant to Labor Code section 1725.5. This project is subject to compliance monitoring and enforcement by the State Department of Industrial Relations.

14.08 CHARACTER OF WORKERS

The Contractor shall not allow his/her agents or employees, Subcontractors, or any agent or employee thereof, to trespass on premises or lands in the vicinity of the Work. Only skilled foremen and workers shall be employed on Work requiring special qualifications, and when required by the Director, the Contractor shall discharge any person who commits trespass, or in the opinion of the Director, acts in a disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable manner. Any employee being intoxicated or bringing or having intoxicating liquors or controlled substances on the Work shall be discharged. Such discharge shall not be the basis of any claim for compensation of damages against the City or any of its officers, agents, and employees.

14.09 NO SMOKING – STATE LABOR CODE SECTION 6404.5

The Contractor and its agents, employees, Subcontractors, representatives, and any person under **Contractor's control, are prohibited from smoking** in— or within a 20-foot distance from— the Site, which is a "place of employment" under California Labor Code § 6404.5.

[END OF ARTICLE]

## ARTICLE 15 - DISPUTE RESOLUTION

### 15.01 SUBMISSION OF CLAIMS

#### A. By Contractor

**Contractor's right to commence the Claims Dispute Resolution Process shall arise upon the Director's written response denying all or part of a Claim. Contractor shall submit a written Statement of Dispute to the Director within seven (7) Days after the Director rejects all or a portion of Contractor's Claim. Contractor's Statement of Dispute shall be signed under penalty of perjury and shall state with specificity the events or circumstances giving rise to the Claim, the dates of their occurrence and the effect, if any, on the compensation due or performance obligations of Contractor under the Construction Contract. Such Statement of Dispute shall include adequate supporting data to substantiate the disputed Claim. Adequate supporting data for a Claim relating to the adjustment of the Contractor's obligations relative to time of performance shall include a detailed, event-by-event description of the impact of each delay on Contractor's time for performance. Adequate supporting data to a Statement of Dispute submitted by Contractor involving Contractor's compensation shall include a detailed cost breakdown and supporting cost data in such form and including such detailed information and other supporting data as required to demonstrate the grounds for, and precise amount of, the Claim.**

#### B. By City

**City's right to commence the Claims Dispute Resolution Process shall arise at any time following the City's actual discovery of the circumstances giving rise to the Claim. Nothing contained herein shall preclude City from asserting Claims in response to a Claim asserted by Contractor. A Statement of Dispute submitted by City shall state the events or circumstances giving rise to the Claim, the dates of their occurrence and the damages or other relief claimed by City as a result of such events.**

#### C. Claims Defined

**The term "claims" as used herein shall be as defined in California Public Contract Code § 20104(b)(2).**

### 15.02 CLAIMS DISPUTE RESOLUTION PROCESS

The parties shall utilize each of the following steps in the Claims Dispute Resolution Process in the sequence they appear below. Each party shall participate fully and in good faith in each step in the Claims Dispute Resolution Process, which good faith effort shall be a condition precedent to the right of each party to proceed to the next step in the Claims Dispute Resolution Process.

#### A. Direct Negotiations

Designated representatives of City and Contractor shall meet as soon as possible (but not later than ten (10) Days after receipt of the Statement of Dispute) in a good faith effort to negotiate a resolution to the Claim. Each party shall be represented in such negotiations by an authorized representative with full knowledge of the details of the Claim or defenses being asserted by such party, and with full **authority to resolve such Claim then and there, subject only to City's right** and obligation to obtain City Council [or other City official] approval of any agreed settlement or resolution. In the Claim involves the assertion of a right or claim by a Subcontractor against Contractor that is in turn being asserted by Contractor against City, then such Subcontractor shall also have a representative attend such negotiations, with the same authority and knowledge as just described. Upon completion of the meeting, if the Claim is not resolved, the parties may either continue the negotiations or either party

may declare negotiations ended. All discussions that occur during such negotiations and all documents prepared solely for the purpose of such negotiations shall be confidential and privileged pursuant to California Evidence Code Sections 1119 and 1152.

B. Deferral of Claims

Following the completion of the negotiations required by Paragraph 15.02-A., all unresolved Claims, except those that do not involve parties other than the Contractor and City, shall be deferred pending Final Completion of the Work, **subject to City's right, in its sole and absolute discretion, to require that** the claims Dispute Resolution Process proceed prior to Final Completion. In the event that City does not elect to proceed with the Claims Dispute Resolution Process prior to Final Completion of the Work, all Claims that have been deferred until such Final Completion shall be consolidated within a reasonable time after such Final Completion and thereafter pursued to resolution pursuant to the Claims Dispute Resolution Process. Nothing contained in this Article 15 shall be interpreted as limiting the **parties' rights to continue informal negotiations of Claims that have been deferred until such Final Completion**; provided, however, that such informal negotiations shall not be interpreted as altering the provisions of this Article 15 deferring final determination and resolution of unresolved Claims until after Final Completion of the Work.

C. Legal Proceedings

If the Claim is not resolved by direct negotiations then the party wishing to further pursue resolution or determination of the Claim shall submit the Claim for determination by commencing legal proceedings in a court of competent jurisdiction.

15.03 NO WAIVER

Participation in the Claims Dispute Resolution Process shall not constitute a waiver, release or compromise of any defense of either party, including, without limitation, any defense based on the assertion that the rights of Contractor that are the basis of a Claim were previously waived by Contractor due to failure to comply with the **Contract Documents, including, without limitation, Contractor's failure to comply with any time periods for providing notices or for submission or supporting documentation of Claims.**

[END OF ARTICLE]

## ARTICLE 16 - ACCOUNTING RECORDS

### 16.01 MAINTENANCE OF RECORDS

Contractor shall keep, and shall include in its contracts with its Subcontractors, provisions requiring its Subcontractors to keep full and detailed books and records in accordance with the requirements of the Contract Documents, including the following: all information, materials and data of every kind and character (hard copy, as well as computer readable data if it exists), that have any bearing on or pertain to any matters, rights, duties or obligations relating to the Project or the performance of the Work, including, without limitation, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, change orders, change order requests, estimates, field orders, schedules, diaries, logs, reports, shop drawings, samples, exemplars, Drawings, Specifications, invoices, delivery tickets, receipts, vouchers, cancelled checks, memoranda; accounting records; job cost reports; job cost files (including complete documentation covering negotiated settlements); backcharge; general ledgers; documentation of cash and trade discounts earned; insurance rebates and dividends, and other documents relating in way to Claims or Change Orders, Construction Change Directives, Work Directives, or other claims for payment related to the Project asserted by Contractor **or any Subcontractor ("Accounting Records")**. Contractor shall exercise such controls as may be necessary for proper financial management of the Work. Such accounting and control systems shall comply with prevailing custom and practice for similar projects, be satisfactory to City and shall include preservation of such records for a period of five (5) years after approval of the Notice of Completion and Acceptance by City, or for such longer period as may be required by applicable laws.

### 16.02 ACCESS TO RECORDS

Contractor shall allow, and shall include in its contracts with its Subcontractors provisions requiring its Subcontractors to allow, City and its authorized representative(s), auditors, attorneys and accountants, upon twenty-four (24) hours notice to Contractor, full access to inspect and copy all books and records relating to the Project that Contractor is required to maintain pursuant to Paragraph 16.01, above.

### 16.03 CONTRACTOR NONCOMPLIANCE, WITHHOLDING

Contractor's compliance with Paragraphs 16.01 and 16.02, above, shall be a condition precedent to maintenance of any legal action or arbitration by Contractor against City. In addition to and without limitation upon City's other rights and remedies for breach, including any other provisions for withholding set forth in the Contract Documents, City shall have the right, exercised in its sole discretion, to withhold from any payment to Contractor due under a current Application for Payment an additional sum of up to ten percent (10%) of the total amount set forth in such Application for Payment, until Contractor and its Subcontractors have complied with any outstanding and unsatisfied request by City under this Article 16. Upon such compliance with this Article 16, any additional monies withheld pursuant to this Paragraph 16.03 shall be released to Contractor.

### 16.04 SPECIFIC ENFORCEMENT BY CITY

Contractor agrees that any failure by Contractor or any Subcontractor to provide access to its books and records as required by this Article 16 shall be specifically enforceable, by issuance of a preliminary and/or permanent mandatory injunction by a court of competent jurisdiction based on affidavits submitted to such court and without the necessity of oral testimony, to compel Contractor to permit access, inspection, audits and/or reproduction of such books and records or to require delivery of such books and records to City for inspection, audit and/or reproduction.

[END OF ARTICLE]

## ARTICLE 17-MISCELLANEOUS PROVISIONS

### 17.01 COMPLIANCE WITH APPLICABLE LAWS

#### A. Notices, Compliance

Contractor shall give all notices required by governmental authorities and comply with all applicable laws and lawful orders of governmental authorities, including but not limited to the provisions of the California Code of Regulations applicable to contractors performing construction and all laws, ordinances, rules, regulations and lawful orders relating to safety, prevailing wage and equal employment opportunities.

#### B. Taxes, Employee Benefits

Contractor shall pay at its own expense, at no cost to the City and without adjustment to the Contract Sum, all local, state and federal taxes, including, without limitation all sales, consumer, business license, use and similar taxes on materials, labor or other items furnished for the Work or portions thereof provided by Contractor or Subcontractors, all taxes arising out of its operations under the Contract Documents and all benefits, insurance, taxes and contributions for social security and unemployment insurance which are measured by wages, salaries or other remuneration paid to Contractor's employees. If under federal excise tax law any transaction hereunder constitutes a sale on which a federal excise tax is imposed and the sale is exempt from such excise tax because it is a sale to meat for its exclusive use, then City, upon request, will execute documents necessary to show that is a political subdivision of the State for the purposes of such exemption and that the sale is for the exclusive use of the City, in which case no excise tax for such materials shall be included in the Bid or Contract Sum.

#### C. Notice of Violations

Contractor shall immediately notify the City and Director in writing of any instruction received from the City, Director, Architect or other person or entity that, if implemented, would cause a violation of any applicable law or lawful order of a governmental authority. If Contractor fails to provide such notice, then Director shall be entitled to assume that such instruction is in compliance with applicable laws and lawful orders of governmental authorities. If Contractor observes that any portion of the Drawings and Specifications or Work are at variance with applicable laws or lawful orders of governmental authorities, or should Contractor become aware of conditions not covered by the Contract Documents which will result in Work being at variance therewith, Contractor shall promptly notify Director in writing. If, without such notice to Director, Contractor or any Subcontractor performs any Work which it knew, or through the exercise of reasonable care should have known, was contrary to lawful orders of governmental authorities or applicable laws, then Contractor shall bear all resulting losses at its own expense, at no cost to City and without adjustment to the Contract Sum.

### 17.02 OWNERSHIP OF DESIGN DOCUMENTS

#### A. Property of City

All Design Documents, Contract Documents and Submittals (including, without limitation, all copies thereof) and all designs and building designs depicted therein are and shall remain the sole and exclusive property of the City and the City shall solely and exclusively hold all copyrights thereto. **Without derogation the City's rights under this Paragraph, the Contractor and Subcontractors are**

granted a limited, non-exclusive license, revocable at will of City, to use and reproduce applicable portions of the Contract Documents and Submittals as appropriate to and for use in the execution of the Work and for no other purpose.

B. Documents on Site

Contractor shall keep on the Project site, at all times and for use by City, Director, Inspectors of Record and **City's Consultants, a complete set of the Contract Documents that have been approved by** applicable Governmental Authorities.

C. Delivery to City

All Design Documents, Contract Documents and Submittals in the possession of Contractor or Subcontractors shall be returned to the City upon the earlier of Final Completion or termination of the Construction Contract; provided, however, that Contractor and each Subcontractor shall have the right to retain one (1) copy of the Contract Documents and Submittals for its permanent records

D. Subcontractors

Contractor shall take all necessary steps to assure that a provision is included in all subcontracts with Subcontractors, of every tier, who perform Work on the Project establishing, protecting and preserving **the, City's** rights set forth in this Paragraph.

17.03 AMENDMENTS

The Contract Documents may be amended only by a written instrument duly executed by the parties or their respective successors or assigns.

17.04 WAIVER

Either party's waiver of any breach or failure to enforce any of the terms, covenants, conditions or other provisions of the Contract Documents at any time shall not in any way limit or waive that party's right thereafter to enforce or compel strict compliance with every term, covenant, condition or other provision, any course of dealing or custom of the trade notwithstanding. Furthermore, if the parties make and implement any interpretation of the Contract Documents without documenting such interpretation by an instrument in writing signed by both parties, such interpretation and implementation thereof will not be binding in the event of any future disputes.

17.05 INDEPENDENT CONTRACTOR

Contractor is an independent contractor, and nothing contained in the Contract Documents shall be construed as constituting any relationship with City other than that of Project owner and independent contractor. In no event shall the relationship between City and Contractor be construed as creating any relationship whatsoever between City and Contractor's employees. Neither Contractor nor any of its employees is or shall be deemed to be an employee of City. Except as otherwise specified in the Contract Documents, Contractor has sole authority and responsibility to employ, discharge and otherwise control its employees and has complete and sole responsibility as a principal for its agents, for all Subcontractors and for all other Persons that Contractor or any Subcontractor hires to perform or assist in performing the Work.

#### 17.06 SUCCESSORS AND ASSIGNS

The Contract Documents shall be binding upon and inure to the benefit of City and Contractor and their permitted successors, assigns and legal representatives.

- A. City may assign all or part of its right, title and interest in and to any Contract Documents, including rights with respect to the Payment and Performance Bonds, to (a) any other governmental person as permitted by governmental rules, provided that the successor or assignee has assumed all of City's obligations, duties and liabilities under the Contract Document then in effect; and (b) any other Person with the prior written approval of Contractor.
- B. Contractor may collaterally assign its rights to receive payment under the Contract Documents. Contractor may not delegate any of its duties hereunder, except to Subcontractors as expressly otherwise permitted in the Contract Documents. Contractor's assignment or delegation of any of its Work under the Contract Documents shall be ineffective to relieve Contractor of its responsibility for the Work assigned or delegated, unless City, in its sole discretion, has approved such relief from responsibility.

Any assignment of money shall be subject to all proper set-offs and withholdings in favor of City and to all deductions provided for in the Contract. All money withheld, whether assigned or not, shall be subject to being used by City for completion of the Work, should Contractor be in default.

- C. Except for the limited circumstances set forth in Paragraph 17.06-B, above, Contractor may not, without the prior written consent of City in its sole discretion, voluntarily or involuntarily assign, convey, transfer, pledge, mortgage or otherwise encumber its rights or interests under the Contract Documents. No partner, joint venturer, member or shareholder of Contractor may assign, convey, transfer, pledge, mortgage or otherwise encumber its ownership interest in Contractor without the **prior written consent of City, in City's sole discretion.**

#### 17.07 SURVIVAL

**Contractor's representations and warranties, the dispute resolution provisions** contained in Article 15, and all other provisions which by their inherent character should survive termination of the Contract and/or Final Acceptance, shall survive the termination of the Contract and the Final Acceptance Date.

#### 17.08 LIMITATION ON THIRD PARTY BENEFICIARIES

It is not intended by any of the provisions of the Contract Documents to create any third party beneficiary hereunder or to authorize anyone not a party hereto to maintain a suit for personal injury or property damage pursuant to the terms or provisions hereof, except to the extent that specific provisions (such as the warranty and indemnity provisions) identify third parties and state that they are entitled to benefits hereunder. The duties, obligations and responsibilities of the parties to the Contract Documents with respect to such third parties shall remain as imposed by law. The Contract Documents shall not be construed to create a contractual relationship of any kind between City and a Subcontractor or any other Person except Contractor.

#### 17.09 PERSONAL LIABILITY OF CITY EMPLOYEES

**City's authorized representatives are acting solely as agents and representatives of City when carrying out** the provisions of or exercising the power or authority granted to them under the Contract. They shall not be liable either personally or as employees of City for actions in their ordinary course of employment.

No agent, consultant, Council member, officer or authorized employee of City, shall be personally responsible for any liability arising under the Contract.

17.10 NO ESTOPPEL

City shall not, nor shall any officer thereof, be precluded or estopped by any measurement, estimate or certificate made or given by the City representative or other officer, agent, or employee of City under any provisions of the Contract from at any time (either before or after the final completion and acceptance of the Work and payment therefor) pursuant to any such measurement, estimate or certificate showing the true and correct amount and character of the work done, and materials furnished by Contractor or any person under the Contract or from showing at any time that any such measurement, estimate or certificate is untrue and incorrect, or improperly made in any particular, or that the work and materials, or any part thereof, do not in fact conform to the Contract Documents. Notwithstanding any such measurement, estimate or certificate, or payment made in accordance therewith, City shall not be precluded or estopped from recovering from Contractor and its **Sureties such damages as City may sustain by reason of Contractor's failure to comply or to have complied with the Contract Documents.**

17.11 GOVERNING LAW

The laws of the State of California govern the construction and interpretation of the Contract Documents, without regard to conflict of law principles. Unless the Contract Documents provide otherwise, any reference to laws, ordinances, rules, or regulations include their later amendment, modifications, and successor legislation. If Contractor or City brings a lawsuit to enforce or interpret one or more provisions of the Contract Documents, jurisdiction is in the Superior Court of the County of Los Angeles, California, or where otherwise appropriate, in the United States District Court, Central District of California. Contractor and City acknowledge that the Contract Documents were negotiated, entered into, and executed—and the Work was performed—in the City of Vernon, California.

17.12 FURTHER ASSURANCES

Contractor shall promptly execute and deliver to City all such instruments and other documents and assurances as are reasonably requested by City to further evidence the obligations of Contractor hereunder, including assurances regarding assignments of Subcontractors contained herein.

17.13 SEVERABILITY

If any clause, provision, section, paragraph or part of the Contract is ruled invalid by a court having proper jurisdiction, then the parties shall: (a) promptly meet and negotiate a substitute for such clause, provision, section, paragraph or part, which shall, to the greatest extent legally permissible, effect the original intent of the parties, including an equitable adjustment to the Contract Price to account for any change in the Work resulting from such invalidated portion; and (b) if necessary or desirable, apply to the court or other decision maker (as applicable) which declared such invalidity for an interpretation of the invalidated portion to guide the negotiations. The invalidity or unenforceability of any such clause, provision, section, paragraph or part shall not affect the validity or enforceability of the balance of the Contract, which shall be construed and enforced as if the Contract did not contain such invalid or unenforceable clause, provision, section, paragraph or part.

17.14 HEADINGS

The captions of the sections of the Contract are for convenience only and shall not be deemed part of the Contract or considered in construing the Contract.

17.15 ENTIRE AGREEMENT

The Contract Documents contain the entire understanding of the parties with respect to the subject matter hereof and supersede all prior agreements, understandings, statements, representations and negotiations between the parties with respect to its subject matter.

17.16 COUNTERPARTS

This instrument may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

[END OF ARTICLE]

EXHIBIT A1

Bond No.: \_\_\_\_\_  
Premium Amount: \$ \_\_\_\_\_  
Bond's Effective Date: \_\_\_\_\_

PERFORMANCE BOND

RECITALS:

1. The City of Vernon, California ("City"), has awarded to

\_\_\_\_\_  
(Name, address, and telephone of Contractor)

\_\_\_\_\_  
("Principal"), a Contact  
(the "Contract") for the Work described as follows:

Specification No. \_\_\_\_\_: \_\_\_\_\_ in Vernon, CA.

2. Principal is required under the terms of the Contract and all contract documents referenced in it ("Contract Documents") to furnish a bond guaranteeing Principal's faithful performance of the Work.
3. The Contract and Contract Documents, including all their amendments and supplements, are incorporated into this Bond and made a part of it by this reference.

OBLIGATION:

THEREFORE, for value received, We, Principal and

\_\_\_\_\_  
(Name, address, and telephone of Surety)

\_\_\_\_\_  
("Surety"), a duly  
admitted surety insurer under California's laws, agree as follows:

By this Bond, We jointly and severally obligate and bind ourselves, and our respective heirs, executors, administrators, successors, and assigns to pay City the penal sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) ("the Bonded Sum"), this amount comprising not less than the total Contract Sum, in lawful money of the United States of America.

The Licensed Agent for Surety is:

\_\_\_\_\_  
(Name, address, and telephone)

Registered Agent's California Department of Insurance License No. \_\_\_\_\_.

THE CONDITION OF THIS BOND'S OBLIGATION IS THAT, if Principal promptly and faithfully performs the undertakings, terms, covenants, conditions, and agreements in the Contract and Contract Documents (including all their amendments and supplements), all within the time and in the manner that those documents specify, then this obligation becomes null and void. Otherwise, this Bond remains in full force and effect, and the following terms and conditions apply to this Bond:

1. This Bond specifically guarantees Principal's performance of each obligation and all obligations under the Contract and Contract Documents, as they may be amended and supplemented including, but not limited to, Principal's liability for liquidated damages, Warranties, Guarantees, Correction, and Maintenance obligations as specified in the Contract and Contract Documents except that Surety's total obligation, as described here, will not exceed the Bonded Sum.

2. For those obligations of Principal that survive Final Completion of the Work described in the Contract and Contract Documents, the guarantees in this Bond also survive Final Completion of the Work.
3. When City declares that Principal is in default under the Contract, or Contract Documents, or both, Surety shall promptly: **(a) remedy the default; (b) complete the Project according to the Contract Documents' terms and conditions then in effect; or (c) using a procurement methodology approved by City, select a contractor or contractors acceptable to City to complete all of the Work, and arrange for a contract between the contractor(s) and City. Surety shall make available, as the Work progresses, sufficient funds to pay the cost of completion less the balance of the Contract Sum, and to pay and perform all obligations of Principal under the Contract and Contract Documents including other costs and damages for which Surety is liable under this Bond except that Surety's total obligation, as described here, will not exceed the Bonded Sum.**
4. An alteration, modification, change, addition, deletion, omission, agreement, or supplement to the Contract, Contract Documents, or the nature of the Work performed under the Contract or Contract Documents including, without limitation, an **extension of time for performance does not, in any way, affect Surety's obligations under this Bond. Surety waives any notice** of alteration, modification, change, addition, deletion, omission, agreement, supplement, or extension of time.
5. **Surety's obligations under this Bond are separate, independent from, and not contingent upon any other surety's guaranteeing Principal's faithful performance of the Work.**
6. No right of action accrues on this Bond to any entity other than City or its successors and assigns.
7. **If an action at law or in equity is necessary to enforce or interpret this Bond's terms, Surety must pay in addition to the Bonded Sum City's reasonable attorneys' fees and litigation costs, in an amount the court fixes.**
8. Surety shall mail City written notice at least 30 days before: (a) the effective date on which the Surety will cancel, terminate, or withdraw from this Bond; or (b) this Bond becomes void or unenforceable for any reason.

[Signatures to this Exhibit A1, Performance Bond, Begin on Next Page].

On the date set forth below, Principal and Surety duly executed this Performance Bond, with the name of each party appearing below and signed by its representative(s) under the authority of its governing body.

Date: \_\_\_\_\_

PRINCIPAL:

SURETY:

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

By: \_\_\_\_\_  
(Name and Title)

By: \_\_\_\_\_  
(Name and Title)

Address for Serving Notices or Other Documents:

Address for Serving Notices or Other Documents:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

CORPORATE SEAL

CORPORATE SEAL

- THIS BOND MUST BE EXECUTED IN DUPLICATE.
- EVIDENCE MUST BE ATTACHED OF THE AUTHORITY OF ANY PERSON SIGNING AS ATTORNEY-IN-FACT.
- THE ATTORNEY-IN-FACT'S SIGNATURE MUST BE NOTARIZED.
- A CORPORATE SEAL MUST BE IMPRESSED ON THIS FORM WHEN THE PRINCIPAL, OR THE SURETY, OR BOTH, ARE A CORPORATION.

APPROVED AS TO SURETY AND  
AMOUNT OF BONDED SUM:

APPROVED AS TO FORM:

By: \_\_\_\_\_  
Abraham Alemu, General Manager of Public Utilities

By: \_\_\_\_\_  
Zaynah N. Moussa, Interim City Attorney

BOND ACKNOWLEDGMENT

FOR  
SURETY'S ATTORNEY-IN-FACT

STATE OF CALIFORNIA            )  
  ) ss  
COUNTY OF \_\_\_\_\_ )

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_,  
before me, \_\_\_\_\_(name), a Notary Public for said County, personally  
appeared \_\_\_\_\_(name), who proved to me on the basis of  
satisfactory evidence to be the person whose name is subscribed to this instrument as the attorney in fact of  
\_\_\_\_\_, and acknowledged to me that he/she subscribed the  
name of \_\_\_\_\_ thereto as principal, and his/he own name as  
attorney in fact.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true  
and correct.

\_\_\_\_\_  
Notary Public

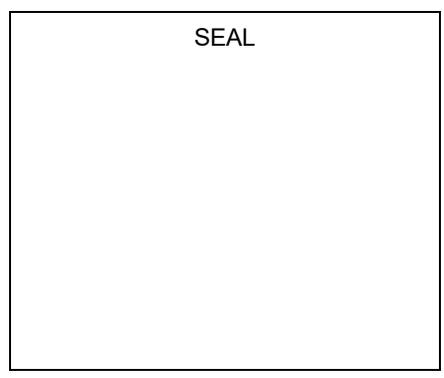


EXHIBIT A2

Bond No.: \_\_\_\_\_  
Premium Amount: \$ \_\_\_\_\_  
Bond's Effective Date: \_\_\_\_\_

PAYMENT BOND  
(LABOR AND MATERIALS)

RECITALS:

1. The City of Vernon, California ("City"), has awarded to

\_\_\_\_\_  
(Name, address, and telephone of Design-Builder)

\_\_\_\_\_  
("Principal"), a  
Contract (the "Contract") for the Work described as follows:

Specification No. \_\_\_\_\_: \_\_\_\_\_ in Vernon, CA.

2. Principal is required under California Civil Code Sections 9550-9566 and the terms of the Contract and all contract documents **referenced in it ("Contract Documents") to furnish a bond guaranteeing Principal's paying claims, demands, liens, or suits** for any work, labor, services, materials, or equipment furnished or used in the Work.
3. The Contract and Contract Documents, including all their amendments and supplements, are incorporated into this Bond and made a part of it by this reference.

OBLIGATION:

THEREFORE, for value received, We, Principal and

\_\_\_\_\_  
(Name, address, and telephone of Surety)

\_\_\_\_\_  
("Surety"), a duly  
admitted surety insurer under California's laws, agree as follows:

By this Bond, We jointly and severally obligate and bind ourselves, and our respective heirs, executors, administrators, successors, and assigns to pay City the penal sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) ("the Bonded Sum"), this amount comprising not less than the total Contract Sum, in lawful money of the United States of America.

The Licensed Agent for Surety is:

\_\_\_\_\_  
(Name, address, and telephone)

Registered Agent's California Department of Insurance License No. \_\_\_\_\_.

**THE CONDITION OF THIS BOND'S OBLIGATION IS THAT, if Principal or a subcontractor fails to pay (a) any person named in California Civil Code Section 9100, or any successor legislation; (b) any amount due under California's Unemployment Insurance Code, or any successor legislation, for work or labor performed under the Contract or Contract Documents; or (c) any amount under Unemployment Insurance Code Section 13020, or any successor legislation, that Principal or a subcontractor must deduct, withhold, and pay over to the Employment Development Department from the wages of its employees, for work or labor performed under the Contract or Contract Documents, then Surety shall pay for the same in an amount not-to-exceed the Bonded Sum. Otherwise, this obligation becomes null and void. While this Bond remains in full force and effect, the following terms and conditions apply to this Bond:**

1. This Bond inures to the benefit of any of the persons named in California Civil Code Section 3181, or any successor legislation, giving those persons or their assigns a right of action in any suit brought upon this Bond, unless California Civil Code Section 3267, or any successor legislation, applies.
2. An alteration, modification, change, addition, deletion, omission, agreement, or supplement to the Contract, Contract Documents, or the nature of the Work performed under the Contract or Contract Documents including, without limitation, an **extension of time for performance does not, in any way, affect Surety's obligations under this Bond. Surety waives any notice** of alteration, modification, change, addition, deletion, omission, agreement, supplement, or extension of time.
3. **Surety's obligations under this Bond are separate, independent from, and not contingent upon any other surety's paying** claims, demands, liens, or suits for any work, labor, services, materials, or equipment furnished or used in the Work.
4. **If an action at law or in equity is necessary to enforce or interpret this Bond's terms, Surety must pay in addition to the Bonded Sum City's reasonable attorneys' fees and litigation costs, in an amount the court fixes.**
5. Surety shall mail City written notice at least 30 days before: (a) the effective date on which the Surety will cancel, terminate, or withdraw from this Bond; or (b) this Bond becomes void or unenforceable for any reason.

[Signatures to this Exhibit A2, Payment Bond, Begin on Next Page].

On the date set forth below, Principal and Surety duly executed this Payment Bond, with the name of each party appearing below and signed by its representative(s) under the authority of its governing body.

Date: \_\_\_\_\_

PRINCIPAL:

SURETY:

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

By: \_\_\_\_\_  
(Name and Title)

By: \_\_\_\_\_  
(Name and Title)

Address for Serving Notices or Other Documents:  
\_\_\_\_\_  
\_\_\_\_\_

Address for Serving Notices or Other Documents:  
\_\_\_\_\_  
\_\_\_\_\_

CORPORATE SEAL

CORPORATE SEAL

- *THIS BOND MUST BE EXECUTED IN DUPLICATE.*
- *EVIDENCE MUST BE ATTACHED OF THE AUTHORITY OF ANY PERSON SIGNING AS ATTORNEY-IN-FACT.*
- *THE ATTORNEY-IN-FACT'S SIGNATURE MUST BE NOTARIZED.*
- *A CORPORATE SEAL MUST BE IMPRESSED ON THIS FORM WHEN THE PRINCIPAL, OR THE SURETY, OR BOTH, ARE A CORPORATION.*

APPROVED AS TO SURETY AND  
AMOUNT OF BONDED SUM:

APPROVED AS TO FORM:

By: \_\_\_\_\_  
Abraham Alemu, General Manager of Public Utilities

By: \_\_\_\_\_  
Zaynah N. Moussa, Interim City Attorney

BOND ACKNOWLEDGMENT  
FOR  
SURETY'S ATTORNEY-IN-FACT

STATE OF CALIFORNIA            )  
  ) ss  
COUNTY OF \_\_\_\_\_ )

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_,  
before me, \_\_\_\_\_(name), a Notary Public for said County, personally  
appeared \_\_\_\_\_(name), who proved to me on the basis of  
satisfactory evidence to be the person whose name is subscribed to this instrument as the attorney in fact of,  
and acknowledged to me that he/she subscribed the name of \_\_\_\_\_ thereto  
as principal, and his/he own name as attorney in fact.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true  
and correct.

\_\_\_\_\_  
Notary Public

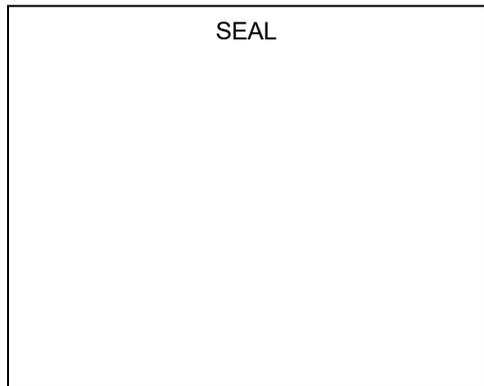


EXHIBIT A3

Bond No.: \_\_\_\_\_  
Premium Amount: \$ \_\_\_\_\_  
Bond's Effective Date: \_\_\_\_\_

MAINTENANCE BOND

RECITALS:

1. The City of Vernon, California ("City"), has awarded to

\_\_\_\_\_  
(Name, address, and telephone of Contractor) \_\_\_\_\_ ("Principal"),

a Contract (the "Contract") for the Work described as follows:

Specification No. \_\_\_\_\_ : \_\_\_\_\_ in Vernon, CA.

2. Principal is required under the terms of the Contract— and all contract documents referenced in it ("Contract Documents")— after completion of the Work and before the filing and recordation of a Notice of Completion for the Work, to furnish a bond to secure claims for Maintenance equal to ten percent (10%) of the total amount of the Contract Which shall hold good for a **period of one (1) year from the date the City's Notice of Completion and Acceptance of the Work is filed with the County Recorder**, to protect the City against the result of faulty material or workmanship during that time.
3. The Contract and Contract Documents, including all their amendments and supplements, are incorporated into this Bond and made a part of it by this reference.

OBLIGATION:

THEREFORE, for value received, We, Principal and

\_\_\_\_\_  
(Name, address, and telephone of Surety) \_\_\_\_\_ ("Surety"), a duly  
admitted surety insurer under California's laws, agree as follows:

By this Bond, We jointly and severally obligate and bind ourselves, and our respective heirs, executors, administrators, successors, and assigns to pay City the penal sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) ("the Bonded Sum"), this amount comprising not less than ten percent (10%) of the total Contract Sum, in lawful money of the United States of America.

The Licensed Agent for Surety is:

\_\_\_\_\_  
(Name, address, and telephone)

Registered Agent's California Department of Insurance License No. \_\_\_\_\_.

**THE CONDITION OF THIS BOND'S OBLIGATION IS THAT** if the said Principal or any of his or her or its subcontractors, or the heirs, executors, administrators, successors, or assigns or assigns of any, all, or either of them, shall fail to execute within a reasonable amount of time, or fail to respond within seven (7) days with a written schedule acceptable to the City for same, repair or replacement of any and all Work, together with any other adjacent Work which may be displaced by so doing, that proves to be defective in its workmanship or material for the period of one (1) year (except when otherwise required in the Contract to be for a longer period) from **the date the City's Notice of Completion and Acceptance, or equivalent, is filed with the County Recorder, ordinary wear and tear and unusual abuse or neglect** excepted with respect to such Work and labor, the Surety herein shall pay for the same, in an amount not exceeding the sum specified in this Bond.

1. When City declares that Principal is in default under the Contract, or Contract Documents, or both, Surety shall promptly

remedy the default using a procurement methodology approved by City, select a contractor or contractors acceptable to City to complete all of the Work, and arrange for a contract between the contractor(s) and City. Surety shall make available sufficient funds to pay the cost of repair or replacement of any and all Work and to pay and perform all obligations of Principal under the Contract and Contract Documents including other costs and damages for which Surety is liable under this Bond **except that Surety's total obligation, as described here, will not exceed the Bonded Sum.**

2. Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.
3. Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of said Contract or to the Work to be performed thereunder or the specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration, or addition.
4. **Surety's obligations under this Bond are separate, independent from, and not contingent upon any other surety's guaranteeing Principal's faithful performance of the Work.**
5. No right of action accrues on this Bond to any entity other than City or its successors and assigns.
6. **If an action at law or in equity is necessary to enforce or interpret this Bond's terms, Surety must pay, in addition to the Bonded Sum, City's reasonable attorneys' fees and litigation costs, in an amount the court fixes.**
7. Surety shall mail City written notice at least 30 days before: (a) the effective date on which the Surety will cancel, terminate, or withdraw from this Bond; or (b) this Bond becomes void or unenforceable for any reason.
8. Death of the Principal shall not relieve Surety of its obligations hereunder.

[Signatures to this Exhibit A3, Maintenance Bond, Begin on Next Page].

On the date set forth below, Principal and Surety duly executed this Maintenance Bond, with the name of each party appearing below and signed by its representative(s) under the authority of its governing body.

Date: \_\_\_\_\_

PRINCIPAL:

SURETY:

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

By: \_\_\_\_\_  
(Name and Title)

By: \_\_\_\_\_  
(Name and Title)

Address for Serving Notices or Other Documents:

Address for Serving Notices or Other Documents:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

CORPORATE SEAL

CORPORATE SEAL

- 
- *THIS BOND MUST BE EXECUTED IN DUPLICATE.*
  - *EVIDENCE MUST BE ATTACHED OF THE AUTHORITY OF ANY PERSON SIGNING AS ATTORNEY-IN-FACT.*
  - *THE ATTORNEY-IN-FACT'S SIGNATURE MUST BE NOTARIZED.*
  - *A CORPORATE SEAL MUST BE IMPRESSED ON THIS FORM WHEN THE PRINCIPAL, OR THE SURETY, OR BOTH, ARE A CORPORATION.*
- 

APPROVED AS TO SURETY AND  
AMOUNT OF BONDED SUM:

APPROVED AS TO FORM:

By: \_\_\_\_\_  
Abraham Alemu, General Manager of Public Utilities

By: \_\_\_\_\_  
Zaynah N. Moussa, Interim City Attorney

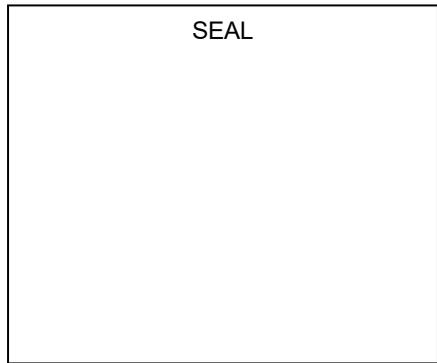
BOND ACKNOWLEDGMENT  
FOR  
SURETY'S ATTORNEY-IN-FACT

STATE OF CALIFORNIA            )  
  ) ss  
COUNTY OF                     )

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_,  
before me, \_\_\_\_\_(name), a Notary Public for said County, personally  
appeared \_\_\_\_\_(name), who proved to me on the basis of  
satisfactory evidence to be the person whose name is subscribed to this instrument as the attorney in fact of  
\_\_\_\_\_, and acknowledged to me that he/she subscribed the  
name of \_\_\_\_\_ thereto as principal, and his/he own name as  
attorney in fact.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true  
and correct.

\_\_\_\_\_  
Notary Public



## EXHIBIT A4

### INSURANCE REQUIREMENTS

#### 1.0 REQUIRED INSURANCE POLICIES

At its own expense, Contractor shall obtain, pay for, and maintain – and shall require each of its Subcontractors to obtain and maintain – for the duration of the Agreement, policies of insurance meeting the following requirements:

A. **Workers' Compensation/Employer's Liability Insurance shall provide workers' compensation statutory benefits as required by law.**

1. **Employer's Liability insurance shall be in an amount not less than:**

- (a) ONE MILLION DOLLARS (\$1,000,000) per accident for bodily injury or disease;
- (b) ONE MILLION DOLLARS (\$1,000,000) per employee for bodily injury or disease; and
- (c) ONE MILLION DOLLARS (\$1,000,000) policy limit.

B. **Commercial General Liability ("CGL") (primary). City and its employees and agents shall be added as additional insureds, not limiting coverage for the additional insured to "ongoing operations" or in any way excluding coverage for completed operations. Coverage shall apply on a primary, non-contributing basis in relation to any other insurance or self-insurance, primary or excess, available to City or any employee, representative or agent of City. Coverage shall not be limited to the vicarious liability or supervisory role of any additional insured. Coverage shall contain no contractors' limitation or other endorsement limiting the scope of coverage for liability arising from explosion, collapse, or underground property damage.**

1. CGL insurance must not be written for less than the limits of liability specified as follows:

- (a) TWO MILLION DOLLARS (\$2,000,000) per occurrence for bodily injury (including accidental death) to any one person;
- (b) TWO MILLION DOLLARS (\$2,000,000) per occurrence for personal and advertising injury to any one person;
- (c) TWO MILLION DOLLARS (\$2,000,000) per occurrence for property damage; and
- (d) FOUR MILLION DOLLARS (\$4,000,000) general aggregate limit.

2. CGL insurance must include all major divisions of coverage and must cover:

- (a) Premises Operations (including Explosion, Collapse, and **Underground ["X,C,U"]** coverages as applicable);
- (b) **Independent Contractor's Protective;**

(c) Independent Contractors;

- (d) Products and Completed Operations (maintain same limits as above until five (5) years after recordation of Notice of Completion);
- (e) **Personal and Advertising Injury (with Employer's Liability Exclusion deleted);**
- (f) **Contractual Liability (including specified provision for Contractor's obligation under Article 11 of the General Conditions);** and
- (g) Broad Form Property Damage.

3. Umbrella or Excess Liability Insurance (over primary), if provided, shall be at least as broad **as any underlying coverage. Coverage shall be provided on a "pay on behalf" basis, with** defense costs payable in addition to policy limits. There shall be no cross liability exclusion **and no contractor's limitation endorsement. The policy shall** have starting and ending dates concurrent with the underlying coverages. The Named Insured may determine the layering of primary and excess liability insurance provided that if such layering differs from that described here, the actual coverage program meets the minimum total required limits and complies with all other requirements listed here.

C. Business Automobile Liability Insurance

1. Business Automobile Liability Insurance must cover all vehicles, whether rented, leased, hired, scheduled, owned or non-owned. If Contractor does not own any vehicles, this requirement may be satisfied by a non-owned vehicle endorsement to the general and umbrella liability policies. Business Automobile Liability Insurance coverage amounts shall not be less than the following:
- (a) TWO MILLION DOLLARS (\$2,000,000) per occurrence for bodily injury (including accidental death) to any one person; and
  - (b) TWO MILLION DOLLARS (\$2,000,000) per occurrence for property damage; or
  - (c) TWO MILLION DOLLARS (\$2,000,000) combined single limit.

D. Contractors Pollution Liability Insurance (CPL)

1. Contractor or Subcontractor shall obtain, pay for, and maintain for the duration of the Contract Contractors Pollution Liability insurance that provides coverage for liability caused by pollution conditions arising out of the operations of the Contractor. Coverage shall be included on behalf of the insured for covered claims arising out of the actions of independent contractors. If the insured is using Subcontractors, the policy must include work performed **"by or on behalf" of the insured.**
2. The policy limit shall provide coverage of no less than one million dollars (\$1,000,000) per claim and in the aggregate. Coverage shall apply to bodily injury; property damage, including loss of use of damaged property or of property that has not been physically injured; cleanup costs; and costs of defense, including costs and expenses incurred in the

investigation, defense, or settlement of claims.

3. All activities contemplated in the Contract shall be specifically scheduled on the CPL policy as **“covered operations.”** In addition, the policy shall provide coverage for the hauling of waste from the Project site to the final disposal location, including non-owned disposal sites.
4. The policy shall specifically provide for a duty to defend on the part of the insurer. City, its officers, employees and agents shall be added to the policy as additional insureds by endorsement.

E. **Builder’s Risk Insurance**

1. **Builder’s Risk Insurance covering all real and personal property for “all risks” of loss or “comprehensive perils” coverage including but not limited to the perils of earth movement** including earthquake and flood for all buildings, structures, fixtures, materials, supplies, machinery and equipment to be used in or incidental to the construction at the site, off site, or in transit, for the full replacement value of such properties. Coverage shall be included for property of others in the care, custody or control of the insured for which any insured may be **liable. The City will purchase a builder’s risk policy for the Project instead of a contractor purchased policy.** Bidder should not include cost for this coverage in his/her bid.

2.0 GENERAL REQUIREMENTS—ALL POLICIES

A. Qualifications of Insurer. **At all times during the term of this Contract, Contractor’s insurance company must meet all of the following requirements:**

1. **“Admitted” insurer by the State of California Department of Insurance or be listed on the California Department of Insurance’s “List of Surplus Line Insurers” (“LESLI”);**
2. Domiciled within, and organized under the laws of, a State of the United States; and
3. **Carry an A.M. Best & Company minimum rating of “A:VII”.**

B. Continuation Coverage. For insurance coverages that are required to remain in force after the Final Payment, and if reasonably available, Contractor shall submit to City, with the final Application for Payment, all certificates and additional insured endorsements evidencing the continuation of such coverage.

C. Deductibles or Self-Insured Retentions. All deductibles or self-insured retentions are subject to **City’s review and approval, in its sole discretion.**

D. Commercial General Liability and Business Automobile insurance policies must be written on an **“occurrence”** basis and must add the City of Vernon and its officers, agents, employees and representatives as additional insureds.

E. **Contractor’s Insurance Primary.** Other insurance (whether primary, excess, contingent or self-insurance, or any other basis) available to City, or its representatives, or both, is **excess over Contractor’s insurance. City’s insurance, or self-insurance, or both, will not contribute with Contractor’s insurance policy.**

F. **Waiver of Subrogation.** **Contractor and Contractor’s insurance company waive—** and shall not exercise— any right of recovery or subrogation that Contractor or the insurer may have against City, or its representatives, or both.

G. **Separation of Insureds.** Contractor's insurance policy applies separately to each insured or additional insured who is seeking coverage, or against whom a claim is made or suit is brought, except that the naming of multiple insureds will not increase an insurance company's limits of liability.

H. **Claims by Other Insureds.** Contractor's insurance policy applies to a claim or suit brought by an additional insured against a Named Insured or other insured, arising out of bodily injury, personal injury, advertising injury, or property damage.

I. **Premiums.** City is not liable for a premium payment or another expense under Contractor's policy

J. At any time during the duration of this Contract, City may do any one or more of the following:

1. Review this **Agreement's insurance coverage requirements;**
2. **Require that Contractor obtain, pay for, and maintain more insurance depending on City's assessment of any one or more of the following factors:**
  - (a) **City's risk of liability or exposure arising out of, or in any way connected with, the services of Contractor under this Agreement;**
  - (b) The nature or number of accidents, claims, or lawsuits arising out of, or in any way connected with, the services of Contractor under this Agreement; or
  - (c) The availability, or affordability, or both, of increased liability insurance coverage.
3. Obtain, pay for, or maintain a bond (as a replacement for an insurance coverage) from a California corporate surety, guaranteeing payment to City for liability, or costs, or both, **that City incurs during City's investigation, administration, or defense of a claim or a suit arising out of this Agreement;** or

K. **Contractor shall maintain the insurance policy without interruption, from the Project's commencement date to the Final Payment date, or until a date that City specifies for any coverage that Contractor must maintain after the Final Payment.**

L. Contractor shall not allow any insurance to expire, cancel, terminate, lapse, or non-renew. **Contractor's insurance company shall mail City written notice at least thirty (30) days in advance of the policy's cancellation, termination, non-renewal, or reduction in coverage and ten (10) days before its insurance policy's expiration, cancellation, termination, or non-renewal, Contractor shall deliver to City evidence of the required coverage as proof that Contractor's insurance policy has been renewed or replaced with another insurance policy which, during the duration of this Agreement, meets all of this Agreement's insurance requirements.**

M. **At any time, upon City's request, Contractor shall furnish satisfactory proof of each type of insurance coverage required— including a certified copy of the insurance policy or policies; certificates, endorsements, renewals, or replacements; and documents comprising Contractor's self-insurance program— all in a form and content acceptable to the City Attorney or City's Risk Manager.**

N. If Contractor hires, employs, or uses one or more Subcontractor(s) to perform work, services, operations, or activities on Contractor's behalf, **Contractor shall ensure that the Subcontractor complies with the following.**

1. **Meets, and fully complies with, this Agreement's insurance requirements; and**

2. Furnishes City at any time upon its request, with a complete copy of the **Subcontractor's insurance policy or policies for City's review, or approval, or both**. Failure of City to request copies of such documents shall not impose any liability on City, or its employees.

O. **Contractor's failure to comply with an insurance provision** in this Agreement constitutes a material breach upon which City may immediately terminate or suspend Contractor's performance of this Agreement, or invoke another remedy that this Agreement or the law allows. At its discretion and without waiving any other rights it may have pursuant to law, City has the right but not a duty to obtain or renew the insurance and pay all or part of the premiums. Upon demand, Contractor shall repay City for all sums or monies that City paid to obtain, renew, or reinstate the insurance, or City may offset the cost of the premium against any sums or monies that City may owe Contractor.

### 3.0 CONTRACTOR'S SUBMITTAL OF CERTIFICATES AND ENDORSEMENTS

A. Contractor shall have its insurance carrier(s) or self-insurance administrator(s) complete and execute the following insurance documents and shall deliver said documents at the same time Contractor delivers this Agreement to City. City will neither sign **this Agreement nor issue a "Notice to Proceed"** until the City Attorney or **City's Risk Manager** has reviewed and approved all insurance documents. City's decision as to the acceptability of all insurance documents is final. Sample insurance documents in the **City's approved format are set forth in this 4.**

B. Required Submittals for Commercial General Liability and Business Automobile Insurance and **Contractor's Pollution Liability Insurance**. **The following submittals must be on forms satisfactory to the City Attorney or City's Risk Manager, and signed by the insurance carrier or its authorized representative – which fully meet the requirements of, and contain provisions entirely consistent with, all of the insurance requirements set forth herein.**

1. "Certificate of Insurance"
2. "Additional Insured Endorsement"
3. Subrogation Endorsement: "Waiver of Transfer to Rights of Recover Against Others"

**Both Certificates of Insurance and Additional Insured Endorsements must read as follows: "The City of Vernon, and its officers, agents, employees and representatives are included as additional insureds under the policy(s). This insurance is primary to all other insurance of the City. The City's insurance and self-insurance will apply in excess of, and will not contribute with this insurance. This insurance applies separately to each insured or additional insured who is seeking coverage, or against whom a claim is made or a suit is brought. The issuing company shall mail thirty (30) days advance notice to the City for any policy cancellation, termination, non-renewal, or reduction in coverage."**

C. **Required Submittals for Workers' Compensation Insurance.** Contractor shall provide City with a **certificate of insurance and a subrogation endorsement on forms satisfactory to the City Attorney or City's Risk Manager, and signed by the insurance carrier or its authorized representative – which fully meet the requirements of, and contain provisions entirely consistent with, this Contract's workers compensation insurance requirements. If Contractor is self-insured for workers' compensation, a copy of the "Certificate of Consent to Self-insure" from the State of California is required; or if Contractor is lawfully exempt from workers' compensation laws, an "Affirmation of Exemption from Labor Code §3700" form is required.**

D. **Required Evidence of Builder's Risk Coverage.** City will provide a **certificate of insurance and a declarations page on a form satisfactory to the City Attorney or City's Risk Manager, and signed by the insurance carrier or its authorized representative. The policy terms must fully meet the requirements of, and contain provisions entirely consistent with, all of the insurance requirements set forth herein. The City shall be named as a loss payee on the insurance policy for the full replacement value of all buildings, structures, fixtures and materials to be constructed, maintained, repaired or supplied pursuant to this Contract.**

E. Contractor agrees to monitor and review all such coverage and assumes all responsibility for

ensuring that all required coverage is provided. Contractor agrees to obtain certificates evidencing such coverage.

F. Contractor agrees to provide immediate notice to City of any claim or loss against Contractor that includes City or any other indemnitee as a defendant. City assumes no obligation or liability by such notice, but has the right (but not the duty) to monitor the handling of any such claim or claims if they are likely to involve City.

G. No liability policy shall contain any provision or definition that would serve to eliminate so-called **“third party action over” claims, including any exclusion for** bodily injury to an employee of the insured or of any contractor or subcontractor.

H. **Any “self-insured retention” must be declared and approved by City. City reserves the right to require** the self-insured retention to be eliminated or replaced by a deductible. Self-funding, policy fronting or other mechanisms to avoid risk transfer are not acceptable. If Contractor has such a program, Contractor must fully disclose such program to City.

EXHIBIT A5

Statement of Intent to Comply with Minimum Requirements of the Stormwater Permit

CITY OF VERNON  
VERNON PUBLIC UTILITIES

Construction Stormwater Program

Permit Number: \_\_\_\_\_ Date: \_\_\_\_\_

Applicant: \_\_\_\_\_ Phone: \_\_\_\_\_

Project Address: \_\_\_\_\_

Property Owner: \_\_\_\_\_

Contractor: \_\_\_\_\_

**Contractor's Address:** \_\_\_\_\_

The National Pollutant Discharge Elimination System (NPDES) is a portion of the Clean Water Act that applies to the protection of receiving waters. Under permits from the Los Angeles Regional Water Quality Control Board (RWQCB), certain activities are subject to RWQCB enforcement. To meet the standards of the Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watershed of Los Angeles County, Except those Discharges Originating from the City of Long Beach MS4 (CAS004001), the City of Vernon has adopted minimum standards for stormwater runoff from development construction activities.

These minimum standards require the implementation of an effective combination of erosion and sediment control Best Management Practices (BMPs) to prevent erosion and sediment loss, and the discharge of construction waste at each site. At a minimum, the construction activity associated with the construction project identified above shall be conducted in such a manner that:

- Prevents illicit construction-related discharges of pollutants into the MS4 and receiving waters.
- Implements and maintains structural and non-structural BMPs to reduce pollutants in stormwater runoff from construction sites.
- Reduces construction site discharges of pollutants to the MS4 to the maximum extent practicable.
- Prevents construction site discharges to the MS4 from causing or contributing to a violation of water quality standards.

Note: The Stormwater BMP Construction Handbook sheets developed by the California Stormwater Quality Association shall be used as guidance in determining and implementing required BMPs. The BMP sheets may be reviewed at the Public Utilities Department counter during regular business hours. A General Construction Permit shall be obtained and maintained for all construction sites one (1) acre or greater. Additional conditions may be required for these sites.

I have read and understand the requirements listed above and certify that I will comply with the minimum requirements above.

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Property Owner: \_\_\_\_\_

EXHIBIT A6

Statement of Intent to Comply with Minimum Requirements of the California  
Covid-19 Industry Guidance: Construction

CITY OF VERNON  
PUBLIC UTILITIES DEPARTMENT

Project Address: \_\_\_\_\_

Property Owner: \_\_\_\_\_

Contractor: \_\_\_\_\_

**Contractor's Address:** \_\_\_\_\_

The latest COVID-19 industry guidelines can be accessed at the following web address:

<https://www.dir.ca.gov/dosh/coronavirus/Guidance-by-Industry.html>

This document provides guidance for the construction industry to support a safe, clean environment for workers. The guidance is not intended to revoke or repeal any worker rights, either statutory, regulatory or collectively bargained, and is not exhaustive, as it does not include county health orders, nor is it a substitute for any existing safety and health-related regulatory requirements such as those of Cal/OSHA.1 Stay current on changes to public health guidance and state/local orders, as the COVID-19 situation continues. Cal/OSHA has more safety and health guidance on their Cal/OSHA COVID-19 Infection Prevention for Construction 2 Employers and Workers webpage. CDC has additional guidance for businesses and employers.

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I have read and understand the requirements listed above and certify that I will comply with the minimum requirements above.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

EXHIBIT B1

TECHNICAL SPECIFICATIONS AND PLANS FOR WELL NO. 22

SPECIFIC FOR THIS PROJECT

# Technical Specifications – Issued for Construction

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## Vernon Well No. 22 Equipment and Site Improvements

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December 2021

Prepared For:



**City of Vernon Public Utilities Department**  
4305 S. Santa Fe Ave.  
Vernon, CA 90058

Prepared by:



**Pacific Advanced Civil Engineering, Inc.**  
17520 Newhope Street, Suite 200  
Fountain Valley, CA 92708  
1-(714)-481-7300



Contact Person:  
Duncan Lee, P.E.

PACE JN #B626



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**SECTION 00700  
SPECIAL CONDITIONS**

**PART 1– GENERAL**

1.1 CONTRACT DOCUMENTS

- A. The Contract Documents which constitute the contract between the CITY and the CONTRACTOR with regard to the subject matter as set forth in Section I of such contract (“Contract Agreement”) and include the Contract Agreement, plans, drawings, supplemental drawings and the technical specifications.
- B. All terms and conditions established in the Contract Agreement shall supersede all general conditions of these specifications to be followed in the event of any conflict or discrepancies.

1.2 DEFINITIONS AND MEANINGS OF TERMS

- A. Whenever in the Contract Documents the following terms or pronouns referring to them are used, the intent and meaning shall be interpreted as follows which shall be applicable to both the singular and plural thereof:
- B. The Contract shall mean the Contract executed by the CITY and the CONTRACTOR, of which these General Conditions form a part; the terms Contract and Agreement are synonymous.
- C. The term CITY shall mean the respective party to the Contract; the CITY being the City of Vernon Public Works Department. The term CITY may also mean consultants, engineers, or other professionals contracted by the CITY to review, supervise, or consult on the project.
- D. The term DISTRICT shall mean City of Vernon Public Works Department.
- E. The term AGENCY shall mean City of Vernon Public Works Department.
- F. The term COUNTY shall mean Los Angeles County, CA.
- G. The term CONTRACTOR shall mean the respective party to the contract.
- H. The term WORK shall refer to all the items listed in the contract documents to be executed by the CONTRACTOR.
- I. The term SUBCONTRACTOR shall mean any individual, partnership or corporation having a direct contract with the CONTRACTOR to perform any part of the work.
- J. The term ENGINEER or DESIGN ENGINEER shall mean Pacific Advance Civil Engineering, Inc. (PACE).
- K. The UTILITY ENGINEER shall refer to City of Vernon Public Utilities Department.
- L. Addenda shall mean written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, Final Design Plans, by additions, deletions, clarifications or corrections.
- M. Bonds shall mean Performance and Payment Bonds and other instruments of security, furnished by the CONTRACTOR and its surety in accordance with the Contract Documents.
- N. Change Order shall mean a written order to the CONTRACTOR authorizing an addition, deletion or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract price or Contract time.

- O. Contractual Agreement shall mean the signed agreement between the CITY and the CONTRACTOR for the work intended.
  - P. Contract Documents shall have the meaning described in Section 1.1 herein.
  - Q. Contract price shall mean the total monies payable to the CONTRACTOR under the terms and conditions of the Contract Documents.
  - R. Contract time in days shall mean the number of consecutive calendar days stated in the Contract Documents for the completion of the Work.
  - S. Drawings shall mean the part of the Contract Documents, which show the characteristics and scope of the Work to be performed and which have been prepared or approved by the ENGINEER. Supplemental drawings shall mean part of the Contract Documents, which shows additional details of the work to be performed.
  - T. Notice to proceed shall mean written communication issued by the CITY to the CONTRACTOR authorizing him to proceed with the Work and establishing the date of commencement of the Work.
  - U. Project shall mean the undertaking to be performed as provided in the Contract Documents.
  - V. Submittals shall mean all drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the CONTRACTOR, a subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed; the terms shop drawings and submittals are synonymous.
  - W. Specifications shall mean a part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.
  - X. Substantial completion shall have the meaning defined in the Contract Agreement.
  - Y. Suppliers shall mean any person, supplier or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.
  - Z. Work shall mean all (i) obligations, responsibilities and duties undertaken by the CONTRACTOR in order to successfully construct, complete and operate (for Startup Completion) the Project, including all labor, materials, equipment and other incidentals, and the furnishing thereof, (ii) Design and Engineering Services, (iii) Training Services, and (iv) Initial Operations, pursuant to the Contract Documents.
  - AA. Written notice shall mean any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party of his authorized representative on the Work.
  - BB. Engineering Supplemental Information (ESI) shall mean written communications issued by the ENGINEER to the CONTRACTOR providing the CONTRACTOR with additional clarifications of the Contract Documents that the ENGINEER deem necessary to ensure the design intent.
  - CC. Request for Information (RFI) shall mean written communications issued by the CONTRACTOR to the ENGINEER requesting additional information or clarification regarding a specific item in the Contract Documents.
- 1.3 CONTRACTOR'S RESPONSIBILITY
- A. **General:** It is the responsibility of the CONTRACTOR and each subcontractor to visit the site and satisfy himself as to the various existing conditions affecting the work as required.

- B. **Underground Utilities:** The information shown on the drawings was obtained from drawings furnished by the CITY, and surveys furnished to the CITY. The CONTRACTOR shall make such investigation as deemed necessary to be satisfied as to the actual location, size, type of material, buried depth, and other factors relating to these services.
- 1.4 PERMITS, FEES, AND SALES TAX
- A. The CONTRACTOR shall submit the required fees, drawings and application for the applicable permits prior to commencement of work.
- 1.5 PRE-CONSTRUCTION MEETING
- A. General: Before issuance of Notice to Proceed, a pre-construction meeting shall be held at the location, date and time designated by ENGINEER and CITY. Attendees shall include the ENGINEER, CITY's representatives, General CONTRACTOR's project manager and field superintendent, and representatives from each subcontractor for the project as appropriate.
- 1.6 CONSTRUCTION PROGRESS MEETINGS
- A. Progress meetings shall be held according to the agreed upon schedule. All matters bearing on progress and performance of the work since preceding progress meeting shall be discussed and resolved including, without limitation, any previously unresolved matters, deficiencies in the work or methods being employed for the work, and problems, difficulties, or delays which may be encountered.
- 1.7 PROTECTION OF WORK
- A. CONTRACTOR shall provide all protection required to insure that all work completed will not be harmed.
- B. The CONTRACTOR may at his option and expense install any lawful security measures he deems necessary to protect his materials, equipment or finished work. Type of security devices or quantity shall be the sole responsibility of the CONTRACTOR. The CONTRACTOR is to provide security and protect the project until the CITY has occupied the space or CITY has accepted the space.
- C. Protection:
1. The CONTRACTOR shall be solely responsibility for the protection of all materials and work.
  2. The CONTRACTOR shall include in his proposal the cost of any temporary partitions, sheathing, plastic covering, etc., as may be required to maintain affected areas. Remove all such temporary work at the proper time during the construction period and repair all damage related to same.
  3. The CONTRACTOR is solely responsible for the protection of the area in which work is being performed.
  4. Provide construction fencing as required to secure the site (See also section 01561, Temporary Fencing).
- 1.8 ACCESS TO SITE
- A. All access to the site by the General CONTRACTOR, Subcontractors, workmen, material/equipment suppliers, etc., shall be via approved access locations as designated by the CITY. All vehicular or equipment activity shall be strictly confined to the construction limits as indicated by CITY.
- B. Remove all temporary construction and temporary facilities at close of the job or when no longer needed.

## 1.9 MATERIALS TESTING

- A. All materials to be incorporated into the work shall be subject to sampling, testing, and approval as required by specifications. CITY shall be responsible for retaining the services of an independent testing Owner for special inspections.
- B. All materials and/or equipment shall be handled in such a manner as to preserve their quality and fitness for the work.
- C. Unless otherwise specified, samples and tests shall be made in accordance with either: the Standard Methods of AASHTO, ASTM, or CalTrans which were in effect and published at the time of advertising for bids. The laboratory responsible for the test(s) shall furnish at least one copy of the test results to the CONTRACTOR, the ENGINEER, and to the appropriate material supplier.
- D. All materials and/or equipment not conforming to the requirements of the Specifications, whether in place or not, will be rejected. Rejected materials and/or equipment shall be removed immediately from the site of work unless otherwise permitted by the ENGINEER. No rejected material and/or equipment, the defects of which have been subsequently corrected, shall be used until approved in writing by the ENGINEER. CONTRACTOR shall be responsible for re-testing of all rejected materials.

## 1.10 SPECIAL INSPECTIONS

- A. Various categories for inspection/ observation of work progress during the course of construction are listed, but not limited to specifications and notes in the drawings. The CITY requires on-site observation of the work at these various stages prior to covering the work. A list of such inspections will be reviewed at the Pre-Construction Conference and subsequent job meetings, and it is understood that the CONTRACTOR will not cover work until such observation has been completed. The CITY and CITY representatives will be responsible for reasonable cooperation with CONTRACTOR requests for observation of the work. The CONTRACTOR shall include anticipated observation requests at weekly update of scheduled activities.

## 1.11 PRIOR APPROVALS

- A. If the General or Prime CONTRACTOR wishes to use items of equipment and/or materials other than those identified in the drawings or specifications, a written request for approval shall be submitted to the ENGINEER prior to the confirmation of contract price. Any requests submitted after this time are not under obligation to be accepted. Request from subcontractors will not be considered.
- B. Proposed substitutions that have not received prior approval are undertaken at the CONTRACTOR's risk to be deemed equivalent during the construction submittal process.
- C. Each request shall include all basic data and characteristics clearly legible. The specified item as well as the proposed item shall be formatted in such manner that a direct comparison can be readily made. ENGINEER shall not be required to perform research to accomplish the comparison. It is the bidder's responsibility to submit complete descriptive and technical information for the ENGINEER and CITY to perform a complete and proper appraisal.
- D. If alternate manufacturers are accepted, the CONTRACTOR shall be responsible for any and all re-design or re-engineering required to accommodate alternate products. Change order proposals that add cost to the project as the result of redesign requirements for alternate manufacturers, or as the result of alternate manufacturers that do not meet the requirements of the construction documents, will not be accepted.

## 1.12 FINAL DESIGN PLANS

- A. The intent of the Final Design Plans is that the CONTRACTOR shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the Work in accordance with the Contract Documents and all incidental work necessary to complete the project in an acceptable manner, ready for use, occupancy or operation by the CITY.
- B. The CONTRACTOR shall keep one set of the Final Design Plans on the site of the work. This set shall be kept current by the addition of all reviewed changes, addenda and amendments thereto.
- C. The Final Design Plans are intended to be explanatory to each other, but should any discrepancy appear or any misunderstanding arise as to the importance of anything contained in either, the CONTRACTOR shall obtain the necessary interpretation from the ENGINEER. Corrections of errors or omissions in the Final Design Plans may be made by the CONTRACTOR; when such corrections are necessary for the proper fulfillment of their intention. However, any changes or corrections to be performed after Notice to Proceed shall require the approval of both the ENGINEER and the CONTRACTOR.
- D. All work or materials shown on the Plans and not mentioned in the Specifications, or any work specified and not shown on the Plans, shall be furnished, performed, and done by the CONTRACTOR as if same were both mentioned in the Specifications and shown on the Drawings.

## 1.13 SUBMITTAL/SHOP DRAWINGS

- A. The CONTRACTOR shall submit shop and working drawings of concrete reinforcement, structural details, piping layout, wiring, materials and equipment fabricated especially for the Contract, and materials and equipment for which such drawings are specifically requested within these Contract Documents.
- B. Such drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc. depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for the Contract.
- C. When so specified or if considered by the ENGINEER to be acceptable, manufacturer's specifications, catalog data, descriptive matter, illustrations, etc., may be submitted in place of shop and working drawings. In such case, the requirements shall be as specified for shop and working drawings, insofar as possible, except that the submission shall be per section 01300 of these Specifications.
- D. No material or equipment shall be purchased or fabricated especially for the Contract until the required shop and working drawings have been submitted as herein above provided and reviewed for conformance to the Contract requirements by the ENGINEER. All such materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.
- E. Until the necessary review has been made, the CONTRACTOR shall not proceed with any construction portion of the Work, the design or details of work, materials, equipment or other features for which review is required.
- F. All shop and working drawings shall be prepared on standard size, 11-inch by 17-inch sheets except those, which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Project Name, CONTRACTOR, and building, equipment, or structure to which the drawing applies, and shall be suitably numbered.
- G. The review of shop and working drawings hereunder will be general only, and nothing contained in these general conditions shall relieve, diminish or alter in any respect the responsibilities of the CONTRACTOR under the Contract Documents and in particular, the specific responsibility of the CONTRACTOR for details and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance specified there under.

#### 1.14 STANDARD SPECIFICATIONS

- A. Where standard specifications, such as those of the American Society for Testing and Materials, the American National Standards Institute, the American Water Works Association, the American Association of State Highway and Transportation Officials, the Federal Aviation Owner, the Federal Specifications, etc. are referred to in the Specifications and Contract Documents and on the Drawings, said references shall be construed to mean the latest amended and/or revised versions of the said standard or tentative specification.

#### 1.15 SPECIFIC BRANDS, MAKERS OR MANUFACTURERS

- A. Wherever in the Specifications one or more specific brands, makers or manufacturers are set out and qualified by the "or equal" clause, it is intended to denote the quality standard of the article desired, but unless otherwise noted does not restrict the CONTRACTOR to the specific brand, make or manufacturer.

#### 1.16 "OR EQUAL" CLAUSE

- A. Whenever the words "or approved equal," or "or equal," or "similar to," etc., appear in the Specifications, they shall be interpreted to mean an item of material or equipment that, in the opinion of the ENGINEER is similar to that named, suited to the same use, capable of performing the same function as that named, has a record of service equal to that named, and is equal in quality, capacity and/or efficiency to that named.
- B. If alternate manufacturers are accepted, the CONTRACTOR shall be responsible for any and all re-design or re-engineering required to accommodate alternate products. Change order proposals that add cost to the project as the result of redesign requirements for alternate manufacturers, or as the result of alternate manufacturers that do not meet the requirements of the construction documents, will not be accepted.

#### 1.17 SAFETY

- A. The CONTRACTOR shall take all necessary precautions and provide all necessary safeguards to prevent personal injury and property damage. The CONTRACTOR shall provide protection for all persons including but not limited to his employees and employees of other contractors or subcontractors; members of the public; and employees, agents, and representatives of the CITY, and regulatory agencies that may be on or about the Work. The CONTRACTOR shall provide protection for all public and private property including but not limited to structures, pipes, and utilities, above and below the ground.
- B. The CONTRACTOR shall provide and maintain all necessary safety equipment such as fences, barriers, signs, lights, walkways, guards and fire prevention and fire-fighting equipment and shall take such other action as is required to fulfill his obligations under this subsection.
- C. The CONTRACTOR shall comply with all federal, state and local laws, ordinances, rules and regulations and lawful orders of authorities having jurisdiction for the safety of persons and protection of property.
- D. The CONTRACTOR shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This responsible person shall have the authority to take immediate action to correct unsafe or hazardous conditions and to enforce safety precautions and programs.

#### 1.18 MATERIALS – SAMPLES – REVIEW

- A. Unless otherwise expressly provided on the Drawings or in any of the other Contract Documents, only new materials and equipment shall be incorporated in the Work. All materials and equipment furnished by the CONTRACTOR to be incorporated in the Work shall be subject to the review of the ENGINEER. No material shall be processed or fabricated for the Work or delivered to the Work site without prior concurrence of the ENGINEER.

- B. Facilities and labor for the storage, handling, and inspection of all materials and equipment shall be the responsibility of the CONTRACTOR. Defective materials and equipment shall be identified to the ENGINEER and removed immediately from the site of the Work.
- C. If the ENGINEER so requires, either prior to or after commencement of the Work, the CONTRACTOR shall submit samples of materials for such special tests, as the ENGINEER deems necessary to demonstrate that they conform to the Specifications.

#### 1.19 SANITARY FACILITIES

- A. The CONTRACTOR shall provide adequate sanitary facilities for the use of those employed on the Work. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers and at such points and in such manner as may be required.
- B. The CONTRACTOR shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the CITY, or on adjacent property.

#### 1.20 EMPLOYMENT QUALIFICATIONS

- A. No person under the age of eighteen (18) years and no convict labor shall be employed to perform any work under this Contract. No person whose age or physical condition is such as to make his employment dangerous to his health or safety or to the health or safety of others shall be employed to perform any work under this Contract, provided that this shall not operate against the employment of physically handicapped persons, otherwise employable, where such persons may be safely assigned to work which they can ably perform. There shall be no discrimination because of race, creed, color, sex or political affiliation in the employment of persons for work under this Contract.

#### 1.21 WORK ON "PRIVATE PROPERTY"

- A. Private property is defined as property other than that belonging to the CITY. Highway and railroad rights-of-way, public parks, school yards and other such properties shall be considered "private properties" for the purpose of this Paragraph.
- B. In connection with water line, sewer line, gas line or similar work performed on "private property," the CONTRACTOR shall confine his equipment, the storage of materials and the operations of his workman to the limits indicated on the Drawings, or to lands and rights-of-way provided for the Project by the CITY, and shall take every precaution to avoid damage to the buildings, grounds and facilities of the CITY or private property.
- C. Fences, walls, hedges, shrubs, etc., shall be carefully removed, preserved, and replaced when the construction is completed. Grassed areas, other than lawns, shall be graded, fertilized and seeded when construction is completed and in accordance with the requirements of the technical Specifications. Where ditches or excavations cross lawns, the sod shall be removed carefully and replaced when the backfilling has been completed. If sod is damaged or not handled properly, it shall be replaced with new sod equal to existing sod at the CONTRACTOR's expense. When construction is completed, the facilities and grounds of the CITY's property shall be restored to as good or better condition than found as quickly as possible at the CONTRACTOR's expense.
- D. When directed by the CITY, large trees or other facilities that cannot be preserved and replaced shall be removed by the CONTRACTOR. The CITY will assume the responsibility for settling with the property CITY for the loss of said trees or facilities. The CONTRACTOR shall be solely and entirely responsible for any damage to all other trees or facilities.

- E. Foundations, adjacent to where an excavation is to be made below the bottom of the foundation, shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter if required to insure the stability of the foundation and the CONTRACTOR shall be held strictly responsible for any damage to said foundations.

#### 1.22 LANDS FOR WORK

- A. The CITY will provide the lands upon which the work under this Contract is to be done or the necessary easements over said lands to include sufficient space for the proper execution of the work, together with right of access to same. The CITY will provide the CONTRACTOR with information, which delineates and describes the lands owned and rights-of-way acquired. The CITY shall provide land required for storage of construction materials and for any temporary construction facilities for the storage of equipment. The CONTRACTOR will furnish his own power and water supply unless otherwise specifically set out herein or in the contract documents.

#### 1.23 INTERFERENCE WITH AND PROTECTION OF STREETS

- A. The CONTRACTOR shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefore from the proper authorities. If any street, road or private way shall be rendered unsafe by the CONTRACTOR's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.
- B. Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the CONTRACTOR, who shall assume and have full responsibility for the adequacy and safety of provisions made therefore.
- C. The CONTRACTOR shall, at least twenty-four (24) hours in advance, notify the Police and Fire Departments in writing, if the closure of a street or road is necessary. He shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.
- D. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining CITYs, tenants and occupants.

#### 1.24 EXISTING UTILITIES

- A. Special precautions shall be taken by the CONTRACTOR to avoid damage to existing overhead and underground utilities owned and operated by the CITY or by public or private utility companies.
- B. Before proceeding with the Work, the CONTRACTOR shall confer with all public or private companies, agencies or departments that own and operate utilities in the vicinity of the Construction Work. The purpose of the conference, or conferences, shall be to notify said companies, agencies or departments of the proposed construction schedule, verify the location of, and possible interference with, the existing utilities that are shown on the Drawings, arrange for necessary suspension of service, and make arrangements to locate and avoid interference with all utilities (including house and any building connections) that are not shown on the Drawings.
- C. The CONTRACTOR shall locate all unknown metallic hazards, namely buried pipe, metals, etc., by using a pipe locator. The pipe locator shall immediately precede the trench ditching and all hazards located shall be marked in such a manner as to notify the machine operator of such hazard.

- D. Where existing utilities or appurtenant structures, either underground or above-ground, are encountered, they shall not be displaced or molested unless necessary, and in such case shall be replaced in as good or better condition than found as quickly as possible. Relocation and/or replacement of all utilities and appurtenant structures to accommodate the construction work shall be at cost to the CITY, unless such relocation and/or replacement is by statute or agreement the responsibility of the CONTRACTOR.

1.25 FINAL CLEAN-UP

- A. The Work will not be considered as completed until all final clean-up has been done by the CONTRACTOR.

1.26 SEQUENCE OF CONSTRUCTION

- A. The sequence of construction shall be the responsibility of the CONTRACTOR. All required coordination in order to implement the CONTRACTOR's sequence of construction shall be the responsibility of the CONTRACTOR. CONTRACTOR shall submit a formal shop drawing submittal for the sequence of construction to the CITY, OWNER, and the ENGINEER for their approval prior to the start of construction. The sequence shall indicate the proposed methods and operations of all work, provide a detailed sequence of construction, expected number of working days to complete each sequence, and the required shut-off of existing equipment/infrastructure with the expected number of working days. The sequence of construction shall be updated weekly and presented at the weekly construction meetings.

1.27 MANUFACTURER STARTUP SERVICES

- A. The CONTRACTOR shall coordinate the proposed sequence of construction with each equipment manufacturer based on the proposed sequence of construction.

1.28 CONFINED SPACE

- A. See Safety Plan Specification for further details. The CONTRACTOR shall provide a confined space entry plan per the applicable OSHA and regulatory requirements.

1.29 EARTHWORK – SITE GEOTECHNICAL REPORT

- A. See Appendix A for the Site Geotechnical Report. All site work and earthwork shall be conducted per the Site Geotechnical Report and per the Geotechnical Engineer's Recommendations and Requirements in the field. CONTRACTOR shall coordinate the sequence of construction with the Site Geotechnical Engineer. CONTRACTOR shall note the subsurface shall be prepared by the site geotechnical report. This includes over-excavation of the subgrade where indicated in the geotechnical report and replacing the subgrade with "Engineered Fill". For additional information, see the geotechnical report.

1.30 CITY FURNISHED PORTABLE STANDBY GENERATOR

- A. The CITY will pre-purchase the portable standby generator indicated on the plans. The CONTRACTOR will not be responsible for installation. The CONTRACTOR will need to provide a connection point for the portable standby generator and the associated ancillary equipment per the manufacturer's requirements.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- END OF SECTION -



**SECTION 01010**  
**SUMMARY OF WORK**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The WORK to be performed under this Contract shall consist of furnishing parts, tools, equipment, materials, supplies and manufactured articles, and furnishing all labor, transportation and services, including fuel, power, water and essential communications, and performing all work or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The WORK shall require that all work, materials and services not expressly indicated or called for in the Contract Documents, which may be necessary for the complete and proper construction of the WORK in good faith shall be provided.
- B. The WORK will conform to the City of Vernon Standard Plans and Specifications for the Construction of Water Mains and Facilities.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The WORK of this Contract comprises of construction of the City of Vernon Well No. 22, furnish and installation of piping and equipment associated pump station upgrades. The work shall include civil, mechanical, structural and electrical and control works shown in the Construction Documents. The specific tasks include, but are not limited to the following:
  - 1. **(Bid Item No. 1-2)** Furnish all labor, materials, tools, equipment, transportation, and incidentals for performing mobilization and demobilization. This is including but not limited to non-productive work, all accessory work and obtaining all necessary permits and bonds. The CONTRACTOR shall also be responsible for removal of all construction equipment and materials, demobilization of the construction site, clean-up of all construction zones, and completion of all as-built drawings. Provide a field construction survey prior to the start of construction.
  - 2. **(Bid Item No. 3)** Furnish all labor, materials, tools, equipment, transportation, and incidentals for performing project potholing. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, and structure installation.
  - 3. **(Bid Item No. 4)** Survey and verify all elevations and dimensions of existing equipment and tie in locations as indicated in the Contract Documents.
  - 4. **(Bid Item No. 5)** Furnish and install all temporary fencing and barriers for staging, security and delineation for the construction zone.
  - 5. **(Bid Item No. 6)** Furnish all labor, materials, tools, equipment and work necessary to submit an approved, project specific, traffic control plan that has been signed by a California licensed traffic engineer for City approval.
  - 6. **(Bid Item No. 7)** The CONTRACTOR shall be responsible for furnishing all labor, materials, tools, equipment and work necessary to implement an approved, project specific, traffic control plan that has been signed by a California licensed traffic engineer and approved by the City.
  - 7. **(Bid Item No. 8)** Furnish all labor, materials, tools, equipment and work necessary to submit an approved, project specific, shoring plan that has been signed by a California licensed structural engineer for City approval. The CONTRACTOR shall be responsible for implementing the approved shoring plan throughout construction.
  - 8. **(Bid Item No. 9-10)** Furnish all labor, materials, tools, equipment and work necessary to submit an approved, project specific, Stormwater Pollution Prevention Plan (SWPPP). The CONTRACTOR shall be responsible for implementing and maintaining the BMPs throughout construction.

9. **(Bid Item No. 11)** Provide all labor, material, equipment and install all improvements per plans, including and not limited to over-excavation, recompaction, piles, concrete foundations, walls, enclosures, temporary and permanent pavement, steel plating, roadway repair, driveway, gutter, sidewalk, curbs, fencing, gates, waterline, storm drain, sewer line, key card entry system, signs, pump, motor, motor control, electrical equipment, instrumentation and control, PLC, conduits, conductors, piping, fittings, valves, pipe supports, thrust blocks, pipe restraints, cathodic protection, shoring, start-up testing, and all items necessary to complete the work in place. The work described above has been further broken down in the following categories:

- Furnish and install civil site grading, asphalt concrete on aggregate base, pervious concrete, concrete v-ditch, curb and gutter, driveways, and concrete sidewalk as indicated in the Contract Documents. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, and structure installation.
- Furnish and install permanent site security including security fencing, key card readers, and an automatic gate. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, and structure installation.
- Furnish and install 15” reinforced concrete pipe, manholes and junction boxes required for connection to the existing storm drain including all necessary fittings, covers, roadway restoration, sidewalks, curb and gutters, and associated appurtenances per the Contract Documents. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, shoring, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, and structure installation.
- Furnish and install 12” ductile iron pipe including all necessary tubing, weldolets, fittings, valves, vaults, vault covers, sidewalks, curb and gutters, pipe supports, concrete pipe supports and associated appurtenances per the Contract Documents. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, shoring, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, and structure installation.
- Furnish and install 8” PVC pipe including all necessary tubing, weldolets, fittings, valves, vaults, vault covers, sidewalks, curb and gutters, pipe supports, concrete pipe supports and associated appurtenances per the Contract Documents. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, shoring, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, and structure installation.
- Furnish and install City of Vernon Well No. 22 pump and motor including the gravel feed tube, camera tube, sounding tube, fittings, valves and associated appurtenances. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, capping and abandoning existing laterals, and structure installation.
- Furnish and install mechanical piping including all fittings, valves, flow meters, air relief valves, weldolets, and associated appurtenances as indicated in the Contract Documents. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, capping and abandoning existing laterals, and structure installation.

- Furnish and install equipment building including the chlorine storage tank, exhaust fan, A/C system, chemical injection pump skid, and chemical process piping including all fittings and valves, building security including all doors, locks and alarms as indicated in the Contract Documents. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, capping and abandoning existing laterals, and structure installation.
  - Furnish and install all structural elements associated with Well No. 22 equipment and site improvements including a concrete well footing and shade structure, equipment building concrete slab and piles, and masonry wall as indicated in the Contract Documents. This is including and not limited to sawcutting, excavating, backfilling, plating, securing site, traffic control, pedestrian detour, compacting, grading, concrete form work, steel reinforcements, concrete, importing fill, exporting soil, disposing soil, hauling, capping and abandoning existing laterals, and structure installation.
  - Furnish and install all new electrical components, SES, VFDs, transformer, panelboards, PLC, local disconnect switches, lighting, alarms, instrumentation and communication equipment, conduits, fittings, conductors, fixtures, switches, receptacles and associated appurtenances as shown in the Contract Documents.
10. **(Bid Item No. 12)** Coordinate with the City of Vernon Public Utilities Department for their installation and connection of electrical service and transformer assembly, and to anticipate a minimum of 2 weeks in construction for such 3<sup>rd</sup> party improvements.
11. **(Bid Item No. 13)** Coordinate for 3<sup>rd</sup> party start-up testing, and to anticipate a minimum of 1 week for such independent testing.
12. **(Bid Item No. 14-16)** The CONTRACTOR shall coordinate all necessary tasks for pump station start up and acceptance by the City of Vernon Public Works Department including but not limited to pressure testing, disinfection of newly installed pipeline and equipment, general equipment testing and training. The CONTRACTOR shall provide two (2) separate four (4) hour training sessions on all newly installed equipment and provide two (2) hard copies and the electronic copies of newly installed equipment O&M manuals to City staff.
- B. The WORK includes obtaining any permits related or required by the Contract.

### 1.3 WORK BY OTHERS

- A. Where two (2) or more Contracts are being performed at one time on the same site or adjacent land in such manner that work under one (1) Contract may interfere with work under another, the sequence and order of the WORK in either or both Contracts to the agreement of both contracting entities shall be determined. When the Site of one (1) Contract is the necessary or convenient means of access for performance of work under another, the privilege of access or other reasonable privilege to the CONTRACTOR so desiring may be granted, to the extent, amount, and in manner and at a time that shall be determined. Conduct its operations to cause a minimum of interference with the work of such other contractors, and shall cooperate fully with such contractors to allow continued safe access to their respective portions of the Site, as required to perform work under their respective contracts.
- B. Interference with Work on Utilities: Cooperate fully with all utility forces or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities, which interfere with the progress of the WORK, and shall schedule the WORK to minimize interference with said relocation, altering or other rearranging of facilities. Any delays, reduction in work efficiency or hardships incurred shall be identified and resolved to the satisfaction of both parties.

### 1.4 USE OF SITE

- A. Use of the Site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities and field offices.

- B. All or part of the existing site may be utilized during the entire period of construction for the conduct of normal construction operations. CONTRACTOR shall cooperate and coordinate to facilitate construction and to minimize interference with the ongoing process operations. Process tie-ins or any connections to the existing system shall not occur without permission from the CITY. The CITY shall be notified as least one week prior to any process tie-ins or connection to the existing system.

**PART 2 – PRODUCTS** (Not Used)

**PART 3 – EXECUTION** (Not Used)

- END OF SECTION -

**SECTION 01025  
MEASUREMENT AND PAYMENT**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Section includes: Descriptions for payment purposes of the various elements, components, actions, equipment, and materials that are included in each bid item. Also included is a description of how measurement of the bid item will be made. Lump Sum bid items will have no measurement description, since the quantity is one.
- B. The Lump Sum price includes full compensation for furnishing all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and to perform all work shown on the Drawings and/or described in the Specifications and Contract Documents. No other compensation will be allowed thereof.
- C. Work for which no separate payment is provided will be considered as a subsidiary obligation of the CONTRACTOR, and the cost thereof shall be included in the applicable contract price for the item to which the work most closely applies.

1.2 PROGRESS AND PAYMENT SCHEDULES (See also the Contract)

- A. Within 15 days after the date of formal execution of the Agreement, prepare and submit, for approval, a Construction Schedule, which depicts the plan for completing the Contract requirements.
- B. Maintain a current Construction Schedule updated monthly at the Site available for inspection. The Schedule shall reflect all approved Change Orders and their impact to the Project Schedule.

1.3 CONDITIONS FOR PAYMENT

- A. Make payments for acceptable work in place and materials properly stored on-site. The value of payment shall be as established on the approved Schedule of Values. Terms of payment shall be as stated in the Contract Agreement.

1.4 CLAIMS FOR EXTRA WORK

- A. If any claims that instructions by the Governmental Agency or others involve extra cost, the CONTRACTOR shall give written notice of said claim within 15 days after the receipt of such instructions, and in any event before proceeding to execute the work, stating clearly and in detail the basis of his claim or claims. No such claim shall be valid unless so made.
- B. If, on the basis, of the available evidence, the determination is made that an adjustment of the Contract Price or time is justifiable, the procedure shall then be as provided in the Contract.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01040  
COORDINATION**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall coordinate the WORK of all crafts, trades and subcontractors engaged on the WORK and he shall have final responsibility in regards to the Schedule, workmanship and completeness of each and all parts of the WORK.
- B. All crafts, trades and subcontractors shall be made to cooperate with each other and with others, as they may be involved in the installation of work, which adjoins, incorporates, precedes or follows the work of another. It shall be the CONTRACTOR's responsibility to point out areas of cooperation prior to execution of subcontractors Agreements and the assignment of the parts of the WORK. Each craft, trade and subcontractor shall be responsible to the CONTRACTOR, for furnishing embedded items, giving directions for doing all cutting and fitting, making all provisions for accommodating the WORK and for protecting, patching, repairing and cleaning as required to satisfactorily perform the WORK.
- C. The CONTRACTOR shall be responsible for supervising all cutting, digging and other action of his subcontractors and workers. Where such action impairs the safety or function of any structure or component of the Project as determined by the ENGINEER, the CONTRACTOR shall make such repairs, alterations and additions as will bring said structure or component back to its original design condition at no additional cost to the CITY.
- D. The CONTRACTOR is expected to be familiar with the General Requirements and all Sections of the detailed Specifications for all other trades and to study all Drawings applicable to his WORK to the end that complete coordination between the trades will be affected. CONTRACTOR shall submit the Request for Information (RFI) to the ENGINEER if conflicts exist within the Contract Documents.
  - 1. The CONTRACTOR shall review the RFI and submit, with comments, to the ENGINEER for review and response. The RFI request should include a requested response date. The ENGINEER will make every effort to meet that requested date. However, the ENGINEER will have 14 business days to review and respond back to the CONTRACTOR. If the nature of the RFI or circumstances surrounding the RFI are beyond the control of the ENGINEER, requiring the need of more than 14 business days, the ENGINEER will notify the CONTRACTOR within five business days of receipt that it will take longer than 14 business days. At that time, the CONTRACTOR and ENGINEER will establish an agreed upon response date.
  - 2. Upon receipt of the RFI response, the CONTRACTOR shall distribute the RFI response as necessary. The CONTRACTOR will be required to keep and maintain a numbered log of the RFI's and responses. A copy of the log, and detail of each RFI shall be submitted to the ENGINEER for Project closeout.
- E. At the discretion of the ENGINEER, additional clarification information may be provided to the CONTRACTOR, regarding the Contract Documents. This notification shall be submitted on an Engineering Supplemental Information (ESI) form. It is the intent of the ESI to provide additional clarification information to the Contract Documents. It is the intent of the ENGINEER to transmit the ESI's in a timely manner. However, the ENGINEER shall not be held responsible for rework to work performed prior to issuance of the ESI.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01045  
CUTTING AND PATCHING**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Perform all WORK associated with cutting and patching for connection to existing water and sewer lines. This shall be complete and operable, in accordance with the Contract Documents and the City's Standards.
- B. Do not cut and patch in a manner that would result in a failure of the WORK to perform as intended, decreased energy performance, increased maintenance, decreased-operational life or decreased safety.
- C. CONTRACTOR shall field verify the existing process piping and civil (edge of sidewalk etc.) points of connection. The CONTRACTOR shall notify the ENGINEER and the CITY of all discrepancies.

**PART 2 – PRODUCTS**

2.1 MATERIALS

- A. Match existing materials for cutting and patching work with new materials conforming to Project Requirements.

**PART 3 – EXECUTION**

3.1 INSTALLATION

- A. Inspect conditions prior to WORK to identify scope and type of WORK required. Protect adjacent WORK. Notify ENGINEER, CITY, and the CITY of WORK requiring interruption to building services or CITY's operations.
- B. Perform WORK with Workmen skilled in the trades involved.
- C. Cutting: Use cutting tools, not chopping tools. Make neat holes. Minimize damage to adjacent work. Check for concealed utilities and structure before cutting.
- D. Patching: Make patches, seams and joints durable and inconspicuous. Comply with tolerances for new WORK.
- E. Clean WORK area and areas affected by cutting and patching operations.

- END OF SECTION -

**SECTION 01070**  
**ABBREVIATIONS OF INSTITUTIONS**

**PART 1 – GENERAL**

1.1 GENERAL

- A. Wherever in these Specifications, references are made to the Standards, Specifications or other Published Data of the various International, National, Regional or Local Organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide, to the User of these Specifications the following acronyms or abbreviations, which may appear in these Specifications, shall have the meanings indicated herein.

1.2 ABBREVIATIONS

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AFPA	American Forest Products Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANS	American Nuclear Society
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association or American Parquet Association, Inc.
API	American Petroleum Institute
APWA	American Public Works Association
ARI	Air-Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers

ASNT	American Society of Nondestructive Testing
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWCI	American Wire Cloth Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBC	Basic Building Code, Building Officials and Code Administrators International
BHMA	Builders Hardware Manufacturer's Association
CABO	Council of American Building Officials
CBM	Certified Ballast Manufacturers
CDA	Copper Development Association
CEMA	Conveyors Equipment Manufacturer's Association
CGA	Compressed Gas Association
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drill Manufacturer's Association
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FCI	Fluid Controls Institute
FM	Factory Mutual System
FPL	Forest Products Laboratory
HI	Hydronics Institute
HPMA	Hardwood Plywood Manufacturers Association
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISDSI	Insulated Steel Door Systems Institute
ISA	Instrument Society of America

ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
MBMA	Metal Building Manufacturer's Association
MIL	Military Standards (DoD)
MPTA	Mechanical Power Transmission Association
MSS	Manufacturers Standardization Society
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
NAGDM	National Association of Garage Door Manufacturers
NB	National Board of Boiler and Pressure Vessel Inspectors (alternate NBBPVI)
NBS	National Bureau of Standards (Now NIST)
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association or National Fluid Power Association or National Forest Products Association
NISO	National Information Standards Organization
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PPI	Plastics Pipe Institute
RCRA	Resource Conservation and Recovery Act
RIS	Redwood Inspection Service
RMA	Rubber Manufacturers Association
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SDI	Steel Door Institute
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPI	Society of the Plastics Industry, Inc.
SPIB	Southern Pine Inspection Bureau

SPR	Simplified Practice Recommendation
SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Society for Protective Coating
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute
TIA	Telecommunications Industries Association
TPI	Truss Plate Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WEF	Water Environment Federation
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WPA	Western Wood Products Association

**PART 2 – PRODUCTS** (Not Used)

**PART 3 – EXECUTION** (Not Used)

- END OF SECTION -

**SECTION 01090**  
**REFERENCE STANDARDS**

**PART 1 – GENERAL**

1.1 GENERAL

- A. **Titles of Sections and Paragraphs:** Titles and Subtitles accompanying Specification Sections and paragraphs are for convenience and Reference only and do not form a part of the Specifications.
- B. **Applicable Publications:** Whenever in these Specifications References are made to Published Specifications, Codes, Standards or other Requirements, it shall be understood that wherever no date is specified, only the latest Specifications, Standards or Requirements of the respective issuing agencies, which have been published as of the date that the Contract shall apply; except to the extent that said Standards or Requirements may be in conflict with applicable Laws, Ordinances or Governing Codes. No Requirements set forth in the Specifications or shown on the Drawings will be waived because of any provision of, or omission from, said Standards or Requirements.
- C. **Specialists, Assignments:** In certain instances, Specification text requires (or implies) that specific WORK is to be assigned to specialists or expert entities, who must be engaged for the performance of that WORK. Such assignments shall be recognized as Special Requirements. These Requirements shall not be interpreted so as to conflict with the enforcement of Building Codes and similar Regulations Governing the WORK; also, they are not intended to interfere with Local Union Jurisdiction Settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "Expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract Requirements remains.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Construct the WORK in accordance with the Contract Documents and the referenced portions of those Referenced Codes, Standards and Specifications.
- B. **Verify the following references agree with the plans and local requirements** - References herein to "Building Code" shall mean International Building Code (IBC) 2006. Similarly, references to "Mechanical Code" or "International Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "International Fire Code," shall mean International Mechanical Code (IMC) 2003, Uniform Plumbing Code (UPC) 1994 and International Fire Code (IFC) 2003. "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA) 2003. The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all Addenda, Modifications, Amendments, or other Lawful changes thereto.
- C. In case of conflict between Codes, Reference Standards, Drawings and the other Contract Documents, the most stringent Requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor through the RFI process. The most stringent Requirements may be bid on.
- D. References herein to "OSHA Regulations for Construction" shall mean **Title 29, Part 1926, Construction Safety and Health Regulations**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- E. References herein to "OSHA Standards" shall mean **Title 29, Part 1910, Occupational Safety and Health Standards** (OSHA), Code of Federal Regulations, including all changes and Amendments thereto.

- F. **Applicable Standard Specifications:** References in the Contract Documents to "Standard Specifications" or SSPWC shall mean the Standard Specifications for Public Works Construction.

1.3 REGULATIONS RELATED TO HAZARDOUS MATERIALS

- A. Responsibility for all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.

**PART 2 – PRODUCTS** (Not Used)

**PART 3 – EXECUTION** (Not Used)

- END OF SECTION -

**SECTION 01292  
SCHEDULE OF VALUES**

**PART 1 – GENERAL**

1.1 SUMMARY

- A. **Section Includes:** Requirements for preparation, format, and submittal of Schedule of Values.

1.2 PREPARATION

- A. Prepare Schedule of Values identifying costs of Major Items of Work and other costs shown in sample included at end of this Section.
- B. Divide the Work into following Major Items of Work and subdivide the Major Items that will complement not only the scope of the work, but the progress of work as well.
- C. Assign prices to Items of Work which aggregate the Contract Price. Base prices on costs associated with scheduled activities based on the Project Schedule for each Item of Work.

1.3 SUBMITTALS

- A. Submit preliminary schedule of values in accordance with Section 01025 and 00700.
- B. Submit corrected schedule of values within 10 days upon receipt of reviewed Schedule of Values, but no later than 10 days prior to anticipated submittal of first Application for Payment, in accordance with Section 01025.
- C. Upon request, support prices with data which will substantiate their correctness.
- D. If activities are added or removed from the Progress Schedule revise the Schedule of Values and resubmit.

1.4 SAMPLE SCHEDULE OF VALUES

- A. Following is an example of an acceptable form for Schedule of Values.

SCHEDULE OF VALUES		
NO.	DESCRIPTION OF ITEM	LUMP SUM COST
1.	Mobilization.	
2.	General Earthwork and Grading.	
3.	Miscellaneous Yard Piping. List Major Items of Work Identified in Paragraph 1.02 C / Number Consecutively.	
4.	General Electrical Work Not Included on Major Items of Work.	
5.	Major Items of Work (Pump Station, Tank, Etc.)	
6.	General Instrumentation Work Not Included on Major Items of Work.	
7.	Start-up and Demobilization	
8.	Site Paving	
9.	Miscellaneous Work Items and Other Prices Not Included in Previous Items and Necessary to Complete the Work.	
	<b>TOTAL LUMP SUM BID</b>	

**PART 2 – PRODUCTS** (Not Used)

**PART 3 – EXECUTION** (Not Used)

-END OF SECTION-

**SECTION 01294**  
**APPLICATIONS FOR PAYMENT**

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Procedures for preparation and submittal of Applications for Payment.
- B. **Related Sections:**
  - 1. Section 01292 - Schedule of Values.
  - 2. Section 01310 - Progress Schedules and Reports.

1.2 FORMAT

- A. Develop satisfactory spreadsheet-type form generated by downloading cost data from the Progress Schedule.
- B. Fill in information required on form.
- C. When Change Orders are executed, add Change Orders at end of listing of scheduled activities.
  - 1. Identify change order by number and description.
  - 2. Provide cost of change order in appropriate column.
- D. After completing, submit Application for Payment.
- E. The ENGINEER will review application for accuracy. When accurate, the ENGINEER will transmit application to CITY for processing of payment.
- F. Execute application with signature of responsible officer of CONTRACTOR.

1.3 SUBSTANTIATING DATA

- A. **Provide Substantiating Data with cover letter identifying:**
  - 1. Project.
  - 2. Application number and date.
  - 3. Detailed list of enclosures.
  - 4. For stored products with item number and identification on application, description of specific material, and proof of insurance coverage for offsite stored products and copies of invoices.

1.4 SUBMITTALS

- A. Submit five copies of Application for Payment and Substantiating Data with cover letter to CITY or Engineer.
- B. Coordinate requirements with the Contract General Conditions.

1.5 PAYMENT REQUESTS

- A. Prepare progress payment requests on a monthly basis. Base requests on the breakdowns of costs for each scheduled activity and the percentage of completion for each activity.
- B. Indicate total dollar amount of work planned for every month of the project. Equate sum of monthly amounts to Lump Sum Contract Price.

- C. Generate Progress Payment request forms by downloading cost data from the schedule information to a spreadsheet type format. Identify each activity on the Progress Schedule that has a cost associated with it, the cost for each activity, the estimated percent complete for each activity, and the value of work completed for both the payment period and job to date.
- D. Prepare summary of cost information for each Major Item of Work listed in the Schedule of Values. Identify the value of work completed for both the payment period and job to date.
- E. Submit progress payment requests at progress meetings.

**PART 2 – PRODUCTS - (Not Used)**

**PART 3 – EXECUTION – (Not Used)**

-END OF SECTION-

**SECTION 01300**  
**SUBMITTALS**

**PART 1 – GENERAL**

1.1 WORK INCLUDED

- A. Shop Drawing, Descriptive Literature, Project Data and Samples (specifically, when Samples are requested) for all manufactured or fabricated items shall be Submitted by the CONTRACTOR. CONTRACTOR shall examine and review the Submittal to ensure that the information is in the form and in the manner required by the ENGINEER. The review of the Submittal by the ENGINEER shall not be construed as a complete check or approval, but will only indicate that the general method of construction and detailing is satisfactory. Review of such Submittal will not relieve the CONTRACTOR of the responsibility for any errors, which may exist. The CONTRACTOR shall be responsible for the dimensions and design of adequate connections, details and satisfactory of all WORK.

1.2 DEFINITIONS

- A. The term "Submittals" shall mean shop drawings, manufacturer's drawings, catalog sheets, brochures, descriptive literature, diagrams, schedules, calculations, material lists, performance charts, test reports, office and field samples and items of similar nature, which are normally Submitted for the ENGINEER's review for conformance with the Design Concept and compliance with the Contract Documents.

1.3 GENERAL CONDITIONS

- A. Review by the ENGINEER of shop drawings or submittals of material and equipment shall not relieve the CONTRACTOR from the responsibilities of furnishing proper dimension, size, quantity, materials and all performance characteristics to, efficiently perform the Requirements and intent of the Contract Documents. Review shall not relieve the CONTRACTOR responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Review of shop drawings shall not be construed as releasing the CONTRACTOR from the responsibility of complying with the Contract Documents.
- B. Do not consider Submittals as Contract Documents. Purpose of Submittals is to demonstrate how CONTRACTOR, to conform to the design concepts.

1.4 GENERAL REQUIREMENTS FOR SUBMITTALS

- A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Documents. Where applicable, show fabrication, layout, setting and erection details. Shop drawings are defined as original drawings prepared by the CONTRACTOR, subcontractor, suppliers or distributors performing WORK under this Contract. Shop drawings illustrate some portion of the WORK and show fabrication, layout, setting or erection details of equipment, materials and components. Shop drawings shall be folded to an approximate size of 8½-inch x 11-inch and in such manner that the title block will be located in the lower right-hand corner of the exposed surface.
- B. Project data shall include manufacturer's standard schematic drawings modified to delete information, which is not applicable to the Project and shall be supplemented to provide additional information applicable to the Project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the Project.
- C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship and to establish Standards by which completed WORK is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.

- D. The CONTRACTOR shall review and check Submittals, indicating his review by initials and date.
- E. If the Submittals deviate from the Contract Drawings and/or Specifications, the CONTRACTOR shall clearly identify the deviation and state any reasons for the deviation. The ENGINEER may approve a change. Any costs resulting from a change will be the responsibility of the CONTRACTOR.
- F. Additional information on particular items, such as special drawings, schedules, calculations, performance curves and material details, shall be provided when specifically requested by the Technical Specifications.
- G. Submittals for all electrically operated items (including instrumentation and controls) shall include complete wiring diagrams showing lead, runs, number of wires, wire size, color coding, all terminations and connections and coordination with related equipment.
- H. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the CONTRACTOR shall be responsible for insuring the compatibility of such coatings with the field applied paint products and systems.
- I. Fastener Specifications of manufacturer shall be indicated on equipment shop drawings.
- J. No material shall be fabricated or shipped unless the applicable drawings or Submittals have been reviewed and approved by the CONTRACTOR and ENGINEER.
- K. All bulletins, brochures, instructions, parts lists and warranties packaged with and accompanying materials and products delivered to and installed in the Project shall be saved and transmitted to the ENGINEER for safe keeping and preparations of the Operation & Maintenance Manuals.
- L. A total of four (4) copies of the Submittals shall be provided to the CONTRACTOR, along with one (1) electronic PDF copy.

#### 1.5 SUBCONTRACTOR or VENDOR RESPONSIBILITIES

- A. Verify field measurements, field construction criteria, catalog numbers and similar data.
- B. Coordinate each Submittal with requirements of Work and Contract Documents.
- C. Submit four (4) copies, excluding samples or mark-ups, of the shop drawings to the CONTRACTOR for review and submission to the ENGINEER for review.

#### 1.6 CONTRACTOR RESPONSIBILITIES

- A. Submit complete listing of all required shop drawing submittals by Specification Section to the ENGINEER.
- B. Submit shop drawings, product data, samples and other pertinent information in sufficient detail to show compliance with specified requirements.
- C. Check, verify and revise Submittals as necessary to bring them into conformance with Contract Documents and actual field conditions.
  - 1. Determine and verify quantities, dimensions, specified design and performance criteria, materials, catalog numbers and similar data.
  - 2. Coordinate Submittal with other Submittals and with the requirements of the Contract Documents.
- D. After completion of checking, verification and revising, stamp, sign and date Submittals indicating review and approval and submit to ENGINEER.
  - 1. Stamp and signature indicates CONTRACTOR has satisfied shop drawing review responsibilities and constitutes written review of shop drawing with general conformance with the Contract Documents.

2. Shop drawings without CONTRACTOR written reviewed stamp and signature will be returned for resubmission.
- E. **Shop Drawings:** Submit four (4) copies. Two (2) will be returned with reviewer's comment's and stamp.
- F. **Product Data and Manufacturer's Instructions:** Submit four (4) copies. Excise or cross out non-applicable information and clearly mark applicable information with citations to and terminology consistent with Contract Documents.
1. Two (2) copies will be returned with reviewer's comments and stamp.
- G. **Samples:** Submit two (2) samples labeled with reference to applicable Contract Documents. Label will be returned with reviewer's selection when appropriate, comments and stamp. Samples will not be returned unless return is requested in writing and additional samples are submitted.
- H. **Special Samples:** Submit one (1) sample labeled with reference to applicable Contract Documents. Sample and one (1) label will be returned for installation in the WORK.
- I. Assume risk expense and delays when proceeding with work related to required Submittals without review and acceptance.
- J. **Submittals in Electronic Media Format:** Include with each submittal electronic copies of all product data, shop drawings as follows:
1. General: Provide all information on CDs.
  2. Product Data: Provide text documents and manufacture's literature.
  3. Shop Drawings, Diagrams: Provide all graphic Submittals utilizing current version of AutoCAD as utilized by the ENGINEER.
  4. CONTRACTOR using other software shall be required to provide to the ENGINEER conclusive evidence of 100% data transfer compatibility.
  5. Adobe Acrobat: Any information provided as an image file shall be in the latest version of Adobe Acrobat (i.e. PDF extension).
- K. **Deferred Submittals:** Submit any and all requested deferred submittals as required by the Building Permit or local governing agency. The deferred submittals may include but not be limited to trusses, bar joists or above ground tanks.

#### 1.7 ENGINEER'S RESPONSIBILITY

- A. ENGINEER's review of shop drawings, samples or test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents.
1. ENGINEER's review does not extend to:
    - a. Accuracy of dimensions, quantities or performance of equipment and systems designed by CONTRACTOR, subcontractor or Vendor.
    - b. CONTRACTOR or subcontractor means, methods, techniques, sequences or procedures, except when specified, indicated on the Drawings or required by Contract Documents.
    - c. Safety precautions or programs related to safety, which shall remain the sole responsibility of the CONTRACTOR and the subcontractor.
- B. Except as may be provided in subsequent Specification, a submittal will be returned within 30 days. When a Submittal cannot be returned within that period, ENGINEER will, within a reasonable time after receipt of the Submittals, give notice of the date by which that submittal will be returned.
- C. For Submittals returned No Exceptions Taken – Submittal is considered in conformance with the design concept.

- D. For Submittals returned Accepted with Correction Noted – Make Correction Noted/See all Comments, CONTRACTOR shall incorporate all review comments into the work, but resubmittal of an amended Submittal is not required.
- E. For Submittals returned Submit Specific Item – CONTRACTOR shall develop a new Submittal package with materials, equipment, methods, etc. that meet the requirements of the Contract Documents for that specific item.
- F. For Submittals returned Revised and Resubmit – Make Corrections Note/See All Comments, CONTRACTOR shall incorporate the review comments into a complete revised package and resubmit it for review.
- G. For Submittals returned Rejected – See All Comments, CONTRACTOR shall develop a new Submittal package with materials, equipment, methods, etc. that meet the requirements of the Contract Documents.
- H. For Submittals returned Submittal Not Reviewed, Filed for Record, no further action is required by the CONTRACTOR for this Submittal.
- I. ENGINEER will be entitled to rely upon the accuracy or completeness of designs, calculations or certification made by licensed professionals accompanying a particular Submittal whether or not a stamp or seal is required by Contract Documents or Laws and Regulations.
- J. Costs incurred by the ENGINEER, as a result, of additional reviews of a particular Submittal after the second time it has been reviewed shall be borne by CONTRACTOR. Reimbursement to ENGINEER will be made by issuance of a Change Order.

#### 1.8 MINOR OR INCIDENTAL PRODUCTS AND EQUIPMENT SCHEDULES

- A. Shop Drawings of minor or incidental fabricated products will not be required, unless requested.
- B. Submit tabulated lists of minor or incidental products showing the names of the manufactures and catalog numbers, with Product Data and Samples, as required to, determine acceptability.

#### 1.9 SUBMITTALS FOR INFORMATION OR RECORD ONLY

- A. Submit three (3) copies of each. None will be returned.
- B. **Mill Test Reports:**
  - 1. Submit three (3) certified copies of factory and mill test reports for record only. No copies will be returned.
  - 2. Do not incorporate Products in the work, which have not passed testing and inspection satisfactorily.
  - 3. Pay for mill and factory tests.
- C. **Reinforcing Steel:**
  - 1. Submit reinforcing steel fabrication and setting drawings for information or record only. No copies will be returned.
  - 2. Note deviations and variations as specified for shop drawings.

#### **PART 2 – PRODUCTS** (Not Used)

#### **PART 3 – EXECUTION** (Not Used)

- END OF SECTION -

**SECTION 01310**  
**PROGRESS SCHEDULES AND REPORTS**

**PART 1 – GENERAL**

1.1 SUMMARY

- A. **Section Includes:** Preparation, submittal and maintenance of computerized progress schedule and reports, contract time adjustments and payment requests, including the following:
1. Preliminary Schedule
  2. Baseline Schedule
  3. Weekly Schedule
  4. Schedule Updates
  5. Schedule Revisions
  6. Time Impact Analyses
  7. Final Schedule Submittal
- B. **Related Sections:**
1. Section 01300 - Submittals
  2. Section 01312 - Project Meetings
  3. Section 01700 – Project Closeout
- C. CITY reserves the right to disapprove scheduler when submitted by CONTRACTOR if not qualified. CITY reserves the right to remove scheduler from the project if found to be incompetent.

1.2 PRECONSTRUCTION SCHEDULING MEETING

- A. The CONTRACTOR will conduct a Preconstruction Schedule Meeting within 14 Calendar days after Notice to Proceed. This meeting is separate from the Preconstruction Conference Meeting and is intended to cover schedule issues exclusively.
- B. At the meeting, scheduling requirements shall be reviewed with CONTRACTOR. These include schedule preparation, reporting requirements, updates, revisions and schedule delay analysis. CONTRACTOR shall present their schedule methodology, planned sequence of operations and present their proposed activity coding structure.
- C. **Coding Structure:** CONTRACTOR shall submit proposed coding structure, identifying the code fields and the associated code values it intends to use in the project schedule. The coding structure shall, at a minimum, include code fields for Project Segment or Phase, Area of Work, Type of Work, Submittal/Procurement/Construction and Responsibility/Subcontractor. Refer to Article 1.091 for listing of activity categories to be included in the schedule.

1.3 PREPARATION

- A. Preparation and submittal of Progress Schedule represents CONTRACTORS intention to execute the WORK within specified time and constraints.
- B. During preparation of the preliminary Progress Schedule, ENGINEER will facilitate CONTRACTOR efforts by being available to answer questions regarding sequencing issues, scheduling constraints, interface points and dependency relationships.

- C. Failure to include an activity required for execution of the Work does not excuse CONTRACTOR from completing the WORK and portions thereof within specified times and at price specified in Agreement. Failure of CONTRACTOR to include required schedule constraints, sequences or milestones in schedule shall not relieve CONTRACTOR of obligation to conform to requirements of Contract. Acceptance of schedule shall not waive Contract requirements. In event of conflict between accepted schedule and Contract requirements, terms of Contract shall govern at all times, unless requirements are waived in writing by the CITY.
- D. Reference Schedule to calendar days with beginning of Contract Time as Day "1."
- E. Should CONTRACTOR submit a Baseline Schedule showing project completion more than 20 working days prior to Contract completion date the CITY may issue Change Order, at no cost to the CITY, revising time of performance of WORK and Contract completion date to match CONTRACTORS schedule completion date. Contract milestone dates, if any, shall be adjusted accordingly.
- F. **Schedule Logic:** Schedule shall be assembled to show order in which CONTRACTOR proposes to carry out WORK, indicate restrictions of access, availability of Work areas, and availability and use of manpower, materials and equipment. Following criteria shall form basis for assembly of schedule logic.
  - 1. Which activities must be completed before subsequent activities can be started?
  - 2. Which activities can be performed concurrently?
  - 3. Which activities must be started immediately following completed activities?
  - 4. What major facility, equipment or manpower restrictions are required for sequencing these activities?

#### 1.4 SUBMITTAL OF PROGRESS SCHEDULES

- A. Submit preliminary
- B. Submit, on a monthly basis, updated schedules as specified. Submit final schedule update as specified.
- C. Submit revised schedules and time impact analyses as specified.

#### 1.5 NETWORK DETAILS AND GRAPHICAL OUTPUT

- A. Produce a clear, legible and accurate calendar based, time scaled, graphical network diagram. Group activities related to the same physical areas of the WORK. Produce the network diagram based upon the early start of all activities.
- B. Include for each activity, the description, activity number, estimated duration in calendar days, total float and all activity relationship lines.
- C. Illustrate order and interdependence of activities and sequence in which WORK is planned to be accomplished. Incorporate the basic concept of the precedence diagram network method to show how the start of one activity is dependent upon the start or completion of preceding activities and its completion restrict the start of following activities.
- D. Indicate the critical path for the project.
- E. Identify system shutdown dates, system tie-in dates, specified interim completion or milestone dates and contract completion date as milestones.
- F. **Include, in addition to Construction Activities:**
  - 1. Submission dates and review periods for major equipment submittals.
  - 2. Any activity by the CITY that may affect progress or required completion dates.
  - 3. Equipment and long-lead material deliveries over eight (8) weeks.
  - 4. Approvals required by regulatory agencies or other third parties.

## 1.6 SCHEDULE OF SHOP DRAWING AND SAMPLE SUBMITTALS

- A. After the Schedule has been submitted and accepted by the CITY, the CONTRACTOR shall print out and submit a list of all shop drawings and sample submittals for all WORK using early start dates. This listing will contain all submittals required for the entire WORK, including those listed above.

## 1.7 UPDATING THE SCHEDULE

- A. Update the schedule on a monthly basis, using the first of each month as a data date.
- B. Should monthly Schedule Update show project completion later than current Contract completion date, CONTRACTOR shall prepare and submit a plan to show how the project will get back on schedule.

## 1.8 REVISIONS TO SCHEDULE

- A. **Submit revised schedule within five (5) calendar days:**
  - 1. When delay in completion of any activity or group of activities indicates an overrun of the Contract time or milestone dates by 20 working days or 5% of the remaining duration, whichever is less.
  - 2. When delays in submittals, deliveries or work stoppages are encountered making necessary the replanning or rescheduling of activities.
  - 3. When the schedule does not represent the actual progress of activities.
  - 4. When any change to the sequence of activities, the completion date for major portions of the work or when changes occur which affect the critical path.
  - 5. When Contract modification necessitates schedule revision, submit schedule analysis of change order work with cost proposal.
- B. Submit revised schedule and materials as specified under Article, "Submittal of Progress Schedule."
- C. Make revisions on most recently accepted version of schedule.
- D. Schedule Revisions shall not be prepared or submitted with Schedule Updates. They shall be separate submittals and shall be noted as Schedule Revisions.
- E. Only upon acceptance of a revision by the CITY shall be reflected in the next monthly Schedule Update.
- F. Schedule Revisions submitted for the purpose of mitigating a CONTRACTOR caused project delay (Recovery Schedule) shall not be implemented until the CITY reviews and accepts the Schedule Revision.

## 1.9 ADJUSTMENT OF CONTRACT TIMES

- A. If the CONTRACTOR believes that the CITY has impacted its work, such that the project completion date will be delayed, the CONTRACTOR must submit proof demonstrating the delay to the critical path. This proof, in the form of a Time Impact Analysis, may entitle the CONTRACTOR to an adjustment of contract time.

### **PART 2 – PRODUCTS (Not Used)**

### **PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01312  
PROJECT MEETINGS**

**PART 1 – GENERAL**

1.1 SUMMARY

- A. **Section Includes:** Requirements for conducting conferences and meetings for the purposes of addressing issues related to the Work, reviewing and coordinating progress of the Work and other matters of common interest, and includes the following:
1. Qualifications of Meeting Participants.
  2. Preconstruction Conference Progress Meetings.
  3. Pre-installation Meetings.
  4. Post Construction Meeting.

1.2 QUALIFICATIONS OF MEETING PARTICIPANTS

- A. Representatives of entities participating in meetings shall be qualified and authorized to act on behalf of entity each represents.

1.3 PRECONSTRUCTION CONFERENCE

- A. Upon issuance of Notice to Proceed, or earlier when mutually agreeable, the CONTRACTOR will arrange a preconstruction conference in convenient place for most persons invited.
- B. Attending Preconstruction Conference: CONTRACTOR superintendent, CITY, ENGINEER, representatives of utilities, major subcontractors and others involved in performance of the Work, and others necessary to agenda.
- C. CONTRACTOR will preside at conference.
- D. **Purpose of Conference:** To establish working understanding between parties and to discuss Construction Schedule, shop drawing and other submittals, cost breakdown of major lump sum items, processing of submittals and applications for payment, and other subjects pertinent to execution of the Work.
- E. **Agenda Will Include:**
1. Adequacy of distribution of Contract Documents.
  2. Distribution and discussion of list of major subcontractors and suppliers.
  3. Proposed progress schedules and critical construction sequencing.
  4. Major equipment deliveries and priorities.
  5. Project coordination.
  6. Designation of responsible personnel.
  7. Procedures and Processing of:
    - a. Field decisions.
    - b. Proposal requests.
    - c. Submittals.
    - d. Change Orders.
    - e. Applications for Payment.
    - f. Record Documents.

8. Use of Premises:
  - a. Office, construction, and storage areas.
  - b. CITY's requirements.
9. Construction facilities, controls, and construction aids.
10. Site geotechnical report
11. Temporary utilities.
12. Safety and first aid procedures.
13. Security procedures.
14. Housekeeping procedures.

F. The CONTRACTOR will record minutes of meeting and distribute copies of minutes within 7 days of meeting to participants and interested parties.

## 1.5 PROGRESS MEETINGS

### A. **Weekly Progress Meetings:**

1. Conduct progress meetings at least once every week in CONTRACTOR'S field office.
2. Require attendance of all subcontractors who are or are proximate to be actively involved in the Work, or who are necessary to agenda.
3. Invite CITY, ENGINEER, utility Companies when the Work affects their interests, and others necessary to agenda.
4. Preside at meetings.
5. Purpose of Progress Meetings: To expedite work of subcontractors or other organizations that are not meeting scheduled progress, resolve conflicts, and coordinate and expedite execution of the Work.
6. Verify:
  - a. Actual start and finish dates of completed activities since last progress meeting.
  - b. Durations and progress of activities not completed.
  - c. Reason, time, and cost data for Change Order Work that will be incorporated into Progress Schedule and application for payment.
  - d. Percentage completion of items on Application for Payment.
  - e. Reasons for required revisions to Progress Schedule and their effect on Contract Time and Contract Price.
7. Discuss potential problems which may impede scheduled progress and corrective measures.
8. The CONTRACTOR will record minutes of meeting and distribute copies of minutes within 7 days of meeting to participants and interested parties.

### B. **Monthly Progress Meetings:**

1. Conduct CITYS monthly progress meetings at least once every month in CONTRACTORS field Office.
2. Distribute to each anticipated participant written notice and agenda of each meeting at least 4 days before meeting.
3. Invite CITY, ENGINEER, utility Companies when the Work affects their interests, and others necessary to agenda.
4. Complete and bring Application for Payment and Progress Schedule to progress meeting.
5. Prepare and distribute agenda.
6. Preside at meetings.

7. Review progress of the Work, Progress Schedule, narrative report, Application for Payment, record documents, and additional items of current interest that are pertinent to execution of the Work.
8. Verify:
  - a. Actual start and finish dates of completed activities since last progress meeting.
  - b. Durations and progress of activities not completed.
  - c. Reason, time, and cost data for Change Order Work that will be incorporated into Progress Schedule and application for payment.
  - d. Percentage completion of items on Application for Payment.
  - e. Reasons for required revisions to Progress Schedule and their effect on Contract Time and Contract Price.
9. Discuss potential problems which may impede scheduled progress and corrective measures.
10. The CONTRACTOR will record minutes of meeting and distribute copies of minutes within 7 days of meeting to participants and interested parties.

#### 1.6 PRE-INSTALLATION MEETINGS

- A. **General:** Meet with manufacturers and installers of major units of construction which require coordination between subcontractors.
- B. Distribute to each anticipated participant written notice and agenda of each meeting at least 7 days before meeting.
- C. Schedule meeting at least 7 days in advance of installation.
- D. Conduct meetings in CONTRACTOR's field office or other mutually agreed upon place.
- E. Require attendance of Superintendent, appropriate manufacturers and installers of major units of constructions, and affected subcontractors.
- F. Invite CITY and ENGINEER.
- G. Preside at meetings.
- H. Record minutes of meeting and distribute copies of minutes within 7 days of meeting to participants and interested parties.

#### 1.7 POST CONSTRUCTION MEETING

- A. Meet with and inspect the Work just prior to Substantial Completion and again prior to final completion with CITY and ENGINEER.
- B. Arrange meeting at least 7 days before meeting.
- C. Meet in CONTRACTOR's office or other mutually agreed upon place.
- D. Inspect the Work and draft list of items to be completed or corrected.
- E. Review service and maintenance contracts, and take appropriate corrective action when necessary.
- F. Complete or correct defective work and extend correction period accordingly.
- G. Require attendance of Superintendent, appropriate manufacturers and installers of major units of constructions, and affected subcontractors.

#### **PART 2 – PRODUCTS (Not Used)**

#### **PART 3 – EXECUTION (Not Used)**

-END OF SECTION-

**SECTION 01329  
SAFETY PLAN**

**PART 1 – GENERAL**

1.1 SUMMARY

- A. Section Includes: Development and maintenance of a Construction Safety Plan.

1.2 REFERENCES

- A. OSHA.

1.3 CONSTRUCTION SAFETY PLAN

- A. Detail the Methods and Procedures to comply with Federal, State, and Local Health and Safety Laws, Rules and Requirements for the duration of the Contract Times. Include the following:
1. Identification of the Certified or Licensed Safety Consultant who will prepare, initiate, maintain and supervise safety programs, and procedures.
  2. Procedures for providing workers with an awareness of safety and health hazards expected to be encountered in the course of construction.
  3. Safety equipment appropriate to the safety and health hazards expected to be encountered during construction. Include warning devices, barricades, safety equipment in public right-of-way and protected areas, and safety equipment used in multi-level structures.
  4. Methods for minimizing employees' exposure to safety and health hazards expected during construction.
  5. Procedures for reporting safety or health hazards.
  6. Procedures to follow to correct a recognized safety and health hazard.
  7. Procedures for investigation of accidents, injuries, illnesses and unusual events that have occurred at the construction site.
  8. Periodic and scheduled inspections of general work areas and specific work stations.
  9. Training for employees and workers at the jobsite.
  10. Methods of communication of safe working conditions, work practices and required personal protection equipment.
- B. Assume responsibility for every aspect of Health and Safety on the jobsite, including the health and safety of Subcontractors, suppliers, and other persons on the jobsite.
1. Forward available information and reports to the Safety Consultant who shall make the necessary recommendations concerning worker health and safety at the jobsite.
  2. Employ additional health and safety measures specified by the Safety Consultant, as necessary, for workers in accordance with OSHA guidelines.
- C. Transmit to CITY and ENGINEER copies of reports and other documents related to accidents or injuries encountered during construction.

#### 1.4 CONFINED SPACE

A. Any Work to be conducted in an area defined by OSHA requirements to be a confined space shall follow all the necessary safety and operational requirements by all regulatory agencies. All participants conducting work in a confined space must be trained and certified to conduct work in an area defined as a confined space. Prior to any work conducted in an area defined as a confined space, the CONTRACTOR must submit to the CITY, ENGINEER and Construction Manager their entry plan which shall satisfy all safety and operational requirements by all regulatory agencies. EACH entry plan must detail each participant's role and confined space certification. EACH entry plan shall also include the following:

1. Purpose/Objective of Each Entry
2. Definitions and Duties of Each Participant
3. Rescue Procedures
4. List of Equipment
5. Plan of Action – List of Daily Construction Tasks

**PART 2 – PRODUCTS** (Not Used)

**PART 3 – EXECUTION** (Not Used)

-END OF SECTION-

**SECTION 01400**  
**QUALITY CONTROL**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The Specific Quality Control Requirements for the WORK are indicated throughout the Contract Documents. The Requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes preactivity inspection, follow up meetings, sampling and testing, and associated requirements.

1.2 INSPECTION AT PLACE OF MANUFACTURE

- A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.
- B. Unless noted otherwise, the presence of the ENGINEER at the place of manufacturer is not required; however, this shall not relieve responsibility for providing products, materials and equipment that comply with all requirements of the Contract Documents.

1.3 SAMPLING AND TESTING

- A. Unless otherwise indicated, all sampling and testing will be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered.

1.4 INSPECTION AND TESTING SERVICE

- A. **Inspection and testing laboratory service shall comply with the following:**
  - 1. Unless indicated otherwise by the Technical Specifications, an independent firm will be appointed and employed by the CONTRACTOR to perform special inspection and soils and concrete testing.
  - 2. Perform inspections, testings and other services as required.
  - 3. Submit Reports of Testing to the ENGINEER, CONTRACTOR and CITY if required in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
  - 4. Cooperate with the independent firm and furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
  - 5. Notification prior to the expected time for operations requiring inspection and laboratory testing services is required.
  - 6. The same independent firm on instructions shall perform retesting required because of non-conformance to requirements.
  - 7. For tests and samples required, arrangements shall be made with an independent firm for payment and scheduling of testing. Responsibility shall be taken for the cost of sampling and testing.
  - 10. Provide an overall report on inspection and test results for project closeout.

**PART 2 – PRODUCTS (Not Used)**

## **PART 3 – EXECUTION**

### 3.1 INSTALLATION

- A. **Inspection:** Inspect materials or equipment upon arrival on the job site, prior to installation and reject damaged and defective items.
- B. **Measurements:** Verify measurements and dimensions of the WORK, as an integral step of starting each installation.
- C. **Manufacturer's Instructions:** Where installations include manufactured products, compliance with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents is required.

- END OF SECTION -

**SECTION 01420  
AS BUILT DRAWINGS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The CONTRACTOR and its Subcontractors at the start of the project shall provide a clean set of Drawings and mark on them, in large writing “As Built.” This set of drawings will be kept at the job site trailer and used to indicate with a red pencil, pen or marker the “As Built” conditions of the project. These drawings will be updated as the work progresses to reflect the “As Built” conditions.
- B. The CONTRACTOR shall be responsible to ensure that the “As Built” drawings are being kept up to date.
- C. Upon substantial completion the CONTRACTOR shall obtain all “As Built” drawings and review them for accuracy and completeness, this includes surveying of utilities as required by Section 01722. After the CONTRACTOR has reviewed and confirmed accuracy and completeness of the “As Built” drawings the CONTRACTOR shall submit the drawings and survey information to the ENGINEER of record.
- D. Upon receipt of the “As Built” drawings the ENGINEER shall make all necessary changes to the documents and provide a Record Drawing set to the CONTRACTOR for their use and distribution as required for project closeout, see Section 01700.

**PART 2 – PRODUCTS**

2.1 AS-BUILT REQUIREMENTS

- A. The CONTRACTOR and its Subcontractors shall include in the as-built drawings all deviations from plans unless excluded by the Engineer in writing.
- B. All buried pipe fitting (3” or greater) and buried duct banks shall be surveyed to show alignment prior to backfill.

**PART 3 – EXECUTION (Not Used)**

-END OF SECTION-

**SECTION 01450**  
**SERVICES OF MANUFACTURER'S REPRESENTATIVE**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. **General:** Provide a qualified service representative from each company manufacturing or supplying certain equipment to perform the duties herein described and as required by the various sections of the Specifications. All costs to perform these services shall be included in the supplier's proposal in accordance with the scope of work.
- B. **Supervision of Installation:** The supplier shall provide direct and/or indirect supervision of the workers and ENGINEER, in accordance with the scope of work, to insure that proper procedures are followed during equipment installation.
- C. **Equipment Check Out:**
  - 1. After installation of the listed equipment has been completed and the equipment is presumably ready for operation but before it is operated by others, the representative shall inspect, operate, test and adjust the equipment. The inspection shall include but shall not be limited to, the following points as applicable:
    - a. Soundness (without cracked or otherwise damaged parts)
    - b. Completeness in all details as specified
    - c. Correctness of setting, alignment and relative arrangement of various parts
    - d. Adequacy and correctness of packing, sealing and lubricants
  - 2. The operation, testing and adjustment shall be as required to prove that the equipment has been installed properly and is capable of satisfactory operation under the conditions specified. On completion of his WORK, the CONTRACTOR, manufacturer or supplier's representatives shall submit a complete signed report of the result of his inspection, operation, adjustments and tests. The report shall include descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the requirements of the Contract Documents and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.
- D. **Field Tests:** As required by the individual specification sections, the manufacturer's representative shall be present when the field tests are made.
- E. **Operator Training:** The manufacturer shall provide the services of its representative to provide hands-on training to maintenance personnel in the proper operation and maintenance of the equipment prior to placing the equipment in full operation.
- F. **Post-startup Services:** As required by the individual specification sections, the manufacturer's representative shall provide services beyond the start up of the equipment. Services may include assistance in the calibration, tuning and troubleshooting, plus any additional training, which may be required during the agreed time after the equipment, is accepted.
- G. The CONTRACTOR shall be the supplier for items not specifically included in the supplier's scope of work.

**PART 2 – PRODUCTS (Not Used)**

## **PART 3 – EXECUTION**

### **3.1 EXECUTION**

- A. The CONTRACTOR shall submit six (6) copies of all equipment field service certification documents and certificates of warranty to the ENGINEER in accordance with Section 01700 Project Closeout

- END OF SECTION -

**SECTION 01454**  
**TESTING LABORATORY SERVICES**

**PART 1 – GENERAL**

1.1 REQUIREMENTS

- A. Testing laboratory services and CONTRACTOR responsibilities related to those services.

1.2 REFERENCE STANDARDS

A. Commercial Standards:

ASTM C 11077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C 3666 Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials

ASTM C 3740 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM C 329 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

ISO/TEC Guide 25 - General Requirements for the Competence of Calibration and Testing Laboratories

1.3 SELECTION AND PAYMENT

- A. The CONTRACTOR will select, employ, and pay for services of an independent testing laboratory to perform inspection and testing.
- B. Employment of a testing laboratory by the CONTRACTOR shall not relieve the subcontractor of its obligation to perform work in accordance with requirements of Contract Documents.
- C. The CONTRACTOR may deduct a minimum two-hour charge for testing laboratory time from periodic progress payment when operations requiring testing or inspection are canceled without prior notification.
- D. The CONTRACTOR may deduct cost of retesting from periodic progress payments whenever failed work is removed, replaced and retested.

1.4 QUALIFICATION OF LABORATORY

- A. Meet laboratory requirements of ASTM E 329 and applicable requirements of ASTM C 1077, ASTM D 3666, and ASTM D 3740.
- B. Meet ISO/TEC Guide 17025 conditions for accreditation by the American Associations for Laboratory Accreditation (A2LA) in specific fields of testing required individual Specification sections.
- C. If laboratory subcontracts are part of the testing services, such work will be placed with a laboratory complying with the requirements of this section.

1.5 LABORATORY REPORTS

- A. Testing laboratory shall provide and distribute copies of the Laboratory reports to the distribution list the CONTRACTOR provides at the pre-construction meeting.
- B. Keep one copy of each laboratory report distributed or faxed at the site field office for the duration of the Work.

- C. Laboratory will fax material supplier, subcontractor and CONTRACTOR reports that indication failing test results by no later than close of business on the working day following test completion and review.

#### 1.6 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge requirements of the Contract.
- B. Laboratory may not approve or accept any portion of the Work.
- C. Laboratory may not assume CONTRACTOR duties.
- D. Laboratory has no authority to stop the Work.

#### 1.7 CONTRACTOR RESPONSIBILITIES

- A. Provide safe access to the Work for testing laboratory personnel.
- B. Provide testing laboratory with a copy of the Construction Schedule and a copy of each update to Construction Schedule.
- C. Notify testing laboratory during normal working hours of the day previous to expected time for operations requiring inspection and testing services. When CONTRACTOR fails to make timely prior notification, do not proceed with the operations requiring inspection and testing services.
- D. Notify ENGINEER 24 hours in advance when Specification presence of ENGINEER for sampling or testing.
- E. Request and monitor testing as required to provide timely results and to avoid delays to the Work. Provide samples to laboratory in sufficient time to allow required test to be performed in accordance with the specified test methods before intended use of the product.
- F. Cooperate with laboratory personnel in collecting samples on site. Provide incidental labor and facilities for safe access to the Work to be tested, to obtain and handle samples at site or at source of Products to be tested, and to facilitate tests and inspections including storage and curing of test samples.
  - 1. Re-testing required for failed tests.
  - 2. Re-testing for non-conforming work.
  - 3. Additional sampling and tests requested beyond specified requirements.
  - 4. Insufficient notification of cancellation of test for work scheduled but not performed.

### **PART 2 – PRODUCTS (Not Used)**

### **PART 3 – EXECUTION**

#### 3.1 CONDUCTING TESTS

- A. Conform to laboratory sampling and testing methods specified in individual Specification sections to the latest issues of ASTM standards, or other recognized test standards approved by the ENGINEER.
- B. Requirements of this section shall also apply to those tests for approval of materials, for mix designs, and for quality control of materials as performed by employed testing laboratories.

-END OF SECTION-

**SECTION 01505  
MOBILIZATION**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Mobilization shall include verification by the CONTRACTOR that all permits have been obtained; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items:
1. Moving onto the site all materials and equipment required for first month operations
  2. Installing temporary construction power, wiring and lighting facilities if applicable
  3. Establishing a fire protection system as required.
  4. Developing a construction water supply as required.
  5. Providing field office trailers if necessary, complete with all specified furnishings and utility services (if available) including telephones, telephone appurtenances and copying machine
  6. Providing all on-site communication facilities including telephones
  7. Providing on-site sanitary facilities and potable water facilities
  8. Arranging for and erection of work and storage yard
  9. Constructing and implementing security features and requirements
  10. Obtaining all required permits for the project.
  11. Comply with all OSHA required notices and establish a safety program
  12. Having the superintendent or authorized representatives at the job site during working hour of this Contract for execution of the work. CONTRACTOR shall submit the name of the superintendent or authorized representative to the Agency. Substitution of authorized representative or superintendent shall require Agency approval.
  13. Provide and implement an on-site Construction SWPP features and requirements complying with Section 01565 – Erosion and Sediment Control.
  14. Provide and implement an on-site Dust Control Plan
- B. CONTRACTOR shall coordinate with the CITY on the allowable staging area of Construction.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01510  
TEMPORARY UTILITIES**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Types: The types of Utility Services required for general temporary use at the Site needed to complete the WORK includes the following:
1. Water Service (potable for certain uses)
  2. Electric Power Service (if available)
  3. Telephone Service
  4. High Speed Internet/E-mail Access (if available)

1.2 JOB CONDITIONS

- A. Scheduled Uses: In conjunction with establishment of Job Progress Schedule, establish a Schedule for implementation and termination of service for each temporary utility at the earliest feasible time and change over from use of temporary utility service to permanent service.

**PART 2 – PRODUCTS**

2.1 MATERIALS

- A. Provide new or used materials and equipment, which are in substantially undamaged condition and without significant deterioration and which are recognized in the construction industry, by compliance with appropriate standards, as being suitable for intended use in each case. The Utility Company provides a portion of temporary utility, the remaining portion with compatible materials and equipment, shall be provided and comply with recommendations of the Utility Company.

**PART 3 – EXECUTION**

3.1 INSTALLATION OF TEMPORARY UTILITY SERVICES

- A. General: Wherever feasible, engage the Utility Company for installation of temporary services to the project, or at a minimum, to make a connection to the existing utility service. Locate services that will not interfere with Total Project Construction WORK; including installation of permanent utility services; maintain temporary services as installed for required period of use and relocate, modify or extend as necessary from time to time during that period as required to accommodate total project construction WORK.
- B. Approval of Electrical Connections: Temporary connections for electricity shall be subject to approval of the CONTRACTOR and the power company representative and shall be removed in like manner, prior to final acceptance of the WORK.
- C. Separation of Circuits: Unless otherwise permitted by the CONTRACTOR, circuits used for power purposes shall be separate from lighting circuits.
- D. Construction Wiring: Wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. Electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

### 3.2 INSTALLATION OF POWER DISTRIBUTION SYSTEM

- A. Power: Provide power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the WORK in a safe and satisfactory manner.

### 3.3 INSTALLATION OF LIGHTING

- A. Construction Lighting: WORK conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper WORK and to afford adequate facilities for inspection and safe working conditions.
- B. Temporary Lighting: Provide a general, weatherproof, grounded temporary lighting system suitable to perform the WORK where needed.

### 3.4 WATER SUPPLY

- A. General: Wherever feasible, coordinate with the Water Utilities Department for obtaining water service connection. Provide all facilities necessary to convey the water from the source to the points of use in accordance with the requirements of the Contract Documents. Pay any permit wet tap fees that may be required, and pay the fee for water meter and all other charges for water use.
- B. Water Connections: No connection shall be made to or draw water from any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency. The CONTRACTOR will pay all permit and water charges.

### 3.5 INSTALLATION OF SANITARY FACILITIES

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.

### 3.6 INSTALLATION OF FIRE PROTECTION

- A. Fire Protection: Fire protection program shall conform to the requirements of the local town/city ordinance or as required in Subpart F of the OSHA Standards for Construction as defined in the Contract.

### 3.7 INSTALLATION OF COMMUNICATIONS

- A. Telephone Services: Provide and maintain at all times during the progress of the WORK not less than one telephone in good working order at its own field construction office at or near the Site. Each such telephone shall be connected to an established exchange for toll service and with all other telephones utilized.
- B. Internet Services: Wherever feasible, provide and maintain at all times during the progress of the WORK access to Internet via either direct connection or wireless network to allow e-mail communication between main office and field.

### 3.8 OPERATIONS AND TERMINATIONS

- A. Inspections: Prior to placing temporary utility services into use, Inspect and test each service and arrange for governing authorities' required inspection and tests, and obtain required certifications and permits for use thereof.
- B. Protection: Maintain distinct markers for underground lines, and protect from damage during excavating operations.

- C. Termination and Removal: When need for a temporary utility service or a substantial portion thereof has ended, or when its service has been replaced by use of permanent services, or not later than time of substantial completion, promptly remove installation unless requested to retain it for a longer period. Complete and restore WORK, which may have been delayed or affected by installation and use of temporary utility, including repairs to construction and grades and restoration and cleaning of exposed surfaces.

- END OF SECTION -

**SECTION 01520  
SECURITY**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Security shall be provided by CONTRACTOR to protect the project as defined in the Contract as follows:
  - 1. Protect WORK, existing premises and operations from theft, vandalism and unauthorized entry.
  - 2. Initiate program in coordination with existing security system at mobilization.
  - 3. Maintain program throughout construction period.
- B. Entry Control
  - 1. Restrict entry of persons and vehicles into Site.
  - 2. Allow entry only to authorized persons with proper identification.
  - 3. Provide all temporary barriers in conformance with Local, State and Federal Codes.
  - 4. Control entrance of persons and vehicles related to operations.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION**

- A. **Implementation of the onsite security:** The CONTRACTOR shall employ an insured and bonded security service with a minimum of 5 years experience to protect the site from theft, vandalism and unauthorized entry during non construction activities and hours (i.e. nights, weekends, and holidays), as defined in the Contract.
- B. **Coordination of the onsite security:**
  - 1. The onsite security company shall coordinate all activities with the CONTRACTOR's construction activity.
  - 2. The onsite security company shall contact the local authorities having jurisdiction as necessary.
- C. **Incident Log:** The onsite security company shall keep a log of all daily activities and incidents at the project site. The logs shall be submitted to the CONTRACTOR on a weekly basis.

- END OF SECTION -

**SECTION 01530  
PROTECTION OF EXISTING FACILITIES**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Protect all existing utilities and improvements, not designated for removal, shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than prior to such damage or temporary relocation, all in accordance with the Contract Documents.
- B. Submit Protection Plan prior to commencement of Work in accordance to Section 01300 Submittals.

1.2 RIGHTS-OF-WAY

- A. WORK that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, shall not be performed nor shall the entry upon the rights-of-way involved until notified that authority has been secured from the proper party.
- B. After authority has been obtained, said party shall be given due notice of its intention to begin work, if required by said party, and shall remove, shore, support, or otherwise protect such pipeline, transmission line, ditch, fence, or structure, or replace the same.

1.3 PROTECTION OF STREET OR ROADWAY MARKERS

- A. Do not destroy, remove or otherwise disturb any existing survey markers, other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. Survey markers or points disturbed shall be accurately restored after street or roadway resurfacing has been completed.

1.4 RESTORATION OF PAVEMENT

- A. General: All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. The pavement restoration requirement to match existing sections shall apply to all components of existing sections, including sub-base, base, and pavement. Temporary and permanent pavement shall conform to the requirements of the affected pavement owner. Pavements that are subject to partial removal shall be neatly saw cut in straight lines.
- B. Temporary Resurfacing: Wherever required by the public authorities having jurisdiction, place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.
- C. Permanent Resurfacing: In order to obtain a satisfactory junction with adjacent surfaces, saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Edges of damaged pavement, along excavations and elsewhere, shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.
- D. Restoration of Sidewalks or Private Driveways: Wherever sidewalks or private roads have been removed for purposes of construction, place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions. If no such period of time is so fixed, maintain said temporary sidewalks or roadways

until the final restoration thereof has been made.

## 1.5 EXISTING UTILITIES AND IMPROVEMENTS

- A. General: Protect underground Utilities and other improvements, which may be impaired during construction operations, regardless of whether or not the Utilities are indicated on the Drawings. Take all possible precautions for the protection of unforeseen Utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.
- B. Except where the Drawings indicate Utilities have been field located during design or certain Utility locations shall be exposed as part of the WORK, responsibility for exploratory excavations as it deems necessary to determine the exact locations and depths of Utilities, which may interfere with its work shall be required. All such exploratory excavations shall be performed as soon as practicable after Notice to Proceed and, in any event, a sufficient time in advance of construction to avoid possible delays progress.
- C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.
- D. Utilities to be Moved: In case it shall be necessary to move the property of any public utility or franchise holder, upon request, the utility company or franchise holder will be notified to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, notification will be required with sufficient time in advance for the necessary measures to be taken to prevent interruption of service.
- E. Utilities to be Removed: The proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement, which is indicated, removal, without unnecessary delay, temporarily replacement or relocation of such Utilities or improvement in a manner satisfactory to the CITY of the facility shall be required. In all cases of such temporary removal or relocation, restoration to the former location shall be accomplished in a manner that will restore or replace the Utility or improvement as close to its former locations and to as good or better condition than found prior to removal.
- F. CITY's Right of Access: The right is reserved to the CITYs of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.
- G. Underground Utilities Indicated: Existing Utility lines that are indicated or the locations of which are made known prior to excavation and that are to be retained. All Utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling if damaged, shall be immediately repaired or replaced, unless otherwise repaired by the CITY of the damaged Utility. If the CITY of the damaged facility performs its own repairs, reimbursement to said CITY for the costs of repair shall be required.
- H. Underground Utilities Not Indicated: In the event that the existing Utility lines are damaged that are not indicated or the locations of which are not made known prior to excavation, a verbal report of such damage shall be made immediately, and a written report thereof shall be made promptly thereafter. Immediately notify the CITY of the damaged Utility. The Utility Owner shall be notified of the damage. If directed, repairs shall be made under the provisions for changes and extra work contained in their Contract Agreement.
- I. Costs of locating and repairing damage, not due to failure to exercise reasonable care and removing or relocating such Utility facilities, not indicated in the Contract Documents, with reasonable accuracy and for equipment on the project, which was actually working on that portion of the WORK which was interrupted or idled by removal or relocation of such Utility facilities, and which was necessarily idled during such work will be paid for as extra work resulting in the issuing of a change order in accordance with the provisions of the Contractual Agreement.

- J. Approval of Repairs: All repairs to a damaged Utility or improvement are subject to inspection and approval by an authorized representative of the Utility or improvement CITY before being concealed by backfill or other work.
- K. Maintaining in Service: Unless indicated otherwise, oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other satisfactory arrangements are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. Responsible for and shall repair all damage due to its operations shall be required, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

#### 1.6 TREES OR SHRUBS WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

- A. General: Except where trees or shrubs are indicated to be removed, exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency. Existing trees and shrubs that are damaged during construction shall be trimmed or replaced by a certified tree company under permit from the jurisdictional agency.
- B. Replacement: Immediately notify the jurisdictional agency if any tree or shrub is damaged by operations. If, in the opinion of said agency, the damage is such that replacement is necessary, replace the tree or shrub at its own expense. The tree or shrub shall be of a like size and variety as the one damaged or if of a smaller size, the owner of said tree shall be paid a compensatory payment acceptable to the tree or shrub owner, subject to the approval of the jurisdictional agency. The size of the tree or shrub shall be not less than 1-inch diameter or less than 6-feet in height. Planting of replacement trees and shrubs shall be in accordance with the recommendations of the nursery furnishing the plants.

#### 1.7 LAWN AREAS

- A. Lawn or landscaped areas damaged during construction shall be repaired to match the pre-construction condition to the satisfaction of the landowner.

#### 1.8 NOTIFICATION

- A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire.

### **PART 2 – PRODUCTS (Not Used)**

### **PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01550  
SITE ACCESS AND STORAGE**

**PART 1 – GENERAL**

**1.1 HIGHWAY LIMITATIONS**

- A. Make investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. Responsibility to construct and maintain any haul roads required for its construction operations shall be required.

**1.2 TEMPORARY CROSSINGS**

- A. General: Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300 feet shall be provided. Cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.
- B. Temporary Bridges: Wherever necessary, provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as securing the consent of the responsible individuals or authorities to omit such temporary bridges or steel plates. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case; designs furnished by said authority shall be adopted for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.
- C. Street Use: Nothing herein shall be construed to entitle any entity to the exclusive use of any public street, alleyway or parking area during the performance of the WORK hereunder, and it shall so conduct its operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways or parking areas. No streets shall be closed to the public without first obtaining permission from the proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets and other drainage facilities.
- D. Traffic Control: For the protection of traffic in public or private streets and ways, provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights and other safety devices.
  - 1. Take all necessary precautions for the protection of the WORK and the safety of the public. Barricades and obstructions shall be illuminated at night and all lights shall be kept burning from sunset until sunrise. Station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. Signs, signals and barricades shall conform to the requirements Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.

**1.3 WORK AND STORAGE AREA**

- A. The CONTRACTOR shall coordinate with the CITY to designate and arrange for the use, a portion of the property adjacent to the WORK for its exclusive use during the term of the Contract as storage and shop area for its construction operations relative to this Contract.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION**

3.1 SITE ACCESS ROAD

- A. The CONTRACTOR shall provide, construct, grade, and compact an access road to and from the site as necessary for any and all vehicles required to access the site. This shall include automobiles, pick-ups, delivery trucks, concrete trucks, equipment lowboys, equipment deliveries. The access shall be constructed as required by the local regulations for emergency vehicle access to include but not limited to EMS, Fire and rescue and law authorities.
- B. The CONTRACTOR shall maintain the site access road and provide access as required. The maintenance shall include leveling, smoothing, grading, BMP and SWPP, dust control and all other activities as required by the local regulations.

- END OF SECTION -

**SECTION 01560**  
**ENVIRONMENTAL CONTROLS**

**PART 1 – GENERAL**

1.1 EXPLOSIVES AND BLASTING

- A. The use of explosives on the WORK will not be permitted.

1.2 RUBBISH CONTROL

- A. During the progress of the WORK, the CONTRACTOR shall keep the Site and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. Dispose of all rubbish and waste materials of any nature occurring at the Site, and shall establish regular intervals of collection and disposal of such materials and waste. Keep its haul roads free from dirt, rubbish and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the Site in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.3 SANITATION

- A. Toilet Facilities: The CONTRACTOR shall provide fixed or portable chemical toilets wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided or organic material wastes from any other source related to operations shall be disposed of away from the Site in accordance with all laws and regulations pertaining thereto.

1.4 CHEMICALS

- A. All chemicals used or furnished by the CONTRACTOR for or during project construction, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

1.5 CULTURAL RESOURCES

- A. Attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800, which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").
- B. Conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.
- C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:
  - 1. The CONTRACTOR shall issue a Field Order directive to cease all construction operations at the location of such potential cultural resources find.
  - 2. Such Field Order shall be effective until such time as a qualified archaeologist can be called to assess the value of these potential cultural resources and make recommendations to the State Historic Preservation Office.

- D. If the archaeologist determines that the potential find is a bona fide cultural resource, at the direction of the State Historic Preservation Office, work shall be suspended at the location of the find under the provisions for changes contained in the Contractual Agreement.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01563  
DUST CONTROL**

**PART 1 – GENERAL**

1.1 DUST ABATEMENT

- A. Preventative measures to limit the production of dust in amounts damaging to property, cultivated vegetation or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity shall be taken in to account. Responsibility for any damage resulting from dust originating from its operations shall be the CONTRACTOR's. The dust abatement measures shall be maintained at all times during construction of the project, in accordance with the requirements of the local Air Quality Management District.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION**

3.1 GENERAL

The CONTRACTOR shall take necessary measures to control any and all dust related to or as a result of construction activities under this Contract. The water necessary for the dust control operation will be CITY furnished, beyond that the CONTRACTOR shall be responsible to provide whatever means necessary to accomplish the task of Dust Control. The CONTRACTOR shall be responsible for any damage resulting from dust originating from construction activities under this Contract.

- END OF SECTION -

**SECTION 01565**  
**EROSION AND SEDIMENT CONTROLS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Perform all WORK and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area, so as to, prevent damage to construction activities and to adjacent wetlands, drainage and/or water courses.
- B. Do not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction.
- C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.

**PART 2 – PRODUCTS**

2.1 MATERIALS

- A. Provide all temporary and permanent Best Management Practices (BMP's) storm water pollution prevention equipment, material, and facilities as required.
- B. Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials. Filter fabric for sediment traps shall be of suitable materials acceptable to the ENGINEER.

**PART 3 – EXECUTION**

3.1 METHODS OF CONSTRUCTION

- A. Use any of the acceptable BMPs methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches and settling basins.
- B. Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area, which may be entered for the construction of temporary or permanent facilities. The authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations shall be given. The CONTRACTOR shall provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion. The cost of this work shall be borne by the CONTRACTOR.
- C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by mean acceptable to the ENGINEER. If for any reason construction materials are washed away during the course of construction, the CONTRACTOR shall remove those materials from the fouled areas.
- D. For Work within easements of rights-of-way, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of these easements or rights-of-way.

- E. The CONTRACTOR shall not pump silt-laden water from trenches or other excavation into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- F. Prohibited construction procedures include, but are not limited to the following:
1. Dumping of spoil material into any streams, wetlands, surface waters or unspecified locations.
  2. Indiscriminate, arbitrary or capricious operation of equipment in wetlands or surface waters.
  3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.
  4. Damaging vegetation, adjacent to or outside the construction area limits.
  5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, wash water from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
  6. Permanent or unauthorized alternation of the flow line of any stream.
  7. Open burning of debris from the construction work.
- G. Any temporary working roadways required shall be clean fill approved by the ENGINEER. In the event fill is used, the CONTRACTOR shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

- END OF SECTION -

**SECTION 01600**  
**PRODUCTS, MATERIALS, EQUIPMENT AND SUBSTITUTIONS**

**PART 1 – GENERAL**

1.1 DEFINITIONS

- A. The word "Products" as used in the Contract Documents is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form WORK. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction" and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying and erection of the WORK.

1.2 QUALITY ASSURANCE

- A. Source Limitations: To the greatest extent possible for each unit of WORK, the CONTRACTOR shall provide products, materials and equipment of a singular generic kind from a single source.
- B. Compatibility of Options: Where more than one choice is available as options for selection of a product, material or equipment, select an option, which is compatible with other products, materials or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.3 PRODUCT DELIVERY AND STORAGE

- A. Deliver and store the product in accordance with manufacturer's written recommendations and by methods and means that will prevent damage, deterioration and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged or sensitive materials to deterioration, theft, and other sources of loss.

1.4 TRANSPORTATION AND HANDLING

- A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.
- B. Provide equipment and personnel to handle products, materials and equipment by methods to prevent soiling and damage.
- C. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.5 STORAGE AND PROTECTION

- A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate-controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.

- B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.
  - C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
  - D. Storage shall be arranged to provide access for inspection. Periodically inspect to assure products are undamaged and are maintained under required conditions.
  - E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.
- 1.6 MAINTENANCE OF PRODUCTS IN STORAGE
- A. Stored products shall be periodically inspected on a scheduled basis.
  - B. Comply with manufacturer's product storage requirements and recommendations.
  - C. Maintain manufacturer-required environmental conditions continuously.
  - D. Ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.
  - E. For mechanical and electrical equipment, provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.
  - F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to final acceptance by the ENGINEER in accordance with the Contract Documents.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01700  
PROJECT CLOSEOUT**

**PART 1 – GENERAL**

1.1 RELATED REQUIREMENTS

A. **Related Sections:**

1. Section 00700 – Special Conditions
2. Section 01710 – Final Cleaning

1.2 PERFORMANCE TESTING

- A. Perform a pre-start systems check in order to provide an efficient transition for start-up of facility. The performance testing shall proceed as follows:
- B. Perform systems checks, which include verification of proper equipment installation, operation, and calibration with the manufacturers or their representatives.
- C. Verify the performance of the equipment and controls through full scale operation using clean water. Water shall be conveyed to the facility and the tanks shall be filled to their normal operating level. Water for testing shall be provided by the CITY.
- D. Temporary piping shall be installed for the conveyance of water to the facility. All equipment shall be tested in normal operating mode to verify proper operation of all equipment in conjunction with the plant control system.

1.3 SUBSTANTIAL COMPLETION

- A. Submit written certification to that the project is substantially complete.
- B. Submit list of major items to be completed or corrected.
- C. Engineer will make an inspection within seven days after receipt of certification, together with a representative.
- D. Should Engineer consider that work is substantially complete:
  1. Prepare, and submit to Engineer, a list of the items to be completed or corrected, as determined by on-site observation.
  2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:
    - a. Date of Substantial Completion.
    - b. List of items to be completed or corrected, verified and amended.
    - c. The time required to complete or correct work of listed items.
    - d. Responsibilities for:
      - 1) Insurance
      - 2) Utilities
      - 3) Operation of mechanical, electrical and other systems
      - 4) Maintenance and cleaning
      - 5) Security
    - e. Signatures of: Engineer
  3. Complete work listed for completion or correction, within designated time.

- E. Should Engineer consider that work is not substantially complete:
  - 1. He shall immediately notify, in writing, stating reasons.
  - 2. Complete work, and send second written notice to Engineer, certifying that Project, or designated portion of project of substantially complete.
  - 3. Engineer will re-review work.

#### 1.4 FINAL INSPECTION

- A. Submit written certification that:
  - 1. Contract Documents have been reviewed.
  - 2. Project has been inspected for compliance with Contract Documents.
  - 3. Work has been completed in accordance with Contract Documents.
  - 4. Equipment and systems have been tested in presence of Engineer and are operational.
  - 5. Project is completed and ready for final inspection.
- B. Engineer will make final on-site observation/review within seven (7) days after receipt of certification.
- C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall prepare and issue the following:
  - 1. Certificate of Completion;
  - 2. Complete sets of As-Builts received; and
  - 3. A Request to make Project Closeout submittals.
- D. Should Engineer consider that work is not finally complete:
  - 1. He shall notify, in writing, stating reasons.
  - 2. Take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.
  - 3. Engineer will re-review the work.

#### 1.5 FINAL CLEANING UP

- A. The work will not be considered as completed and final payment made until all final cleanup has been done in a satisfactory manner.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: to requirements of particular technical specifications and Section 01730.
- B. Equipment, materials, workmanship and performance Warranties and Bonds: to requirements of particular technical specifications.

#### 1.7 INSTRUCTION

- A. Instruct personnel in operation of all systems, mechanical, electrical and other equipment.

#### 1.8 FINAL APPLICATION FOR PAYMENT

- A. Submit final applications in accordance with requirements of Contractual Agreement.

1.9 FINAL CERTIFICATE FOR PAYMENT

- A. Engineer will issue final certificate in accordance with provisions of Contractual Agreement.

**PART 1 – PRODUCTS** (Not Used)

**PART 2 – EXECUTION** (Not Used)

- END OF SECTION -

**SECTION 01710  
FINAL CLEANING**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. On a continuous basis, maintain premises free from accumulations of waste, debris and rubbish, caused by operations.
- B. At completion of WORK, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy to the satisfaction of the DEVELOPER.
- C. Related Sections:
  - 1. Section 01045 – Cutting and Patching
  - 2. Section 01700 – Project Closeout

1.2 SAFETY REQUIREMENTS

- A. Hazards control:
  - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
  - 2. Prevent accumulation of wastes, which create hazardous conditions.
  - 3. Provide adequate ventilation during use of volatile or noxious substances.
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
  - 1. Do not burn or bury rubbish and waste materials on Project site without written permission from the CONTRACTOR.
  - 2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
  - 3. Do not dispose of wastes into streams or waterways.

**PART 2 – PRODUCTS**

2.1 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

**PART 3 – EXECUTION**

3.1 DURING CONSTRUCTION

- A. Execute cleaning to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- C. At reasonable intervals during progress of Work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris and rubbish.

- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off the DEVELOPERS's property.
- F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- G. Each subcontractor areas of work shall thoroughly be cleaned of all materials and equipment installed from their areas of work.

### 3.2 FINAL CLEANING

- A. Employ experienced workers, or professional cleaners, for final cleaning.
- B. In preparation for substantial completion, conduct final inspection of sight-exposed interior and exterior surface, and of concealed spaces.
- C. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- D. Broom clean paved surfaces; rake clean other surfaces of grounds.
- E. Maintain cleaning until Project, or portion thereof, is occupied by AGENCY.
- F. The CONTRACTOR shall restore or replace existing property or structures as promptly and practicable as work progresses.

- END OF SECTION -

**SECTION 01722  
FIELD ENGINEERING**

**PART 1 – GENERAL**

1.1 SUMMARY

- A Section Includes: Field engineering to establish lines and grades for the Work.
- B. Related Sections: Section 01700 – Project Closeout.

1.2 THE REQUIREMENT

- A. The CONTRACTOR shall provide the initial surveying and staking control for the reservoir site. In addition, the CONTRACTOR shall provide the initial staking of the property and easement limits, clearing limits, inlet and outlet lines and utilities, and excavation limits.
- B. The CONTRACTOR shall provide all necessary staking following the initial staking, as required to construct the Scope of Work.
- C. The CONTRACTOR shall survey the location of any underground utility line that the CONTRACTOR installs. This shall include all joints, hydrants and services.

1.2 QUALITY ASSURANCE

- A. Qualifications of Surveyor or Engineer: Registered civil engineer or land surveyor in state where Project is located.
- B. Accuracy of stakes, alignments, and grades may be checked randomly by ENGINEER.
  - 1. Notice of when checking will be conducted will be given.
  - 2. When notice of checking is given, postpone parts of the Work affected by stakes, alignments or grades to be checked until checked.
  - 3. Do not assume that ENGINEER's check substitutes or complements required field quality control procedures.

1.3 CONSTRUCTION STAKES, LINES, AND GRADES

- A. Execute the Work in accordance with the lines and grades indicated.
- B. Make distances and measurements on horizontal planes, except elevations and structural dimensions.

1.4 SURVEY REFERENCE POINTS

- A. Basic reference line, a beginning point on basic reference line, and a bench mark will be provided, by OWNER as defined in the Contract.
- B. From these reference points, establish other control and reference points as required to properly lay out the Work.
- C. Locate and protect control points prior to starting sitework, and preserve permanent reference points during construction.
  - 1. Make no changes or relocations without prior written notice.
  - 2. Replace Project control point, when lost or destroyed, in accordance with original survey control.

- D. Set monuments for principal control points and protect them from being disturbed and displaced.
  - 1. Re-establish disturbed monuments.
  - 2. When disturbed, postpone parts of the Work that are governed by disturbed monuments until such monuments are re-established.

#### 1.5 PROJECT SURVEY REQUIREMENTS

- A. Establish minimum of 2 permanent bench marks on site referenced to data established by survey control points.
- B. Record permanent bench mark locations with horizontal and vertical data on Project Record Documents.
- C. Assume responsibility for accuracy of stakes, alignments, and grades by performing verifications and checking in accordance with standard surveying practice.
- D. Locate all utilities installed within the project prior to backfilling. Make a complete survey at the line, hub, or joint locations.

#### 1.6 RECORD DOCUMENTS

- A. Prepare and submit Record Documents.
- B. Maintain complete, accurate log of control points and survey.
- C. Submit all utility locate information.
- D. Affix civil engineer's or land surveyor's signature and registration number to Record Drawing to certify accuracy of information shown.

### **PART 2 – PRODUCTS (Not Used)**

### **PART 3 – EXECUTION**

#### 3.1 GENERAL

- A. The CONTRACTOR shall provide the initial field engineering for the project. This shall include staking, control, bench marks, property lines and clearing limits as necessary for the completion of this project. This shall also include staking of the structure corners with offsets, and two established bench marks.
- B. The CONTRACTOR shall provide all required field engineering, as necessary to complete the work as defined in the contract.

- END OF SECTION -

**SECTION 01730  
OPERATING AND MAINTENANCE DATA**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Compile product data and related information appropriate for maintenance and operation of equipment furnished under the Contract. Prepare Operating and Maintenance Data as specified.
- B. Instruct CONTRACTOR's personnel in the maintenance and operation of equipment and systems as outlined herein.
- C. In addition to Operating and Maintenance Data, the Manufacturer's printed recommended Installation Practice shall be included. If not part of the Operating and Maintenance Manual, separate written installation instructions shall be provided, serving to assist the CONTRACTOR in equipment installation.
- D. Related Sections:
  - 1. Section 00700 – Special Conditions
  - 2. Section 01300 – Submittals

1.2 OPERATING AND MAINTENANCE MANUAL

- A. Every piece of equipment furnished and installed shall be provided with complete maintenance and operations manuals. These shall be detailed in instructions to the CONTRACTOR's personnel. They shall be attractively bound for the CONTRACTOR's records. After approval, the CONTRACTOR shall store all manuals until the completion of the project or until requested by the ENGINEER. The manuals will be stored and delivered to the AGENCY in an organized format.
- B. Provide six (6) hard copies plus one (1) electronic version in PDF format. Four (4) copies shall be delivered to the jobsite shipped with the equipment and two (2) copies shall be delivered to the CONTRACTOR's main office.

1.3 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 - Submittals.

1.4 CONTENT OF MANUAL

- A. Neatly typewritten table of contents for each volume, arranged in systematic order.
  - 1. CONTRACTOR, name of responsible principal, address and telephone number.
  - 2. A list of each product required to be included, indexed to the content of the volume.
  - 3. List, with each product, the name, address and telephone number of:
    - a. Subcontractor or installer.
    - b. Maintenance contractor, as appropriate.
    - c. Identify the area of responsibility of each.
    - d. Local source of supply for parts and replacement.
  - 4. Identify each product, by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:
  - 1. Include only those sheets, which are pertinent to the specific product. References to other sizes and types or models of similar equipment shall be deleted or lined out.

2. Annotate each sheet to:
    - a. Clearly identify the specific product or part installed.
    - b. Clearly identify the data applicable to the installation.
    - c. Provide a parts list for all new equipment items, with catalog numbers and other data necessary for ordering replacement parts.
    - d. Delete references to inapplicable information.
  3. Clear and concise instructions for the operation, adjustment, lubrication, and other maintenance of the equipment including a lubrication chart.
- C. Drawings:
1. Supplement product data with drawings as necessary to clearly illustrate:
    - a. Relations of component parts of equipment and systems.
    - b. Control and flow diagrams.
  2. Coordinate drawings with information in Project Record Documents to assure correct illustration of complete installation.
- D. Written text, as required to supplement product data for the particular installation:
1. Organize in a consistent format under separate headings for different procedures.
  2. Provide a logical sequence of instructions for each procedure.
- E. Copy of each warranty, bond and service contract issued: Provide information sheet for AGENCY's personnel.
1. Proper procedures in the event of failure.
  2. Instances which might affect the validity of warranties or bonds.
- F. The manuals must be approved by the CONTRACTOR before final payment on the equipment is made.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

- END OF SECTION -

**SECTION 01740**  
**CONSTRUCTION PROGRESS PHOTOS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. CONTRACTOR is responsible for the preparation, submittal and maintenance of digital construction progress photos.
- B. Construction photographs provided by CONTRACTOR shall be in the form of digital files.
- C. Related Sections:
  - 1. Section 01312 – Project Meetings

**PART 2 – PRODUCTS**

2.1 DESCRIPTION

- D. Images must be created using only digital photographic equipment. Camera should be capable of utilizing a moderate wide-angle lens system and have electronic flash capable of properly illuminating a large interior space. The digital camera must have a sensor capacity of at least 6.1 megapixels and produce original uncompressed JPEG format image files that open to display at dimensions which exceed 20x30 inches, at a minimum of 72 dpi (1500 x 2200 pixel) resolution. The camera shall automatically imprint the date and time the photo is taken into one corner of the image. Digital images shall be saved in JPEG format and properly labeled.
- E. Digital copies shall be provided for the CITY and ENGINEER by CONTRACTOR at each weekly progress meeting.
- F. Saved images shall include detailed photograph description along with month, day, and year and separated by treatment process.

**PART 3 – EXECUTION (NOT USED)**

- END OF SECTION -



**SECTION 02084**  
**UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish and install structural pre-cast concrete work in accordance with the Contract Documents.
- B. This Section covers the design, fabrication, delivery and installation of all pre-cast concrete units, including connections, complete, in place, as shown and specified.
- C. Soils Report
  - 1. This work shall conform to the requirements of the latest Geotechnical Evaluation and or Soils Report.
- D. Related Sections:
  - 1. Section 02100 – Site Preparation
  - 2. Section 02200 – Earthwork
  - 3. Section 02318 – Trenching

1.2 CODES AND STANDARDS

- A. Codes: All codes, as referenced herein, are specified in Section 01090 - Reference Standards.
- B. Referenced Documents:
  - 1. ASTM Standards:
    - ASTM A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement
    - ASTM A 184 Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
    - ASTM A 185 Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
    - ASTM A 496 Specification for Steel Wire, Deformed, for Concrete Reinforcement
    - ASTM A 497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement
    - ASTM A 615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
    - ASTM A 616 Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
    - ASTM A 617 Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
    - ASTM A 706 Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement
    - ASTM C 31 Practice for Making and Curing Concrete Test Specimens in the Field
    - ASTM C 33 Specification for Concrete Aggregates
    - ASTM C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
    - ASTM C 42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
    - ASTM C 94 Specification for Ready-Mixed Concrete
    - ASTM C 150 Specification for Portland Cement

ASTM C 192	Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete
ASTM C 330	Specification for Lightweight Aggregates for Structural Concrete
ASTM C 478	Specification for Precast Reinforcement Concrete Manhole Sections
ASTM C 494	Test Method for Shear Fatigue of Sandwich Core Materials
ASTM C 595	Specification for Blended Hydraulic Cements
ASTM C 618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 857	Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

2. American Concrete Institute Standards:

ACI 318 Building Code Requirements for Reinforced Concrete

3. American Welding Society Standards:

AWS-D1.4 Structural Welding Code Reinforcing Steel

1.3 SUBMITTALS

A. Submittals shall be made in accordance with Section 01300 - Submittals.

B. Shop Drawings:

1. Shop drawings shall show structure dimensions and orientation and location of all applicable inflow and outflow penetrations, access hatches, and conduit sleeves.
2. Shop drawings shall include design structural calculations, assuming the applicable seismic zone and project groundwater conditions, that are stamped and signed by a Professional Engineer registered in California and shall be approved by the ENGINEER.
3. Shop drawings shall indicate pre-cast unit identification marks, location of units in the WORK, elevations, fabrication details, joint details, reinforcement, connections, dimensions, interface with adjacent members, and special handling instructions in sufficient detail to cover manufacture, handling and erection. Shop drawings shall include erection drawings.

C. Test Reports: Tests for compressive strength of concrete shall be performed by the factory. Copies of test reports including all test data and all test results shall be submitted.

D. Certificates of Compliance: Certificates of compliance shall be submitted attesting that materials and products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. General Requirements: Design members under direct supervision of a Professional Engineer experienced in design of pre-cast concrete units, registered in the State of California and conforming to requirements of this specification.

1. Manufacture, Transportation and Installation: The Manufacturer shall specialize in providing pre-cast products and services normally associated with pre-cast concrete construction with high quality finishes similar to that indicated on drawings.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Pre-cast members shall be handled to position consistent with their shape and design; they shall be lifted and supported from design incorporated support points and provided with strong backs and other devices as required. Lifting or handling equipment shall be capable of maintaining units during manufacture, storage, transportation, erection, and in position for fastening.
- B. Blocking and supports, lateral restraints and protective materials during transport and storage shall be clean, non-staining, without causing harm to exposed surfaces, including temporary support to prevent bowing and warping. Lateral restraints shall be provided to prevent undesirable horizontal movement. Edges and exposed faces of members shall be protected to prevent straining, chipping, or spalling of concrete.
- C. Units shall be marked with date of production and final position in structure in location not visible after erection.
- D. Pre-cast units shall be stored off the ground in a manner to prevent warpage and they shall be protected from weather, marring, and overload.
- E. Stainless Steel Hardware: Stainless steel hardware shall be transported, handled, stored, and protected in wood crates.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Cement: ASTM C 150 or ASTM C 595.
- B. Aggregates: ASTM C 33 and ASTM C 330, except that the requirements for grading shall not apply.
- C. Admixtures: May be used provided such admixtures are not injurious to other products used in the concrete.
- D. Chemical Admixtures: ASTM C 494
- E. Fly Ash and Pozzolanic Admixture: ASTM C 618
- F. Water: Used for curing, washing, aggregate, or mixing concrete shall be clean and free of injurious amounts of oil, acids, alkalis, salts, organic materials, or other substances that may be incompatible with concrete or steel.
- G. Steel Reinforcement:
  - 1. Wire ASTM A 82 or ASTM A 496
  - 2. Wire Fabric ASTM A 185 or ASTM A 497
  - 3. Bars ASTM A 184, ASTM A 615, ASTM A 616, ASTM A 617 or ASTM A 706

### 2.2 DESIGN REQUIREMENTS

- A. Design Method: The elastic method of structural design or the ultimate strength method of reinforced concrete design as outlined in ACI 318 shall be used to design the concrete sections, including the reinforcement required, when the structure is subjected to the loading conditions covered in Practice C 857.
- B. Access Openings: The structural design shall take into consideration the number, placement and size of access openings.
- C. Floors: The minimum floor thickness resulting from slope shall be considered as nominal floor thickness in the structure.

- D. Terminators, Knockouts and Sumps: Duct terminators, knockouts and sumps shall be designed to carry the loads imposed upon them. The basic structure shall be designed to carry all imposed loads with knockouts removed.
- E. Placement of Reinforcement: The design concrete cover for reinforcing bars, mats or fabric shall not be less than ¾-inch (19 mm) subject to the requirements of Section 2.2.
- F. Concrete Strength: The minimum specified compressive strength for design shall be 4,000 psi (21 MPa) at 28 days of age. Compressive-strength tests should be made in accordance with Practices C 31 and C 192 and Test Methods C 39 and C 42.
- G. Joints: Joints in sectional precast concrete structure shall be designed so as to be self-aligning when assembling sections of the structure.
  - 1. The manufacture shall provide a single joint design on all units of the same size and type to ensure interchangeability.
- H. Lifting Devices: Design of embedded lifting devices shall conform to requirements as specified in 8.4 under Special Loading Considerations of Practice ASTM C 890.
- I. Pickup Points and Boxouts: Pickup points, boxouts and inserts on panel faces and surfaces to be exposed are prohibited except as approved.
- J. Traffic Loads: Structure and access hatches shall be designed for HS-20-44 traffic wheel loads per AASHTO as last revised, including a 30% impact factor.

## 2.3 MANUFACTURE

- A. Forms: Forms shall be accurately constructed and strong enough to maintain the structure's dimensions within the tolerances given in Section 2.4. Forms should be constructed in such a manner as to minimize the seepage of water. All casting surfaces shall be smooth nonporous material.
- B. Cleaning and Oiling: Forms shall be cleaned before each use. New forms shall be free of paint or other protective coatings that might cling to the surface of the structure. Releasing agents applied to the form to aid in breaking the bond between the form and the concrete shall not be injurious to the concrete.
- C. Reinforcement: Steel reinforcement shall conform to the requirements of this specification and shall be securely positioned in the form to maintain design concrete cover given in Section 2.2 during concrete placement. All chairs, bolsters, braces and spacers in contact with form and reinforcing rod shall be of material that will not deteriorate.
- D. Mixture: The aggregates shall be sized, graded, proportioned and thoroughly mixed in a batch mixer with proportions of cement and water as will produce a homogeneous concrete having the required specified compressive strength. If Ready-Mix concrete is used, it shall be in accordance with Specification C 94.
- E. Concrete Placement: Concrete shall be deposited as nearly as practicable in its final position. Concrete shall be placed in the form at a rate such that the concrete is plastic at all times and flows readily into all parts of the form and around all reinforcement steel and embedded fixtures without segregation of materials. Concrete that has partially hardened or has been contaminated by foreign material shall not be deposited in the form.
- F. Curing: Structures shall be cured by an accepted industry method that will develop the required 28-day compressive strength without affecting the long-term durability of the concrete.

## 2.4 PERMISSIBLE VARIATIONS

- A. Dimensional Tolerances: The length, width, height or diameter measurements of the structure when measured on the inside surface shall not deviate from the design dimensions more than the following:

Dimension	Tolerance
0 to 5-feet (0 to 1.5 m)	± ¼-inch (± 6 mm)
5 to 10-feet (1.5 to 3.0 m)	± ⅜-inch (± 10 mm)
10 to 20-feet (3.0 to 6.1 m)	± ½-inch (± 13 mm)
20-feet (6.1 m) and over	as agreed upon between manufacturer and purchaser

- B. Squareness Tolerance: The inside of the precast concrete component shall be square as determined by diagonal measurements. The difference between such measurements shall not exceed the following:

Measured Length	Allowable Difference
0 to 10-feet (0 to 3.0 m)	± ½-inch (± 13 mm)
10 to 20-feet (3.0 to 6.1 m)	± ¾-inch (± 19 mm)
20-feet (6.1 m) and over	as agreed upon between manufacturer and purchaser

- C. Joint Surfaces: The inside joint seam gap between two sections placed together without a joint sealant shall not exceed ⅜-inch (9.5 mm).
- D. Insert Location: Insert locations for attachments in each component shall not deviate individually or cumulatively more than ± ⅛-inch (3.18 mm) from dimensions on specification drawings.
- E. Reinforcement Location: With reference to thickness of wall or slab, reinforcement shall be within ± ¼-inch (6.3 mm) of the design location, but in no case shall the cover be less than ¾-inch (19 mm). The reinforcement spacing shall not vary more than one tenth of the designed bar spacing nor exceed ½-inch (38 mm) in variation, except for welded wire mesh which shall conform to Specifications A 185 or A 497.
- F. Slab and Wall Thickness: The slab and wall thickness shall not be less than that shown in the design by more than 5% or 3/16-inch (4.8 mm), whichever is greater. A thickness greater than that required in the design shall not be a cause for rejection.

## 2.5 REPAIRS

- A. Precast concrete structures may be repaired. Repairs shall be performed by the manufacturer, in such a manner as to ensure that the repaired structure conforms to the requirements of this specification.

## 2.6 INSPECTION

- A. The quality of material, process of manufacture, and the finished structure shall be subject to inspection at anytime by the purchaser or their representative.

## 2.7 REJECTION

- A. Precast concrete structures or sections of structures shall be subject to rejection upon failure to conform to any specified requirements contained herein, or if any of the following imperfections occur:
1. Defects that indicate any imperfect concrete mixing and molding, or
  2. Surface defects indicated by honeycombed or open-texture and damaged areas where such defects would affect the structural adequacy.

## 2.8 CERTIFICATION

- A. At the request of the purchaser, the manufacturer shall, prior to the actual delivery of a structure, furnish a statement giving the source and type of cement, the source and specific gravities of the aggregates, the concrete mix proportions, strength, type, amount, and name of admixtures and mill certificates for the reinforcement steel used in manufacture.

## 2.9 MARKING

- A. The weight shall be marked on the outside of each component section.
- B. The purchaser may request additional information to be marked on the component section when ordering.
- C. The method of marking shall be agreed upon between the purchaser and the supplier prior to ordering.

## **PART 3 – EXECUTION**

### 3.1 INSTALLATION

#### A. **Erection:**

1. The units shall be erected in accordance with approved shop/erection drawings without damage to shape or finish or adjacent work. Unless otherwise shown, members shall be erected level and plumb within allowable tolerances.
2. The CONTRACTOR shall align and maintain uniform horizontal joints as erection progresses, provide approved shims and wedges as required, and when members required adjustment beyond design or tolerance criteria, discontinue affected work. Units shall be secured in place and field welds, scratches and otherwise damaged steel surfaces shall be touched up.
3. Pickup points, boxouts, inserts and bearing surfaces shown shall be grouted with non-shrink grout in accordance with Section 03315 - Grout. The color and texture of concrete surfaces of adjacent areas shall be finished to match in the same plane.

### 3.2 PROTECTION

- A. Adjacent surfaces shall be protected from damage during sealing and cleaning operations and against damage, disfiguration or discoloration from subsequent operations. Noncombustible shielding shall be used during welding operations.

- END OF SECTION -

**SECTION 02085**  
**FRAMES, GRATES, RINGS, AND COVERS**

**PART 1 - GENERAL**

1.1 REQUIREMENTS

- A. Iron castings for manhole or precast concrete frames and covers, inlet frames and grates, catch basin frames and grates, meter vault frames and covers, adjustment rings, and extensions.

1.2 REFERENCES

A. Commercial Standards

AASHTO	American Association of State Highway and Transportation Officials Standard Specification for Highway Bridges
ASTM A 48	Standard Specification for Gray Iron Castings
ASTM A 615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
AWS - D 12.1	Welding Reinforcing Steel.

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions.
- C. Submit shop drawings for fabrication and installation of casting assemblies that are not included in Drawings or City of Vernon Standard Plans and Specifications. Include plans, elevations, sections and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.

**PART 2 – PRODUCTS**

2.1 CASTINGS

- A. Use castings for frames, grates, rings and covers conforming to ASTM A 48, Class 35B. Provide locking covers if indicated on Drawings.
- B. Use clean castings capable of withstanding application of AASHTO M306- 40,000 pound proof loading without detrimental permanent deformation.
- C. Fabricate castings to conform to shapes, dimensions, and with wording or logos shown on Drawings. Standard dimensions for manhole covers are 32 inches in diameter.
- D. Cast iron. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure flat, true surfaces.
- E. Bolt-down covers shall be used on all manholes within the double perimeter security fence and shall have either six 3/8-inch or four 1/2-inch-diameter by 1-1/2-inch-long capscrews with washers.

- F. Capscrews and washers shall be Type 316 stainless steel conforming to ASTM A193. Countersink bolt holes in cover so that the top of the capscrews are below the top plane of the cover. Frames for bolt-down covers shall be supplied with four 3/4-inch-diameter Type 316 stainless steel anchor bolts, nuts, and washer as detailed on the Drawings.
- G. Nominal inside opening of the frame shall be 24 inches. Provide a blind pick hole or lifting lug in the cover. Do not provide lifting rings or vent holes in covers unless specifically required.

## 2.2 BEARING SURFACES

- A. Machine bearing surfaces between covers or grates and their respective frames so that even bearing is provided for position in which casting may be seated in frame.

## 2.3 SPECIAL FRAMES AND COVERS

- A. Where indicated on Drawings, provide watertight manhole frames and covers with minimum of four bolts and gasket designed to seal cover to frame. Supply approved watertight manhole covers and frames.
- B. Where shown on Drawing, provide manhole frames and covers with 48 inch diameter clear opening, with inner cover for 22 inch diameter clear opening. Provide approved inner cover with pattern shown on Drawings.

## 2.4 FINISH

- A. Unless otherwise specified, uncoated cast iron.

## 2.5 FABRICATED RING GRATES

- A. Fabricate ring grates from reinforcing steel conforming to ASTM A 615.
- B. Grating shall be 2 1/2 inch metal that shall fit into the area shown on the mechanical plan.
- C. The gratings shall be secured in place by at least four (4) acceptable removable-type fasteners per grating panel. The ends of each grating section shall be banded with bearing bars.
- D. Conform to welds connecting bars to AWS D 12.1.

## 2.6 ADJUSTMENT RINGS FOR ASPHALT OVERLAYS

- A. Use castings conforming Section 2.01.
- B. One piece casting with dimensions to fit frame and cover.

# PART 3 – EXECUTION

## 3.1 INSTALLATION

- A. Install castings according to approved shop drawings, instructions in related specifications, and applicable directions from manufacturer's printed materials.
- B. Set castings accurately at required locations to proper alignment and elevation. Keep castings plumb, level, true, and free of rack. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.
- C. Install adjustment rings in existing frames with clean bearing surfaces that are free from rocking.

-END OF SECTION-

**SECTION 02100  
SITE PREPARATION**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The WORK of this Section as defined in the Contract includes all work necessary to satisfactorily prepare the site as shown on the accepted drawings, per the Site Geotechnical Report and as specified herein. Following this preparation, the site shall be in such a condition as to easily continue with the next operation whether it be excavating, backfilling, or any other operations that are a part of the project. Site preparation includes clearing, grubbing, grading, tree and shrub removal, native grass stripping and removing and disposing of all debris within the limits of the project and such other areas as may be indicated on the plans or required work, except such objects as are designated to remain or are to be removed in accordance with the plans. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.
  
- B. Related Sections:
  - 1. Section 01040 – Coordination
  - 2. Section 01505 – Mobilization
  - 3. Section 01530 – Protection of Existing Facilities
  - 4. Section 01550 – Site Access and Storage
  - 5. Section 01560 – Temporary Environmental Controls
  - 6. Section 01563 – Dust Control
  - 7. Section 01722 – Field Engineering
  - 8. Section 02200 – Earthwork
  
- C. Soils Report: This work shall conform to the requirements of the Geotechnical Soils Report.

1.2 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 - Submittals.
- B. Shop Drawings: Submit clearing limits and site access plans and limits.

1.3 SITE SURVEY AND LAYOUT

- A. The CONTRACTOR shall establish construction and clearing limits by providing the initial site survey and field staking. The initial staking will include property line limits, casements and access points and structure locations with 100 ft. offsets. The CITY shall provide the CONTRACTOR the survey data for the project to include the survey control points, hubs, etc and benchmarks for the site. The CONTRACTOR shall layout required construction staking as defined in Section 01722 – Field Engineering.

1.4 PERMITS

- A. Verify all required permits have been secured for this work. Comply with applicable Air Pollution Control requirements. In the absence of specific ordinances, periodic watering shall be done to control dust throughout the work. Make all necessary arrangements for water required for this work.

**PART 2 – PRODUCTS (Not Used)**

## **PART 3 – EXECUTION**

### **3.1 PRIMARY SITE ACCESS**

- A. The CONTRACTOR shall provide clearing, grubbing, and stripping as defined in the contract.
- B. The CONTRACTOR shall develop any necessary access to the Site, including access entrance barriers to prohibit entry of unauthorized persons as defined in the Contract. The CONTRACTOR shall provide at the project site access barriers to prohibit entry of unauthorized persons as defined in the Contract.
- C. Adequately support existing structures, sidewalks, slabs, pavements, utilities, and other facilities that may be affected by the proposed construction as defined in the Contract.
- D. Utility Interference: Where existing utilities interfere with the WORK, notify the utility CITY before proceeding in accordance with the General Conditions.

### **3.2 CLEARING, GRUBBING AND STRIPPING**

- A. The CONTRACTOR shall perform this work as defined in the soils report.
- B. Construction areas shall be cleared of grass and weeds to at least a depth of 1 inch and cleared of structures, pavement, sidewalks, concrete or masonry debris, trees, logs, upturned stumps, loose boulders, and any other objectionable material of any kind which would interfere with the performance or completion of the WORK, create a hazard to safety, or impair the subsequent usefulness of the WORK, or obstruct its operation. Trees and other natural vegetation outside the actual lines of construction shall be protected from damage during construction.
- C. Within the limits of clearing, the areas below the natural ground surface shall be grubbed to a depth necessary to remove all stumps, roots, buried logs and all other objectionable material. Septic tanks, drain fields, and connection lines and any other underground structures, debris or waste shall be removed if found on the Site. All objectionable material from the clearing and grubbing process shall be removed from the Site and wasted in approved safe locations.

### **3.3 OVEREXCAVATION, REGRADING AND BACKFILL UNDER FILL AREAS**

- A. All grading and excavation shall conform to the requirements of the soil reports.

### **3.4 EXISTING UTILITY SERVICES**

- A. At start of work, CONTRACTOR shall locate and identify all utility services located within the construction limits (both underground and overhead). Utilize Dig Alert services and private location services as required, including potholing as may be necessary.
- B. CONTRACTOR shall disconnect or reroute all existing services, where such services will be affected by construction operations. Comply with all instructions issued during the pre-construction conference regarding coordination, advance notice, emergency repairs, etc.
- C. All disconnections or terminations shall be performed in safe manner, in accordance with applicable codes and regulation. Provide any disconnects switches, valves, plugs, tees, etc., as required for the various locations.

- END OF SECTION -

**SECTION 02200  
EARTHWORK**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Perform all earthwork indicated and required for construction of the WORK, complete and operable in accordance with the Contract Documents and the latest site geotechnical report.
- B. Related Sections:
  - 1. Section 01040 – Coordination
  - 2. Section 01530 – Protection of Existing Facilities
  - 3. Section 01550 – Site Access and Storage
  - 4. Section 01560 – Temporary Environmental Controls
  - 5. Section 01563 – Dust Control
  - 6. Section 01565 – Erosion and Sediment Controls
  - 7. Section 01722 – Field Engineering
  - 8. Section 02084 – Underground Precast Concrete Utility Structures
  - 9. Section 02318 – Trenching

1.2 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 - Submittals.
  - 1. Excavation Plan and stock pile storage sites.
  - 2. Backfill Plan

**PART 2 - PRODUCTS**

2.1 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

- A. General: All excavation or backfill shall conform to the requirements of the Geotechnical Engineer. Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation and approved by the Geotechnical Engineer.
- B. Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.
- C. Suitable Materials: Materials not defined as unsuitable below are defined as suitable materials and may be used in fills, backfilling and embankment construction subject to the indicated limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.
- D. Suitable materials may be obtained from on-site excavations, or may be processed on-site materials. If the Soils Engineer determines that excavated material is not suitable then additional compensation may be allowed on site processing or for import materials.

E. The following types of suitable materials are defined, unless otherwise specified in the project soils report.

1. Type A: Native soil excavated from the site after the site is stripped in accordance with Section 02100 – Site Preparation. This soil must be approved by the Geotechnical Engineer.
2. Type B (sand backfill): Sand with 100% passing a 3/8-inch sieve, at least 90% passing a Number 4-sieve, and a sand equivalent value not less than 30.
3. Type C (crushed rock): Crushed rock shall be imported material that consists of durable rock and gravel that contains less than one percent asbestos by weight or volume and free from slaking or decomposition under the action of alternate wetting and drying. Crushed rock shall meet the following gradation requirements.

Sieve Size	Percentage Passing
1-inch	100
3/4-inch	90 - 100
No. 4	0 - 10
No. 200	0 - 2

These materials should have a durability index of not less than 40.

4. Type D (pea gravel or chat backfill): Crushed rock or gravel with 100% passing a 1/2-inch sieve and not more than 10% passing a Number 4-sieve.
5. Type E (coarse drain rock): Crushed rock or gravel with a Durability Index of not less than 40 meeting the following gradation requirements:

Sieve Size	Percentage Passing
2-inch	100
1 1/2-inch	90 - 100
1-inch	20 - 55
3/4-inch	0 - 15
No. 200	0 - 3

6. Type F (aggregate base): Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. The grading for either the 1 1/2-inch maximum size or 3/4-inch maximum size gradation shall be used. The R-value shall not be less than 78. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements:

Sieve Size	Percentage Passing	
	1 1/2-inch Max. Gradation	3/4-inch Max. Gradation
2-inch	100	-
1 1/2-inch	90 - 100	-
1-inch	-	100
3/4-inch	50 - 85	90 - 100
No. 4	25 - 45	35 - 55
No. 30	10 - 25	10 - 30
No. 200	2 - 9	2 - 9

7. Type G (topsoil): Stockpiled topsoil material, which has been obtained at the site by removing soil to a depth not exceeding 1 1/2-feet. Removal of the topsoil shall be done after the area has been cleared of vegetation and debris.
8. Type H (cement-treated backfill): Material which consists of Type E material, which has been cement-treated so that the cement content of the material is not less than 5% by weight when tested in

accordance with ASTM D 2901 - Standard Test Method for Cement Content of Freshly Mixed Soil Cement. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633 - Standard Test Method for Compressive Strength of Molded Soil - Cement Cylinders.

9. Type I (trench plug): Low permeable fill material, a non-dispersible clay material having a minimum plasticity index of 10.

## 2.2 UNSUITABLE MATERIAL

A. Unsuitable materials include the materials listed below:

1. Soils as defined unsuitable in the Soils Report or by the Geotechnical Engineer.
2. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the Classifications of PT, OH, CH, MH or OL.
3. Soils, which cannot be compacted sufficiently to achieve the density specified for the intended use.
4. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.
5. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.
6. Topsoil, except as allowed below.

## 2.3 USE OF FILL, BACKFILL AND EMBANKMENT MATERIAL TYPES

A. The types of materials as designated herein for all required fill, backfill and embankment construction hereunder shall be used.

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the ENGINEER shall be immediately notified. In case of conflict between types of pipe embedment backfills, the agency-specified backfill material if that material provides a greater degree of structural support to the pipe shall be used. In case of conflict between types of trench or final backfill types, the agency-specified backfill material, if that material provides the greater in-place density after compaction shall be used.

C. Fill and backfill types shall be used in accordance with the following provisions as approved by the Geotechnical Engineer:

1. Embankment fills shall be constructed of Type A materials, as defined herein, or of primarily Type I mixed with lesser amounts of Type A through Type H materials.
2. Pipe zone backfill, as defined under Section 2318.
3. Aggregate base materials under pavements shall be Type F material constructed to the thicknesses indicated. For aggregate sub-base shall be Type H material.
4. Backfill around structures shall be Type I material or Types F or H where indicated on the plans.
5. Backfill materials beneath structures shall be defined by the Geotechnical Engineer or as follows:
  - a. Drain rock materials under hydraulic structures or other water retaining structures with underdrain systems shall be Type C material or where shown.
  - b. Under concrete hydraulic structures or other water retaining structures without underdrain systems, Types G or H materials shall be used. Undisturbed subgrade.
  - c. Under structures where groundwater must be removed to allow placement of concrete, Type E material shall be used. Before the Type E material is placed, filter fabric shall be placed over the exposed foundation.
  - d. Under all other structures, Type A or F materials shall be used.

6. Filter fabric, if not specified on the plans, shall be **Mirafi 140 N**, **Mirafi 700X** or ENGINEER approved equal.

## 2.4 MATERIALS TESTING

- A. All soils testing of samples submitted will be done by a testing laboratory with the ENGINEER's approval and at no additional expense. At its discretion, the ENGINEER may request that samples for testing of any material used in the work be supplied.
- B. Particle size analysis of soils and aggregates will be performed using ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.
- C. Determination of sand equivalent value will be performed using ASTM D 2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- D. Unified Soil Classification System: References in this Section to soil classification types and standards shall have the meanings and definitions indicated in ASTM D 2487. ASTM D 2487 in the interpretation of soil classifications shall bind all applicable provisions.

## PART 3 - EXECUTION

### 3.1 EXCAVATION - GENERAL

- A. General: Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the WORK. The removal of said materials shall conform to the lines and grades indicated or ordered. Unless otherwise indicated, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. All supports and shoring that may be required for the sides of the excavations shall be furnished, placed and maintained. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State and OSHA safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).
- B. Removal and Exclusion of Water: Remove and exclude water, including stormwater, groundwater, irrigation water and wastewater, from all excavations as defined in the contract. Dewatering wells, wellpoints, sump pumps or other means shall be used to remove water and continuously maintain groundwater at a level at least 2-feet below the bottom of excavations before the excavation work begins at each location. Water shall be removed and excluded until backfilling is complete and all field soils testing have been completed per Section 02140 – Dewatering.

### 3.2 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

- A. Excavation Beneath Structures and Embankments: Except where otherwise indicated for a particular structure, excavation shall be carried to the grade of the bottom of the footing or slab and prepared in accordance with the soils report.
- B. Excavation Beneath Paved Areas: Excavation under areas to be paved shall extend to the bottom of the aggregate base and prepared in accordance with the soils report.

### 3.3 PIPELINE AND UTILITY TRENCH EXCAVATION

- A. See Section 02318.

### 3.4 OVER-EXCAVATION NOT ORDERED OR INDICATED

- A. Any over-excavation carried below the grade ordered or indicated, shall be backfilled and compacted to the required grade with the indicated material, in accordance with the Geotechnical Engineer's requirements.

### 3.5 EXCAVATION IN VICINITY OF TREES

- A. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission. Trees shall be supported during excavation by any means previously reviewed.
- B. Explosives and Blasting will not be permitted.

### 3.6 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- A. Obtain CITY approvals for disposal of excess excavated material in a designated wasting area, as defined in the contract.

### 3.7 BACKFILL - GENERAL

- A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed.
- B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation and the trench sidewalls and bottom have been dried to moisture content suitable for compaction.
- C. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have all loose sloughing, or caving soil and rock materials removed. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

### 3.8 PLACING AND SPREADING OF BACKFILL MATERIALS

- A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that when each layer compacted shall not exceed 6 inches in thickness. The compaction lift depth may be adjusted at the direction of the Project Geotechnical Engineer.
- B. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so when compacted the pipe zone backfill will provide uniform bearing and side support.
- C. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the moisture content is between optimum and 3% over the optimum.
- D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is between optimum and 3% over the optimum.

### 3.9 COMPACTION OF FILL, BACKFILL AND EMBANKMENT MATERIALS

- A. Each layer of Types A, B, F and G, backfill materials as defined herein, where the material is graded such that at least 10% passes a No. 4-sieve, shall be mechanically compacted to the indicated percentage of density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

- B. Each layer of Type C, D and E backfill materials shall be compacted by means of at least two passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the sub-grade.
- C. Flooding, ponding or jetting shall not be permitted.
- D. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations. Exception: With the written approval of the Structural Engineer.
- E. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand operated, vibratory compactors and rollers. After completion of at least 2-feet of compacted backfill over the top of pipeline, compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.
- F. Compaction Requirements: The following compaction test requirements shall be in accordance with ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft - lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>) for Type A, B, C, E, F and G materials and in accordance with ASTM D 4253 - Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table, and D 4254 - Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density, for Type C, D, E and H materials. Where agency, utility company, or soils report requirements govern, the highest compaction standards shall apply.

Location or Use of Fill	Percentage of Maximum Density
Final backfill, beneath paved areas or structures	95
Final backfill, not beneath paved areas or structures	90
Embankments and fills	90
Embankments and fills beneath paved areas or structures	90
Backfill beneath structures and hydraulic structures	95
Backfill and fill around structures on reservoir or structure roof	90
Topsoil (Type G material)	80
Aggregate base or sub-base (Type F or H material)	95

### 3.10 FILL AND EMBANKMENT CONSTRUCTION

- A. The area where a fill or embankment is to be constructed shall be cleared, grubbed and stripped in accordance with Section 02100 - Site Preparation. Embankment and fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be thoroughly mixed and moisture conditioned, as necessary. Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness.
- B. Base keys shall be provided at the toes of all fill slopes more than 5-feet high. The keys shall be cut into underlying undisturbed soil. Keys shall be a minimum of 12-feet wide and 4-feet deep measured at the downslope side of the key. Keys shall be sloped back toward the fill slope at a gradient of no less than 2%.
- C. When an embankment or fill is to be made and compacted against hillsides or slopes steeper than 4:1, the slopes shall be horizontally benched to key the embankment or fill to the underlying ground. A minimum of 12 inches normal to the slope shall be removed and re-compacted as the embankment or fill is brought up in layers. Material thus cut shall be re-compacted along with the new material. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

- D. Where embankment or structure fills are constructed over pipelines, the first 4-feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4-feet of fill over the pipe has been completed.
- E. All permanent fill slopes shall be overbuilt by at least 1-foot and then cut to final grade to provide adequate compaction.

### 3.11 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Lawn or Unpaved Areas: Plus or minus 1 inch
  - 2. Walks: Plus or minus 1 inch
  - 3. Pavements: Plus or minus ½ inch

### 3.12 FIELD TESTING

- A. General: All field soils testing will be done by a testing laboratory as specified in the Contract Documents.
- B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with Method C of ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth), or by such other means acceptable to the ENGINEER.
- C. In case the test of the fill or backfill show non-compliance with the required density, a remedy as may be required to insure compliance shall be accomplished. Subsequent testing to show compliance shall be performed by a testing laboratory.
- D. Provide test trenches and excavations including excavation, trench support and groundwater removal for the ENGINEER's field soils testing operations. The trenches and excavations shall be provided at the locations and to the depths required by the ENGINEER.

- END OF SECTION -

**SECTION 02315  
ROADWAY EXCAVATION**

**PART 1 – GENERAL**

1.1 REQUIREMENTS

- A. Excavation and compaction of materials for roadways and excavation and compaction of materials for roadside ditches.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

- ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
- ASTM D 2216 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- ASTM D 2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- ASTM D 3017 Standard Test Method for Water content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- ASTM D 4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 - Submittals.

**PART 2 – PRODUCTS**

2.1 MATERIALS

- A. Provide topsoil conforming to requirements of Section 02200 – Earthwork.
- B. Provide backfill which is excavated material, graded free of roots, lumps greater than 6 inches, rocks larger than 3 inches, organic material, and debris.
- C. Provide structural backfill which is select material meeting following requirements:
  - 1. Plasticity index: not less than 12 nor more than 20.
  - 2. Maximum liquid limit: 45

**PART 3 – EXECUTION**

3.1 PREPARATION

- A. Identify required lines, levels, and datum. Coordinate with Section 01722 - Field Engineering.
- B. Identify and flag surface and aerial utilities.
- C. Notify utility companies to remove or relocate utilities.
- D. Identify, stake, and flag known utility locations below grade. Make temporary or permanent relocation of underground pipes, ducts, or utilities where indicated on Drawings.

- E. Upon discovery of unknown or badly deteriorated utilities, or concealed conditions, discontinue work. Notify ENGINEER and obtain instructions before proceeding in such areas.
- F. Obtain approval of top soil quality before excavating and stockpiling.

### 3.2 PROTECTION

- A. Protect following from damage or displacement
  - 1. Trees, shrubs, lawns, existing structures, and other features outside of grading limits.
  - 2. Utilities either above or below grade, which are to remain.

### 3.3 TOPSOIL REMOVAL

- A. Strip off topsoil from area to be excavated to minimum depth of 6 inches, unless indicated otherwise on Drawings.
- B. Stockpile topsoil in designated location for reuse. Stockpile topsoil to depth not exceeding 8 feet. Cover to protect from erosion.

### 3.4 SOIL EXCAVATION

- A. Excavate to lines and grades shown on Drawings.
- B. Remove unsuitable material not meeting specifications. Backfill with embankment materials and compact to requirements of Section 02200 – Earthwork.
- C. Record location and plug and fill inactive water and oil wells. Conform to Federal, State & Local regulations. Notify ENGINEER prior to plugging wells.
- D. At intersections, grade back at minimum slope of one inch per foot. Produce smooth riding junction with intersecting street. Maintain proper drainage.
- E. When area is inadvertently over excavated, fill area in accordance with requirements of Section 02200 – Earthwork at no additional cost to the CITY.
- F. Remove material not qualified for use and excess soil not being reused from site in accordance with requirements of Section 01560 Temporary Environmental Controls.

### 3.5 COMPACTION

- A. Maintain optimum moisture content of subgrade to attain required density.
- B. Compact to following minimum densities at optimum moisture content as determined by ASTM D 1557, unless otherwise indicated on Drawings:
  - 1. Areas under future paving and shoulders: Minimum density of 95 percent of maximum dry density.
  - 2. Other areas: Minimum density of 90 percent of maximum dry density.

### 3.6 TOLERANCES

- A. Top of Compacted Surface: Plus or minus 1/2 inch in cross section, or in 16-foot length.

### 3.7 FIELD QUALITY CONTROL

- A. Testing will be performed under provisions of Section 01454 - Testing Laboratory Services.

- B. Test and analysis of soil materials will be performed in accordance with ASTM D 4318, ASTM D 2216, and ASTM D 1557.
- C. Compaction testing will be performed in accordance with ASTM D 1557 or ASTM D 2922 and ASTM D 3017.
- D. A minimum of three tests will be taken for each 1000 linear feet per lane of roadway.
- E. When tests indicate work does not meet specified compaction requirements, recondition, recompact, and retest at no additional cost to CITY.

### 3.8 PROTECTION

- A. Prevent erosion at all times. Maintain ditches and cut temporary swales to allow natural drainage in order to avoid damage to roadway. Do not allow water to pond.
- B. Distribute construction traffic evenly over compacted areas, where practical, to aid in obtaining uniform compaction. Protect exposed areas having high moisture content from wheel loads that cause rutting.
- C. Maintain excavation and embankment areas until start of subsequent work. Repair and recompact slides, washouts, settlements, or areas with loss of density.

-END OF SECTION-

**SECTION 02318  
TRENCHING**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Section Includes: Trench excavation, fine grading, pipe bedding, backfilling, and compaction for the following, including requirements for ditch crossings:
  - 1. Pipe and electrical conduits.
  - 2. Manholes, valves, or other accessories.
  - 3. Potable water pipe appurtenances.
- B. Related Sections:
  - 1. Section 01530 – Protection of Existing Facilities
  - 2. Section 01563 – Dust Control
  - 3. Section 01565 – Erosion and Sediment Controls
  - 4. Section 01700 – Project Closeout
  - 5. Section 01722 – Field Engineering
  - 6. Section 02084 – Underground Precast Concrete Utility Structures
  - 7. Section 02100 – Site Preparation
  - 8. Section 02200 – Earthwork
- C. Soils Report: This work shall conform to the requirements of the Geotechnical Soils Report.
- D. All work shall conform to the City of Lathrop’s Standards for Construction and Details.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. C 117 - Test Method for Material Finer than 75 Fm (No. 200) Sieve in Mineral Aggregates by Washing.
  - 2. C 131 - Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - 3. C 136 - Test Method for Sieve Analysis of Fine and Course Aggregates.
  - 4. D 1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
  - 5. D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 6. D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Products Data: For all proposed bedding and backfill materials as defined in Section 02200 - Earthwork.
  - 1. Material source.
  - 2. Gradation.

3. Testing data.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

#### **A. General:**

1. The following types of suitable materials are defined, unless otherwise specified by the project soils report.
2. Provide material having maximum particle size not exceeding 4 inches and that is free of leaves, grass, roots, stumps, and other vegetable matter. Type A.
3. Materials derived from processing demolished or removed asphalt concrete are not acceptable.

**B. Aggregate Base Course:** As specified in Section 02200 – Earthwork, Type F.

**C. Gravel:** As specified in Section 02200 – Earthwork, Type C or D.

**D. Native Material:** As specified in Section 02200 – Earthwork, Type A.

**E. Sand:** As specified in Section 02200 – Earthwork, Type B.

**F. Select Material:** As specified in Section 02200 – Earthwork, Type H or I.

### **2.2 UNSUITABLE MATERIAL**

#### **A. Unsuitable materials include the materials listed below:**

1. Soils as defined unsuitable in the Soils Report or by the Geotechnical Engineer.
2. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the Classifications of PT, OH, CH, MH or OL.
3. Soils, which cannot be compacted sufficiently to achieve the density specified for the intended use.
4. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.
5. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.
6. Topsoil, except as allowed below.

### **2.3 USE OF FILL, BACKFILL**

- A.** Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the ENGINEER shall be immediately notified. In case of conflict between types of pipe embedment backfills, the agency-specified backfill material if that material provides a greater degree of structural support to the pipe shall be used. In case of conflict between types of trench or final backfill types, the agency-specified backfill material, if that material provides the greater in-place density after compaction shall be used.

- B. Fill and backfill types shall be used in accordance with the following provisions:
1. Pipe zone backfill shall consist of the following materials for each pipe material listed below.
    - a. Mortar coated pipe, concrete pipe and un-coated ductile iron pipe shall be provided Type C pipe bedding and embedment backfill material.
    - b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe and other non-mortar coated pipe shall be backfilled with Type B bedding and embedment zone backfill material.
    - c. Plastic pipe and vitrified clay pipe shall be backfilled with Type C bedding and embedment zone backfill material.
    - d. Where pipelines are installed on grades exceeding 4%, and where backfill materials are graded such that there is less than 10% passing a Number 4-sieve, trench plugs of Type H or I material shall be provided at maximum intervals of 200 feet unless indicated otherwise.

## 2.4 MATERIALS TESTING

- A. As defined in Section 02200 - Earthwork

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. General:
1. All utility piping shall be field surveyed for location of pipe runs and joints prior to backfilling.
  2. Before laying pipes or electrical conduits in fill, place fill and compact it to not less than 1 ft above top of pipe or conduit.
  3. After placing and compacting fill, excavate through fill and fine grade as required in this Section.
- B. **Protection:** Stabilize excavation as required by OSHA or local standards, whichever is more stringent.

### 3.2 EXCAVATION AND GRADING

- A. Exploratory Excavation:
1. Excavate and expose buried points of connection to existing utilities where indicated on the Drawings. Excavation shall be performed prior to preparation of Shop Drawings for connections and before fabrication of pipe, and the data obtained shall be used in preparing Shop Drawings.
  2. Data, including dates, locations excavated, and sketches, shall be submitted to the ENGINEER within one week of excavation.
  3. Damage to utilities from excavation activities shall be repaired at the CONTRACTOR's expense.
- B. Trench Excavation:
1. General Requirements:
    - a. If, because of soil conditions, safety requirements or other reasons, trench width at top of pipe is increased beyond width specified in this section, upgrade laying conditions or install stronger pipe designed in conformance with the appropriate pipe specification section for the increased trench width, without additional cost.
    - b. Pipe and Electrical Conduits:
      - 1) Lay pipe or electrical conduits in open trench.
      - 2) If bottom of excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of pipe and refill to grade with aggregate base course material or sand placed at uniform density, with minimum possible compaction, at no additional cost.

- 3) If bottom of excavation is found to consist of soft or unstable material which is incapable of properly supporting pipe, remove such material to a depth and for the length required, as determined by the ENGINEER, and then refill trench to grade with aggregate base course or sand, compacted to 90 percent of maximum density.
- 4) Where indicated on the Drawings, cradle pipe in concrete.
- c. For Manholes, Valves, or Other Accessories:
  - 1) Provide excavations sufficient to leave at least 12 inches clear between their outer surfaces and embankment or shoring which may be used to hold banks and protect them.
  - 2) Do not backfill with earth under manholes, vaults, tanks, or valves.
  - 3) Fill any unauthorized excess excavation below elevation indicated on the Drawings for foundation of any structure with sand, aggregate base material, bedding material, or concrete at no additional cost.
  - 4) Backfilling of Manhole Excavation: Conform to backfilling requirements as specified for pipe and utility trench backfill in this Section.
- d. Potable and Non-Potable Water Pipe Appurtenances:
  - 1) Lay in trenches separate from those used for sewers.
  - 2) Unless otherwise specified or indicated on the Drawings, lay in trenches having cover of not less than 3 feet below surface of ground and located at distance of not less than 6 feet from any parallel sewer trench, or as required by local requirements.
- e. At Road Crossings or Existing Driveways:
  - 1) Make provision for trench crossings at these points, either by means of backfills, tunnels, or temporary bridges.

C. Trench Fine Grading:

1. For Pipes 16 Inches in Nominal Diameter and Under:
  - a. Unless otherwise specified, accurately grade bottom of trench to provide uniform bearing and support for each section of pipe, on undisturbed soil at every point along pipe's entire length, except for portions of pipe where it is necessary to excavate for bells and for proper sealing of pipe joints.
2. For Pipe over 16 Inches in Diameter:
  - a. Over excavate bottom of trench by at least 4 inches, or 1/12 outside diameter of pipe, whichever is greater.
  - b. Fill overcut with bedding material specified herein, and fine graded as specified above.
  - c. Place bedding material at uniform density, with minimum possible compaction.
  - d. Where trench excavation is below grade of bedding material, restore trench bottom to proper grade by backfilling and compacting backfill to 95 percent of maximum density, at no additional cost. Use bedding material as specified in this Section.
3. Bell or Coupling Holes:
  - a. Dig holes after trench bottom has been graded.
  - b. Provide holes of sufficient width to provide ample room for grouting, banding, or welding.
  - c. Excavate holes only as necessary in making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.
4. Depressions for Joints, Other than Bell and spigot:
  - a. Make in accordance with recommendations of joint manufacturer for particular joint used.

3.3 EXCAVATION IN VICINITY OF TREES

- A. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission. Trees shall be supported during excavation by any means previously reviewed.
- B. Explosives and Blasting will not be permitted.

### 3.4 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- A. Obtain and pay for all required permits, landowner and agency approvals for disposal of excess excavated material, as defined in the contract.

### 3.5 BACKFILL - GENERAL

- A. Allowable bedding and backfill requirements shall be per local or State Standards
- B. Backfill shall not be dropped directly upon any pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed.
- C. Except for drain rock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation and the trench sidewalls and bottom have been dried to moisture content suitable for compaction.
- D. If a moveable trench shield is used during excavation, pipe installation and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally. No trench shields shall be dragged along the trench causing damage or displacement to the trench sidewalls, the pipe, or the bedding and backfill.
- C. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have all loose sloughing, or caving soil and rock materials removed. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

### 3.6 PLACING AND SPREADING OF BACKFILL MATERIALS

- A. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so when compacted the pipe zone backfill will provide uniform bearing and side support.
- B. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the moisture content is between optimum and 3% over the optimum.
- C. Where the backfill material moisture, content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is between optimum and 3% over the optimum.

### 3.7 COMPACTION OF FILL, BACKFILL AND EMBANKMENT MATERIALS

- A. Compaction Requirements: The following compaction test requirements shall be in accordance with ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft. - lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>) for Type A, B, C, E, F and G materials and in accordance with ASTM D 4253 - Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table, and D 4254 - Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density, for Type C, D, E, and H materials. Where agency, utility company or soil report requirements govern, the highest compaction standards shall apply.

<b>Location or Use of Fill</b>	<b>Percentage of Maximum Density</b>	<b>Relative Density</b>
Pipe embedment backfill for flexible pipe.	90	70
Pipe bedding and over-excavated zones under bedding for flexible pipe, including trench plugs	90	70
Pipe embedment backfill for steel yard piping	--	70

Location or Use of Fill	Percentage of Maximum Density	Relative Density
Pipe embedment backfill for rigid pipe	90	55
Pipe zone backfill portion above embedment for rigid pipe.	90	70
Pipe bedding and over-excavated zones under bedding for rigid pipe	90	70
Trench zone backfill, beneath paved areas and structures, including trench plugs	95	70
Trench zone backfill, not beneath paved areas or structures, including trench plugs	90	70
Topsoil (Type G material)	80	N.A.
Aggregate base or sub-base (Type F or H material)	95	N.A.

### 3.8 PIPE AND UTILITY TRENCH BACKFILL

#### A. Pipe Zone Backfill:

1. The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane below the bottom surface of the pipe and a plane at a point above the top surface of the pipe. The bedding is defined as that portion of pipe zone backfill material between the trench sub-grade and the bottom of the pipe. The embedment is defined as that portion of the pipe zone backfill material between the bedding and a level line.
2. After compacting the bedding, perform a final trim using a laser or approved method for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.
3. The pipe zone shall be backfilled with the indicated backfill material. Care to prevent damage to the pipeline coating, cathodic bonds and the pipe itself during the installation and backfill operations shall be exercised.
4. If a moveable trench shield is used during backfill operations, the shield shall be lifted to a location above each layer of backfill material prior to compaction of the layer. The pipe or backfill shall not be displaced while the shield is being moved.

B. Trench Zone Backfill: After the pipe zone backfills have been placed, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying as indicated between a plane above the top surface of the pipe and a plane at a point, 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway sub-grade.

C. Final Backfill: Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, all backfill within 18 inches of the roadway sub-grade.

### 3.9 FIELD QUALITY CONTROL

#### A. Tests:

1. Confirmation Tests:
  - a. CONTRACTOR's Responsibilities:
    - 1) Accomplish specified compaction of trench backfill.
    - 2) Control operations by confirmation tests to verify and confirm that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.
    - 3) All field soils testing will be done by a testing laboratory as specified in the Contract Documents.

- 4) Copies of Confirmation Test Reports: Submit promptly to the ENGINEER.
- b. Frequency of Confirmation Testing:
  - 1) Perform testing not less than as follows:
    - a) For Trenches: At each test location include tests for each type or class of backfill from bedding to finish grade.
    - b) In Open Fields: Two every 1,000 linear feet.
    - c) Along Dirt or Gravel Road or off Traveled Right-of-way: Two every 500 linear feet.
    - d) Crossing Paved Roads: Two locations along each crossing.
    - e) Under Pavement Cuts or Within 2 Feet of Pavement Edges: one location every 400 linear feet.
2. Compliance Tests:
  - a. Frequency of Testing: Periodic compliance tests will be made by the ENGINEER to verify that compaction is meeting requirements previously specified.
  - b. If Compaction Fails to Meet Specified Requirements: Perform remedial work by one of the following methods:
    - 1) Remove and replace backfill at proper density.
    - 2) Bring density up to specified level by other means acceptable to the ENGINEER.
  - c. Retesting:
    - 1) Costs of Retesting: Costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements shall be borne by the CONTRACTOR.
    - 2) CONTRACTOR's Confirmation Tests During Performance of Remedial Work:
      - a) Performance: Perform tests in manner acceptable to the ENGINEER.
      - b) Frequency: Double amount specified for initial confirmation tests.
3. Water Testing Pipe:
  - a. After Bedding the Pipe, CONTRACTOR Has the Following Option To:
    - 1) Water-test pipe.
    - 2) Backfill to surface, at his own risk, before water-testing pipe.
  - b. If pipe does not pass test, uncover pipe, locate leaks, repair and retest, repeating until pipe section under test passes.

- END OF SECTION -

**SECTION 02461  
AC PAVEMENT AND BASE  
(HOT MIX ASPHALT)**

**PART 1 – GENERAL**

1.1 REQUIREMENT

- A. Perform all WORK associated with Asphalt Concrete (AC) Pavement and base as shown and specified herein including all labor, materials, equipment supplies, and facilities associated with providing a finished product satisfying all the requirements of the Contract Documents.
- B. Verify all requirements with latest Geotechnical Evaluation and Report and notify the Engineer immediately if discrepancies exist.
- C. Follow Caltrans General Specifications Section 39-1 for producing and placing hot mix asphalt (HMA).
  - 1. HMA includes one or more of the following types:
    - a. Type A
    - b. Type B
    - c. OGFC, including HMA-O, RHMA-O, and RHMA-O-HB
    - d. RHMA-G
  - 2. The HMA construction process includes one or more of the following:
    - a. Standard
    - b. Method
    - c. QC/QA

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Codes: All codes, as referenced herein.
- B. References: These specifications refer to the State of California Department of Transportation (Caltrans) Standard Specifications Section 39-1.

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Submit, in writing, materials testing reports, mix designs and other pertinent information satisfactory to the ENGINEER demonstrating that materials and methods it proposes to utilize will comply with the referenced provisions of the Standard Specifications, in accordance Submittal Requirements.

**PART 2 – PRODUCTS**

2.1 DESCRIPTION

- A. Asphaltic concrete shall consist of furnishing all materials, mixing, hauling, and placing a mixture of aggregates, mineral admixture, and bituminous material to form a pavement course or to be used for other specified purposes, in accordance with the details shown on the project plans and as directed by the Engineer.
- B. The CONTRACTOR may propose the use of a mix design that has been developed for a previous project and approved by Caltrans. The CONTRACTOR shall provide evidence that the asphalt cement and mineral admixture type and source of supply, and the source and methods of producing mineral aggregate, have not changed since the formulation of the previous mix design. The CONTRACTOR shall also provide current test results for all specified characteristics of the mineral aggregate proposed for use. The Engineer will

determine if the previously used mix design is suitable for the intended use. The Engineer will determine if the previously used mix design is suitable for the intended use. The Engineer will either approve or disapprove the proposed mix design. Should the Engineer disapprove the use of the previously used mix design, the CONTRACTOR shall prepare and submit a new mix design proposal in accordance with the requirements of these specifications.

- C. A previously used mix design older than two years from the date it was formulated, sealed, signed, and dated shall not be allowed for use. Any previously used mix design that is older than one year, but less than two years, shall not be allowed for use unless the CONTRACTOR provides verification testing results. Such testing shall be a one-point verification at the design asphalt content utilizing the proposed mineral aggregate, asphalt cement, and mineral admixture. Once approved for use on a project, a mix design may be used for the duration of the project.

2.2 MATERIALS REQUIREMENTS

- A. Mineral aggregate shall conform to the following requirements when tested in accordance with the applicable test methods.
  - 1. Coarse aggregate: Aggregate retained on a no. 4 sieve.
  - 2. Fine aggregate: Aggregate passing the no. 4 sieve.
    - a. Supplemental fine aggregate: Aggregate passing the no. 30 sieve, including hydrated lime, Portland cement, and fines from dust collectors.
- B. Aggregate must be clean and free from deleterious substances. The specified aggregate gradation must be determined before the addition of asphalt binder and includes supplemental fine aggregate. The Department tests for aggregate grading under California Test 202, modified by California Test 105 if there is a difference in specific gravity of 0.2 or more between the coarse and fine parts of different aggregate blends. Choose sieve size TV within each TV limit presented in the aggregate gradation tables. The proposed aggregate gradation must be within the TV limits for the specified sieve sizes shown in the following tables:
  - 1. Aggregate Gradation (Percentage Passing) HMA Types A and B

**3/4-inch HMA Types A and B**

Sieve sizes	TV limits	Allowable tolerance
1"	100	--
3/4"	90-100	TV ± 5
1/2"	70-90	TV ± 6
No. 4	45-55	TV ± 7
No. 8	32-40	TV ± 5
No. 30	12-21	TV ± 4
No. 200	2.0-7.0	TV ± 2

**1/2-inch HMA Types A and B**

Sieve sizes	TV limits	Allowable tolerance
3/4"	100	---
1/2"	95-99	TV ± 6
3/8"	75-95	TV ± 6
No. 4	55-66	TV ± 7
No. 8	38-49	TV ± 5
No. 30	15-27	TV ± 4
No. 200	2.0-8.0	TV ± 2

### 3/8-inch HMA Types A and B

Sieve sizes	TV limits	Allowable tolerance
1/2"	100	--
3/8"	95-100	TV ± 6
No. 4	58-72	TV ± 7
No. 8	34-48	TV ± 6
No. 30	18-32	TV ± 5
No. 200	2.0-9.0	TV ± 2

### No. 4 HMA Types A and B

Sieve sizes	TV limits	Allowable tolerance
3/8"	100	--
No. 4	95-100	TV ± 7
No. 8	72-77	TV ± 7
No. 30	37-43	TV ± 7
No. 200	2.0-12.0	TV ± 4

### 3/4-inch RHMA-G

Sieve sizes	TV limits	Allowable tolerance
1"	100	---
3/4"	95-100	TV ± 5
1/2"	83-87	TV ± 6
3/8"	65-70	TV ± 6
No. 4	28-42	TV ± 7
No. 8	14-22	TV ± 5
No. 200	0-6.0	TV ± 2

### 1/2-inch RHMA-G

Sieve sizes	TV limits	Allowable tolerance
3/4"	100	--
1/2"	90-100	TV ± 6
3/8"	83-87	TV ± 6
No. 4	28-42	TV ± 7
No. 8	14-22	TV ± 5
No. 200	0-6.0	TV ± 2

## 2. Open Grade Friction Course (OGFC)

### 1-inch OGFC

Sieve sizes	TV limits	Allowable tolerance
1 1/2"	100	---
1"	99-100	TV ± 5
3/4"	85-96	TV ± 5
1/2"	55-71	TV ± 6
No. 4	10-25	TV ± 7
No. 8	6-16	TV ± 5
No. 200	1.0-6.0	TV ± 2

### 1/2-inch OGFC

Sieve sizes	TV limits	Allowable tolerance
3/4"	100	--
1/2"	95-100	TV ± 6
3/8"	78-89	TV ± 6
No. 4	28-37	TV ± 7
No. 8	7-18	TV ± 5
No. 30	0-10	TV ± 4
No. 200	0-3.0	TV ± 2

### 3/8-inch OGFC

Sieve sizes	TV limits	Allowable tolerance
1/2"	100	--
3/8"	90–100	TV ± 6
No. 4	29–36	TV ± 7
No. 8	7–18	TV ± 6
No. 30	0–10	TV ± 5
No. 200	0–3.0	TV ± 2

- C. Before the addition of asphalt binder and lime treatment, aggregate must have the values for the quality characteristics shown in the following table:

#### Quality

Quality characteristic	Test method	HMA type			
		A	B	RHMA-G	OGFC
Percent of crushed particles	California Test 205	90	25	--	90
Coarse aggregate (% min.)		75	--	90	75
One fractured face					
Two fractured faces					
Fine aggregate (% min.) (Passing no. 4 sieve and retained on no. 8 sieve.)		70	20	70	90
One fractured face					
Los Angeles Rattler (% max.)	California Test 211	12	--	12	12
Loss at 100 rev.		45	50	40	40
Loss at 500 rev.					
Sand equivalent (min.) <sup>a</sup>	California Test 217	47	42	47	--
Fine aggregate angularity (% min.) <sup>b</sup>	California Test 234	45	45	45	--
Flat and elongated particles (% max. by weight @ 5:1)	California Test 235	10	10	10	10

1. Reported value must be the average of 3 tests from a single sample.
2. The Engineer waives this specification if HMA contains less than 10 percent of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

### 2.3 ASPHALT BINDER

- A. Asphalt binder in HMA must comply with the specifications for asphalts. Asphalt binder for geosynthetic pavement interlayer must comply with the specifications for asphalts. Choose from Grades PG 64-10, PG 64-16, or PG 70-10. Use asphalt rubber binder in RHMA-G, RHMA-O, and RHMA-O-HB. Asphalt rubber binder must be a combination of:
1. Asphalt binder
  2. Asphalt modifier
  3. CRM
    - a. The combined asphalt binder and asphalt modifier must be  $80.0 \pm 2.0$  percent by weight of asphalt rubber binder.

- B. Asphalt modifier must be a resinous, high flash point and aromatic hydrocarbon and must have the values for the quality characteristics shown in the following table:

**Asphalt Modifier for Asphalt Rubber Binder**

Quality characteristic	Test method	Value
Viscosity, m <sup>2</sup> /s (x 10 <sup>-6</sup> ) at 100 °C	ASTM D 445	X ± 3 a
Flash point, Cleveland Open Cup, °C	ASTM D 92	207 min
Molecular analysis		
Asphaltenes, percent by mass	ASTM D 2007	0.1 max
Aromatics, percent by mass	ASTM D 2007	55 min

1. The symbol "X" is the proposed asphalt modifier viscosity. "X" must be from 19 to 36. A change in "X" requires a new asphalt rubber binder design.
2. Asphalt modifier must be from 2.0 to 6.0 percent by weight of the asphalt binder in the asphalt rubber binder.

C. Crumb Rubber Modifier (CRM)

1. CRM consists of a ground or granulated combination of scrap tire crumb rubber and high natural rubber. CRM must be 75.0 ± 2.0 percent scrap tire rubber and 25.0 ± 2.0 percent high natural rubber by total weight of CRM. Scrap tire crumb rubber must be from any combination of automobile tires, truck tires, or tire buffing.
2. Sample and test the scrap tire crumb rubber and high natural rubber separately. CRM must have the values for the quality characteristics shown in the following table:

**Crumb Rubber Modifier for Asphalt Rubber Binder**

Quality characteristic	Test method	Value
Scrap tire crumb rubber gradation (% passing no. 8 sieve)	LP-10	100
High natural rubber gradation (% passing no. 10 sieve)	LP-10	100
Wire in CRM (% max.)	LP-10	0.01
Fabric in CRM (% max.)	LP-10	0.05
CRM particle length (inch max.) <sup>a</sup>	--	3/16
CRM specific gravity <sup>a</sup>	California Test 208	1.1–1.2
Natural rubber content in high natural rubber (%) <sup>a</sup>	ASTM D 297	40.0–48.0

3. Test at mix design and for certificate of compliance.
4. CRM must be ground and granulated at ambient temperature. If steel and fiber are cryogenically separated, it must occur before grinding and granulating. If cryogenically produced, CRM particles must be large enough to be ground or granulated and not pass through the grinder or granulator.
5. CRM must be dry, free-flowing particles that do not stick together. CRM must not cause foaming when combined with the asphalt binder and asphalt modifier. Calcium carbonate or talc may be added up to 3 percent by weight of CRM.

D. Asphalt Rubber Binder Design and Profile

1. Submit a proposal for asphalt rubber binder design and profile. In the design, include the asphalt, asphalt modifier, and CRM and their proportions. The profile is not a performance specification and only serves to indicate expected trends in asphalt rubber binder properties during binder production. The profile must include the same component sources for the asphalt rubber binder used.

2. Design the asphalt rubber binder from testing perform for each quality characteristic and for the reaction temperatures expected during production. The 24-hour (1,440-minute) interaction period determines the design profile. At a minimum, mix asphalt rubber binder components, take samples, and perform and record the tests shown in the following table:

**Asphalt Rubber Binder Reaction Design Profile**

Test	Minutes of reaction <sup>a</sup>							Limits
	45	60	90	120	240	360	1440	
Cone penetration @ 77 °F, 0.10-mm (ASTM D 217)	X <sup>b</sup>				X		X	25–70
Resilience @ 77 °F, percent rebound (ASTM D 5329)	X				X		X	18 min.
Field softening point, °F (ASTM D 36)	X				X		X	125–165
Viscosity, centipoises (LP-11)	X	X	X	X	X	X	X	1,500–4,000

<sup>a</sup> Six hours (360 minutes) after CRM addition, reduce the oven temperature to 275 °F for 16 hours. After the 16-hour (1,320-minutes) cool down after CRM addition, reheat the binder to the reaction temperature expected during production for sampling and testing at 24 hours (1,440 minutes).

<sup>b</sup> "X" denotes required testing

E. Asphalt Rubber Binder

1. After interacting for at least 45 minutes, asphalt rubber binder must have the values for the quality characteristics shown in the following table:

**Asphalt Rubber Binder**

Quality characteristic	Test for quality control or acceptance	Test method	Value	
			Minimum	Maximum
Cone penetration @ 77 °F, 0.10 mm	Acceptance	ASTM D 217	25	70
Resilience @ 77 °F, percent rebound	Acceptance	ASTM D 5329	18	--
Field softening point, °F	Acceptance	ASTM D 36	125	165
Viscosity @ 375 °F, centipoises	Quality control	LP-11	1,500	4,000

- F. Tack Coat must comply with the specifications for asphaltic emulsion or asphalts. Choose the type and grade. Notify the Engineer for dilution of asphaltic emulsion with water. The weight ratio of added water to asphaltic emulsion must not exceed 1 to 1. Measure added water either by weight or volume in compliance with water districts, cities, or counties. Apply proper conversion factor to determine the correct weight.

1. With each dilution, submit:
  - a. Weight ratio of water to bituminous material in the original asphaltic emulsion
  - b. Weight of asphaltic emulsion before diluting
  - c. Weight of added water
  - d. Final dilution weight ratio of water to asphaltic emulsion

- G. Geosynthetic Pavement Interlayer must comply with the specifications for pavement fabric, paving mat, paving grid, paving geocomposite grid, or geocomposite strip membrane.

### PART 3 – EXECUTION

#### 3.1 SUBGRADE PREPARATION

- A. Subgrade Preparation shall comply with the soil evaluation and report. Aggregate base shall be provided where shown and to the thickness shown. Construction of the aggregate base course shall be as shown on the plans.

### 3.2 HOT MIX ASPHALT MIX DESIGN REQUIREMENTS

- A. If required by the CONTRACTOR, following the HMA design requirement specified under Caltrans Specification 39-

### 3.3 CONTRACTOR QUALITY CONTROL

- A. Establish, maintain, and change a quality control system to ensure materials and work comply with Caltrans Specifications 39-1. Submit quality control test results within 3 days of a request, except if the QC/QA construction process is specified.

### 3.4 PRODUCTION

- A. General: Produce HMA in a batch mixing plant or a continuous mixing plant. Proportion aggregate by hot or cold feed control. HMA plants must be Caltrans qualified. Before production, the HMA plant must have current qualification under the Department's Materials Plant Quality Program.
- B. Mixing: Mix HMA ingredients into a homogeneous mixture of coated aggregates. Asphalt binder must be from 275 to 375 degrees F when mixed with aggregate. Asphalt rubber binder must be from 350 to 425 degrees F when mixed with aggregate. When mixed with asphalt binder, aggregate must not be more than 325 degrees F, except aggregate for OGFC must be not more than 275 degrees F. These aggregate temperature specifications do not apply to RAP. HMA with or without RAP must not be more than 325 degrees F.
- C. Asphalt Rubber Binder: Deliver scrap tire crumb rubber and high natural rubber in separate bags. Either proportion and mix asphalt binder, asphalt modifier, and CRM simultaneously or premix the asphalt binder and asphalt modifier before adding CRM. For premix of asphalt binder and asphalt modifier, the asphalt binder must be from 375 to 425 degrees F when asphalt modifier is added. Mix for at least 20 minutes. For addition of CRM, the asphalt binder and asphalt modifier must be from 375 to 425 degrees F.
  - 1. Do not use asphalt rubber binder during the first 45 minutes of the reaction period. During this period, the asphalt rubber binder mixture must be from 375 to the lower of 425 degrees F or 25 degrees F below the asphalt binder's flash point described in the MSDS.
  - 2. If any asphalt rubber binder is not used within 4 hours after the reaction period, discontinue heating. If the asphalt rubber binder drops below 375 degrees F, reheat before use. If more scrap tire crumb rubber is added to the reheated asphalt rubber binder, the binder must react for 45 minutes. The added scrap tire crumb rubber must not exceed 10 percent of the total asphalt rubber binder weight. Reheated and reacted asphalt rubber binder must comply with the viscosity specifications for asphalt rubber binder in section 39-1.02D. Do not reheat asphalt rubber binder more than twice.

### 3.5 SUBGRADE, TACK COAT, AND GEOSYNTHETIC PAVEMENT INTERLAYER

- A. General: Prepare subgrade or apply tack coat to surfaces receiving HMA. If specified, place geosynthetic pavement interlayer over a coat of asphalt binder.
- B. Subgrade to receive HMA must comply with the compaction and elevation tolerance specifications in the sections for the material involved. Subgrade must be free of loose and extraneous material. If HMA is paved on existing base or pavement, remove loose paving particles, dirt, and other extraneous material by any means including flushing and sweeping.
- C. Tack Coat: Apply tack coat:
  - 1. To existing pavement, including planed surfaces
  - 2. Between HMA layers

3. To vertical surfaces of:
  - a. Curbs
  - b. Gutters
  - c. Construction joints
4. Before placing HMA, apply tack coat in 1 application. The application rate must be the minimum residual rate specified for the underlying surface conditions shown in the following tables:

**Tack Coat Application Rates for HMA Type A, Type B, and RHMA-G**

HMA overlay over:	Minimum residual rates (gal/sq. yd.)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h asphaltic emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 asphaltic emulsion	Asphalt binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h asphaltic emulsion
New HMA (between layers)	0.02	0.03	0.02
PCC and existing HMA (AC) surfaces	0.03	0.04	0.03
Planed PCC and HMA (AC) surfaces	0.05	0.06	0.04

**Tack Coat Application Rates for OGFC**

OGFC over:	Minimum residual rates (gal/sq. yd.)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h asphaltic emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 asphaltic emulsion	Asphalt binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h asphaltic emulsion
New HMA	0.03	0.04	0.03
PCC and existing HMA (AC) surfaces	0.05	0.06	0.04
Planed PCC and HMA (AC) surfaces	0.06	0.07	0.05

5. For vertical surfaces, apply a residual tack coat rate that will thoroughly coat the vertical face without running off. If authorized, the following can be performed:
    - a. Change tack coat rates
    - b. Omit tack coat between layers of new HMA during the same work shift if:
      - 1) No dust, dirt, or extraneous material is present
      - 2) Surface is at least 140 degrees F
  6. Immediately in advance of placing HMA, apply additional tack coat to damaged areas or where loose or extraneous material is removed.
  7. Close areas receiving tack coat to traffic. Do not track tack coat onto pavement surfaces beyond the job site.
  8. Asphalt binder tack coat must be from 285 to 350 degrees F when applied.
- D. Geosynthetic Pavement Interlayer: Place under the manufacturer's instruction. Before placing the geosynthetic pavement interlayer and asphalt binder:
1. Repair cracks 1/4 inch and wider, spalls, and holes in the pavement. These repairs are change order work.
  2. Clean the pavement of loose and extraneous material.

3. Immediately before placing the interlayer, apply  $0.25 \pm 0.03$  gal of asphalt binder per square yard of interlayer or until the fabric is saturated. Apply asphalt binder the width of the geosynthetic pavement interlayer plus 3 inches on each side. At interlayer overlaps, apply asphalt binder on the lower interlayer the same overlap distance as the upper interlayer.
4. Asphalt binder must be from 285 to 350 degrees F and below the minimum melting point of the geosynthetic pavement interlayer when applied.
5. Align and place the interlayer with no folds that result in a triple thickness, except that triple thickness layers less than 1 inch in width may remain if less than 1/2 inch in height. Folds that result in a triple layer greater than a 1 inch width must be slit and overlapped in a double thickness at least 2 inches in width.
6. The minimum HMA thickness over the interlayer must be 0.12 foot thick, including conform tapers. Do not place the interlayer on a wet or frozen surface.
7. Overlap the interlayer borders from 2 to 4 inches. In the direction of paving, overlap the following roll with the preceding roll at any break.
8. Rolling equipment to correct distortions or wrinkles in the interlayer is acceptable.
9. If asphalt binder tracked onto the interlayer or brought to the surface by construction equipment causes interlayer displacement, cover it with a small quantity of HMA.
10. Before placing HMA on the interlayer, do not expose the interlayer to:
  - a. Traffic, except for crossings under traffic control, and only after a small HMA quantity has been placed
  - b. Sharp turns from construction equipment
  - c. Damaging elements
11. Pave HMA on the interlayer during the same work shift.

### 3.6 SPREADING AND COMPACTING EQUIPMENT

- A. Paving equipment for spreading must be:
  1. Self-propelled
  2. Mechanical
  3. Equipped with a screed or strike-off assembly that can distribute HMA the full width of a traffic lane
  4. Equipped with a full-width compacting device
  5. Equipped with automatic screed controls and sensing devices that control the thickness, longitudinal grade, and transverse screed slope
- B. Install and maintain grade and slope references.
- C. The screed must produce a uniform HMA surface texture without tearing, shoving, or gouging.
- D. The paver must not leave marks such as ridges and indentations, unless it can be eliminated by rolling.
- E. Rollers must be equipped with a system that prevents HMA from sticking to the wheels. A parting agent that does not damage the HMA or impede the bonding of layers may be used.
- F. In areas inaccessible to spreading and compacting equipment:
  1. Spread the HMA by any means to obtain the specified lines, grades, and cross sections.
  2. Use a pneumatic tamper, plate compactor, or equivalent to achieve thorough compaction.

### 3.7 TRANSPORTING, SPREADING, AND COMPACTING

- A. Do not pave HMA on wet pavement or a frozen surface. HMA may be deposited in a windrow and load it in the paver if:
1. Paver is equipped with a hopper that automatically feeds the screed
  2. Loading equipment can pick up the windrowed material and deposit it in the paver hopper without damaging base material
  3. Activities for deposit, pickup, loading, and paving are continuous
  4. HMA temperature in the windrow does not fall below 260 degrees F
- B. HMA may be paved in 1 or more layers on areas less than 5 feet wide and outside the traveled way, including shoulders. Mechanical equipment may be used other than a paver for these areas. The equipment must produce uniform smoothness and texture. HMA handled, spread, or windrowed must not stain the finished surface of any improvement, including pavement.
- C. Do not use petroleum products such as kerosene or diesel fuel to release HMA from trucks, spreaders, or compactors.
1. HMA must be free of:
    - a. Segregation
    - b. Coarse or fine aggregate pockets
    - c. Hardened lumps
  2. Longitudinal joints in the top layer must match specified lane edges. Alternate the longitudinal joint offsets in the lower layers at least 0.5 foot from each side of the specified lane edges. Other longitudinal joint placement patterns may be requested. Until the adjoining through lane's top layer has been paved, do not pave the top layer of:
    - a. Shoulders
    - b. Tapers
    - c. Transitions
    - d. Road connections
    - e. Driveways
    - f. Curve widenings
    - g. Chain control lanes
    - h. Turnouts
    - i. Turn pockets
  3. If the number of lanes changes, pave each through lane's top layer before paving a tapering lane's top layer. Simultaneous to paving a through lane's top layer, an adjoining area's top layer may be paved, including shoulders. Do not operate spreading equipment on any area's top layer until completing final compaction.
  4. If leveling with HMA is specified, fill and level irregularities and ruts with HMA before spreading HMA over the base, existing surfaces, or bridge decks. Mechanical equipment other than a paver for these areas may be used. The equipment must produce uniform smoothness and texture. HMA used to change an existing surface's cross slope or profile is not paid for as HMA (leveling).
  5. If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material.
  6. Rolling must leave the completed surface compacted and smooth without tearing, cracking, or showing. Complete finish rolling activities before the pavement surface temperature is:
    - a. Below 150 degrees F for HMA with unmodified binder
    - b. Below 140 degrees F for HMA with modified binder
    - c. Below 200 degrees F for RHMA-G

7. If a vibratory roller is used as a finish roller, turn the vibrator off. Do not use a pneumatic-tired roller to compact RHMA-G.
8. For Standard and QC/QA construction processes, if 3/4-inch aggregate grading is specified, 1/2-inch aggregate grading may be used if the total layer thickness is from 0.125 to 0.20 foot thick.
9. Spread and compact HMA under sections 39-3.03 and 39-3.04 if any of the following applies:
  - a. Specified paved thickness is less than 0.15 foot.
  - b. Specified paved thickness is less than 0.20 foot and 3/4-inch aggregate grading is specified and used.
  - c. Spread and compact at:
    - 1) Asphalt concrete surfacing replacement areas
    - 2) Leveling courses
    - 3) Areas for which the Engineer determines conventional compaction and compaction measurement methods are impeded
10. Do not allow traffic on new HMA pavement until its mid-depth temperature is below 160 degrees F.
11. If request and if authorized, HMA Type A and Type B may be cooled with water when rolling activities are complete. Apply water under section 17-3.
12. Spread sand at a rate from 1 to 2 lb. /sq. yd. on new RHMA-G, RHMA-O, and RHMA-O-HB pavement when finish rolling is complete. Sand must be free of clay or organic matter. Sand must comply with section 90-1.02C(4)(c). Keep traffic off the pavement until spreading sand is complete.

### 3.8 SMOOTHNESS

- A. General: Determine HMA smoothness with a profilograph and a straightedge.
  1. Smoothness specifications do not apply to OGFC placed on existing pavement not constructed under the same project.
  2. If concrete pavement is placed on HMA:
    - a. Cold plane the HMA finished surface to within specified tolerances if it is higher than the grade ordered.
    - b. Remove and replace HMA if the finished surface is lower than 0.05 foot below the grade ordered.
- B. Straightedge: The top layer of HMA pavement must not vary from the lower edge of a 12-foot straightedge:
  1. More than 0.01 foot when the straightedge is laid parallel with the centerline
  2. More than 0.02 foot when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
  3. More than 0.02 foot when the straightedge is laid within 24 feet of a pavement conform
- C. Profilograph
  1. For the top layer of HMA Type A, Type B, and RHMA-G pavement, determine the PI0 and must-grinds under California Test 526. Take 2 profiles within each traffic lane, 3 feet from and parallel with the edge of each lane.
  2. A must-grind is a deviation of 0.3 inch or more in a length of 25 feet. Must-grinds must be corrected.
  3. For OGFC, only determine must-grinds if placed over HMA constructed under the same project. The top layer of the underlying HMA must comply with the smoothness specifications before placing OGFC.
  4. Profile the pavement in the Engineer's presence.
  5. On tangents and horizontal curves with a centerline radius of curvature of 2,000 feet, the PI0 must be at most 3 inches per 0.1-mile section.

6. On horizontal curves with a centerline radius of curvature from 1,000 to 2,000 feet, including pavement within the superelevation transitions, the PIO must be at most 6 inches per 0.1-mile section.
7. Before the Engineer accepts HMA pavement for smoothness, submit final profilograms. Submit 1 copy of profile information in Microsoft Excel and 1 copy of longitudinal pavement profiles in ".erd" format or other ProVAL compatible format to the Engineer and to:  
Smoothness@dot.ca.gov
8. The following HMA pavement areas do not require a PIO. These areas must be measure with a 12-foot straightedge and determine must-grinds with a profilograph:
  - a. New HMA with a total thickness less than 0.25 foot
  - b. HMA sections of city or county streets and roads, turn lanes, and collector lanes less than 1,500 feet in length
9. The following HMA pavement areas do not require a PIO and measurement shall be with a 12-foot straightedge:
  - a. Horizontal curves with a centerline radius of curvature less than 1,000 feet, including pavement within the superelevation transitions of those curves
  - b. Within 12 feet of a transverse joint separating the pavement from:
    - 1) Existing pavement not constructed under the same project
    - 2) A bridge deck or approach slab
10. Exit ramp termini, truck weigh stations, and weigh-in-motion areas
11. If steep grades and superelevation rates greater than 6 percent are present:
  - a. Ramps
  - b. Connectors
12. Turn lanes
13. Areas within 15 feet of manholes or drainage transitions
14. Acceleration and deceleration lanes for at-grade intersections
15. Shoulders and miscellaneous areas
16. HMA pavement within 3 feet from and parallel to the construction joints formed between curbs, gutters, or existing pavement

D. Smoothness Correction

1. If the top layer of HMA Type A, Type B, or RHMA-G pavement does not comply with the smoothness specifications, grind the pavement to within specified tolerances, remove and replace it, or place an overlay of HMA. Do not start corrective work until choice of methods is authorized. Remove and replace areas of OGFC not in compliance with the must-grind and straightedge specifications, except OGFC may be grinded for correcting smoothness:
  - a. At transverse joints separating the OGFC from pavement not constructed under the same project
  - b. Within 12 feet of a transverse joint separating the OGFC from a bridge deck or approach slab
2. Corrected HMA pavement areas must be uniform rectangles with edges:
  - a. Parallel to the nearest HMA pavement edge or lane line
  - b. Perpendicular to the pavement centerline
3. Measure the corrected HMA pavement surface with a profilograph and a 12-foot straightedge and correct the pavement to within specified tolerances. If a must-grind area or straight edged pavement cannot be corrected to within specified tolerances, remove and replace the pavement. On areas ground but not overlaid with OGFC, apply fog seal coat under section 37-2.

3.9 CONSTRUCTION REQUIREMENTS FOR PAVEMENT REPAIR

- A. Preparation of the site for pavement repair shall be in accordance with the Contract Drawings.

- B. New pavement shall be placed according to the provisions of this Section and shall be of similar materials and pavement thickness as existing adjacent pavement except that the new pavement section surface shall be 1/8-inch higher than adjacent pavement.
- C. Diamond saw cut joining pavement edges and tack coat edges.

- END OF SECTION -

**SECTION 02500**  
**PIPELINE CONNECTIONS TO EXISTING FACILITIES**

**PART 1 – GENERAL**

1.1 DESCRIPTIONS

- A. This section includes requirements for connection to and abandonment of existing water facilities.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Related Sections:
1. Section 02200 – Earthwork
  2. Section 02318 – Trenching
  3. Section 02643 – Pipeline Testing and Disinfection

1.3 LOCATION

- A. As the CONTRACTOR's first order of work, the connection points to the existing water system shall be potholed to identify depth, diameter and pipe material. Coordinates and Dimensions to locate the exact pothole location shall also be documented. Pothole information shall be immediately provided to the Engineer for review. The Engineer will not review any other CONTRACTOR submittals until after the pothole data is received.

1.4 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. CONTRACTOR shall submit to the City of Vernon Public Works Department at least six weeks prior to any connections to existing facilities which requires the shutdown of that facility, their plan to perform the shut down and requirements of which facilities will be shut down to accomplish the connection.

**PART 2 – MATERIALS**

- A. All materials used in making the connection or removing the facility from service shall conform to the applicable sections of these specifications and the contract drawings.

**PART 3 – EXECUTION**

3.1 CONNECTION TO EXISTING WATERLINES

- A. Notification: The CONTRACTOR shall give the City of Vernon Public Utilities Department a minimum of ten (10) working days' notice in writing before the time of any required shutdown of existing mains or services. The City of Vernon Public Utilities Department shall determine the actual time and date of shutdown.
- B. Authorization: Connections shall be made only in the presence of the City of Vernon Utilities Works Department representative. No connection work shall be performed prior to authorization by the CITY.
- C. Time Schedule: The CONTRACTOR is restricted to a time limit not exceeding 4 hours after pipe draining by the CITY, to connect the new pipelines to existing pipelines, with required fittings, and restore water service.
- D. Material: The CONTRACTOR shall furnish all pipe and materials as may be required for connections including but not limited to: labor and equipment necessary to make the connections; all required excavation; backfill; lights; barricades; water truck; highline hose; and fittings for making the connections. The

CONTRACTOR shall provide verification to the City of Vernon Public Utilities Department that all necessary materials and personnel are on-site before requesting shutdown or commencing with connection to existing mains or services.

- E. Inadequate Progress: If progress is inadequate during the connection operations to complete the connection in the time specified, the Engineer shall order necessary corrective measures. All costs for corrective measures shall be paid by the CONTRACTOR.
- F. Connections: Connections shall be made with as little change as possible in the grade of new main. If the grade of the existing pipe is below that of the new pipeline, a sufficient length of the new line shall be deepened so as to prevent the creation of any high spot or abrupt changes in grade of the new line. Where the grade of the existing pipe is above that of the new pipeline, the new line shall be laid at specified depth, except for the first joint adjacent to the connection, which shall be deflected as necessary to meet the grade of the existing pipe. If sufficient change in direction cannot be obtained by the limited deflection of the first joint, a fitting of the proper angle shall be installed. Where the connection creates a high or low spot in the line, a standard air release or blow-off assembly shall be installed as directed by the Engineer.
- G. Testing: The new pipeline shall be disinfected and hydrostatically tested as required.

### 3.2 CONNECTION TO NON-WATERLINE PIPES

- A. Notification: The CONTRACTOR shall give the CITY a minimum of ten (10) working days' notice in writing before the time of any required shutdown of existing pipelines. The City of Vernon Public Utilities Department shall determine the actual time and date of shutdown.
- B. Authorization: Connections shall be made only in the presence of the City of Vernon Public Utilities Department Representative. No connection work will be performed prior to authorization by the CITY.
- C. Time Schedule: The CONTRACTOR is restricted to a time limit not exceeding 4 hours (unless previously negotiated with the CITY in writing) to connect the new pipelines to the existing pipeline, with required fittings, and restore service.
- D. Material: The CONTRACTOR shall furnish all pipe and materials as may be required for connections including but not limited to: labor and equipment necessary to make the connections; all required excavation; backfill; lights; barricades; water truck; highline hose; and fittings for making the connections. The CONTRACTOR shall provide verification to the City of Vernon Public Utilities Department that all necessary materials and personnel are on-site before requesting shutdown or commencing with connection to existing mains or services.
- E. Inadequate Progress: If progress is inadequate during the connection operations to complete the connection in the time specified, the Engineer shall order necessary corrective measures. All costs for corrective measures shall be paid by the CONTRACTOR.
- F. Connections: Connections shall be made with as little change as possible in the grade of new main. If the grade of the existing pipe is below that of the new pipeline, a sufficient length of the new line shall be deepened so as to prevent the creation of any high spot or abrupt changes in grade of the new line. Where the grade of the existing pipe is above that of the new pipeline, the new line shall be laid at specified depth, except for the first joint adjacent to the connection, which shall be deflected as necessary to meet the grade of the existing pipe. If sufficient change in direction cannot be obtained by the limited deflection of the first joint, a fitting of the proper angle shall be installed. Where the connection creates a high or low spot in the line, a standard air release or blow-off assembly shall be installed as directed by the Engineer.

- END OF SECTION -

**SECTION 02560**  
**REINFORCED CONCRETE CYLINDER PIPE**

**PART**

required to complete the work as indicated in the Contract Documents.

in place, in accordance with the requirements of the Contract Documents.

conform to or exceed the applicable requirements of the following referenced Standards to the extent that the requirements therein are not in conflict with the provisions of this Section.

ASTM C 76	Specifications for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM C 94	Specifications for Ready-Mixed Concrete
ASTM C 150	Specification for Portland Cement
ASTM C 494	Specifications for Chemical Admixtures for Concrete
ASSHTO M 170	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

joints, and piping appurtenances in accordance with the requirements of Section 01300 – Submittals.

requirements of Section 01300 - Submittals, and the following supplemental requirements as applicable:

position, type, size, and area of wire or reinforcement; manufacturing tolerances; and all other pertinent information required for the manufacture of the product. Joint details shall be submitted where deep bell or butt strap joints are required for control of temperature stresses.

appurtenances where shown on the Drawings which indicate amount and position of all reinforcement. All fittings shall be properly reinforced to withstand the external loading conditions indicated in the Contract Documents.

and appurtenances - all sufficient to ascertain conformance of pipe and fittings with the Specifications.

location of each pipe and the direction of each fitting in the completed line shall be shown. In addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; the station and invert elevation to which the bell end of each pipe will be laid; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained and/or welded joints, or of concrete encasement.

requirements herein. The CONTRACTOR shall notify the ENGINEER and the CITY in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.

manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

with the requirements of AWWA, as applicable.

provided that the CONTRACTOR schedule is not delayed for the convenience of the ENGINEER or the CITY.

this section of the specifications.

## **PART**

otherwise. The pipe shall be of the diameter shown, and all fittings and bends shall be provided as required under the Contract Documents.

sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation. All pipe sections and fittings shall be marked at each end with top field centerline. The word "top" shall be painted or marked on the outside top spigot end of each pipe section.

ENGINEER, designed and constructed to prevent damage to the pipe. The use of chains, hooks, or other equipment which might injure the pipe will not be permitted. Stockpiled pipe shall be suitably supported and

shall be secured to prevent accidental rolling. All pipe handling equipment and methods shall be acceptable to the ENGINEER.

fittings during handling, storage, hauling, and installation.

smaller pipe, with shorter lengths permissible as required by weight or other considerations.

surface crazing and roughness. The interior and exterior surfaces shall be concentric. Pipe manufactured by pouring and vibrating methods within stationary internal and external forms shall have smooth, glossy surfaces, relatively free from pits and air holes. Pits or air holes greater than 3/8-inch in any dimension on the inside or outside surfaces of the pipe shall be repaired. Fractures, cracks or chips extending into the pipe wall in such a manner as to reduce the strength of the pipe shall not be permitted.

may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing shown on the Drawings. The locations of correction pieces and closure assemblies are shown on the Drawings. Any change in location or number of said items shall be subject to acceptance by the ENGINEER.

axis of the pipe within  $\pm 1/4$ -inch when measured from one side of the pipe. The concrete core shall be a uniform distance from the ends of the bell and spigot joint rings as shown on the Drawings. The joints shall be so constructed that after the pipe is laid, the offset on the inside of the pipe at any joint will not be more than 1/8-inch (except for bevels), and the clear space provided for grouting between pipe ends at the outside of the joint rings shall be not less than 1/4-inch.

spigot ring and the inside of the bell ring contact surface in excess of 1/8-inch, measured in a radial direction when the pipe is joined in the field and the joint is fully telescoped.

edition of the Standard Specification for Public Works Construction Section 207-2.2. A fly ash or pozzolan shall not be used as a cement replacement.

the concrete. The admixture shall conform to ASTM C-494 for type D chemical admixture and shall be compatible with the cement specified. Calcium chloride shall not be used.

percent of the nominal pipe diameter shall be mortar-lined and mortar-coated steel plate fittings. Resistance to moments and thrusts resulting from combined loads shall be provided by one of the following methods:

soil-cement.

moments and thrusts. Stiffener rings shall be fabricated from material conforming to the requirements of ASTM A 283, Grades C or D, ASTM A 36, or equal, and shall be designed for a maximum stress of 15,000 psi. Stiffener rings shall be cement-mortar coated to provide protection equal to that provided for the pipe.

pneumatically-placed cement mortar. Reinforcement pads or collars of suitable dimensions shall be used to develop the full strength of mesh or bar reinforcement at discontinuities at outlets.

pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11.25 degrees.

joints, by using short lengths or pipe, or a combination of these methods except that pulled joints shall not be used in combination with bevels. The maximum total allowable angle for beveled joints shall be 5 degrees per pipe joint. The maximum allowable angle for pulled joints shall be in accordance with the manufacturer's recommendations or the angle which results from a 3/4-inch pull out from normal joint closure, whichever is less. All horizontal deflections or fabricated angles shall fall on the alignment.

of minimum earth cover, and pipeline outlets and structures, the pipe angle points shall match the angle points shown on the Drawings.

CONTRACTOR shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all fitting openings to prevent drying out of the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe fitting is installed.

ANSI B16.5 150-lb class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to either AWWA C207 Class E or ANSI B16.5 150-lb class. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300-lb class. Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown. Attachment of the flanges to the pipe shall conform to the requirements of AWWA C207.

344" or Rust-Oleum "R-9", or Engineer approved equal. Edges and back faces of attached flanges shall be shop-coated with Kopper's "Bitumastic Mill Undercoat", or Engineer approved equal. All surfaces of blind flanges, except the machined surfaces and surfaces exposed to water during pipeline operation, shall be shop-coated with Kopper's "Bitumastic Mill Undercoat", or Engineer approved equal. The inside of blind flanges shall be cement-mortar coated, the thickness to be the same as the cement-mortar lining for pipe as stated herein.

non-asbestos sheet packing.

flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer.

sleeves and washers shall be one piece when flange bolt diameter is 1.5 inches or smaller and shall be made of acetyl resin. For bolt diameters larger than 1.5 inches, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic. Steel washers shall be in accordance with ASTM A 325.

ASTM A 307, Grade B, with heavy hex nuts. Machine bolts may be used on all other flanged connections and shall be in accordance with ASTM A 307, Grade A, with hex nuts. Studs and bolts shall extend through the nuts a minimum of 1/4-inch.

couplings, such as Dresser, Rockwell, Romac, or Engineer approved equal. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket.

to air under normal storage or use conditions. The rubber in the gasket shall meet the following specifications:

The gaskets shall be immune to attack by impurities normally found in water. All gaskets shall meet the requirements of ANSI/ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as noted above.

assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

minimum of 25 mil thick, 100 percent solids coal-tar epoxy coating, Amercoat 1972B, or Engineer approved equal. The coating may be applied to freshly placed, partially cured, or cured cement-mortar coating or cured concrete surface. Application shall be in accordance with the manufacturer's printed instructions.

- B. The requirement for coal-tar epoxy should be utilized only upon recommendation of a qualified corrosion engineer for the following three conditions:
1. High chloride soils subject to alternate wetting and drying where the chloride ion concentration in the soil exceeds 1000 ppm and the soil resistivity, based on a statistical analysis of field measurements taken in the maximum natural moisture state, is lower than 1000 ohm-cm.

2. Acidic soils where the soil pH is below 5 and there is a probability of groundwater movement, i.e., fluctuating water table within the pipe zone. This condition rarely occurs except in peat bogs or man-made environments such as cinders, mine wastes, and industrial dumps. Other protective methods are often available such as impermeable clay backfill or calcareous backfill in the pipe zone.
3. Cathodic interference environments which cannot be fully mitigated by drainage bonds or other corrosion control practices.

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shocks, and free fall. All pipe handling equipment shall be acceptable to the INSPECTOR. Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the trench site or elsewhere. Pipe shall be handled and stored at the trench site in accordance with Paragraph 2.1 C "Handling and Storage". No pipe shall be installed where the interior or exterior surfaces show cracks that may be harmful as determined by the ENGINEER. Such damaged interior and exterior surfaces, shall be repaired, or a new undamaged pipe shall be furnished and installed.

The CONTRACTOR shall remove or smooth out any burrs, gouges, weld splatter or other small defects prior to laying the pipe.

which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the work.

damaged portion will be on top. The damaged area shall be repaired for the protection of any exposed steel. All damaged areas shall be repaired using materials and methods acceptable to the ENGINEER.

that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of slings after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings and to facilitate positioning of the grout bands. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.

laid to the set line and grade, within approximately  $\pm 1$  inch. On grades of zero slope, the intent is to lay to grade.

change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint. In all cases the joint opening, before finishing with the protective mortar inside the pipe, shall be the controlling factor.

exceeding 10 percent. Pipe which is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement. All bends shall be properly installed as shown on the Drawings.

diameter and larger. Struts in fabricated steel plate fittings smaller than 42 inches may be removed immediately after laying provided that the deflection of the fitting during and after backfilling does not exceed that specified. After the backfill has been placed, the struts shall be removed and shall remain the property of the CONTRACTOR.

time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water or any undesirable substance. The bulkheads shall be so designed to prevent drying out of the interior of the pipe. The CONTRACTOR shall introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads. At all times, means shall be provided to prevent the pipe from floating.

The CONTRACTOR shall completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints and any necessary interior repairs prior to testing and disinfecting the completed pipeline.

gasket lubricated with an approved vegetable-based lubricant shall be placed in the spigot groove. The volume of the gasket shall be "equalized" by moving a metal rod between the gasket and the spigot ring around the full circumference of the spigot ring. The bell of the pipe already in place shall be carefully cleaned and lubricated with a vegetable-based lubricant. The spigot of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped to its proper position. Pipe shall be entered as nearly in alignment as possible. Tilting of the pipe to insert the spigot into the bell will not be permitted. After the pipe units have been joined, a feeler gage shall be inserted into the recess and moved around the periphery of the joint to detect any irregularity in the position of the rubber gasket. If the gasket cannot be "felt" all around, the joint shall be disassembled. If the gasket is undamaged, as determined by the ENGINEER, it may be reused, but only after the bell ring and gasket have been relubricated. Field welded joints shall be in accordance with AWWA C206.

and other foreign material shall be removed from the inside surface of the pipe. The cement for joint grout and mortar shall be Portland cement acceptable under ANSI/ASTM C 150 and shall be of the same type used for the pipe. Otherwise heavy-duty diapers should be specified and all references to polyethylene foam disregarded.

the pipe securely in place, the outside annular space between pipe sections shall be completely filled with grout. If coal-tar epoxy protective coating is required the space between pipe sections shall be formed by the use of polyethylene foam-lined fabric bands otherwise heavy-duty diapers shall be used. The grout shall be composed of one part cement to not more than 2 parts sand, thoroughly mixed with water to a consistency of thick cream. The grout space prior to filling shall be flushed with water so that the surface of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured. The joint shall be filled with grout by pouring from one side only, and shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe and up the opposite side. Pouring and rodding the grout shall be continued to allow completion of the filling of the entire joint recess in one operation. Care shall be taken to leave no unfilled space. Grouting of the outside joint spaces shall

be kept as close behind the laying of the pipe as possible except that in no case shall grouting be closer than 3 joints of the pipe being laid.

sufficient strength to hold the fresh mortar, resist rodding of the mortar and allow excess water to escape. The foam plastic shall be 100 percent closed cell, chemically inert, insoluble in water and resistant to acids alkalis and solvents, and shall be Dow Chemical Company, Ethafoam 222, or Engineer approved equal.

edges. The polyethylene foam shall be cut into strips 6-inches wide and slit to a thickness of 1/4-inch which will expose a hollow or open cell surface on one side. The foam liner shall be attached to the fabric backing with the open or hollow cells facing towards the pipe. The foam strip shall cover the full interior circumference of the grout band with sufficient length to permit an 8-inch overlap of the foam at or near the top of the pipe joint. Splices to provide continuity of the material will be permitted. The polyethylene foam material shall be protected from direct sunlight.

extending over each pipe end and securely attached to the pipe with the steel straps. After filling the exterior joint space with cement grout, the flaps shall be closed and overlapped in a manner that fully encloses the grout with polyethylene foam. The fabric band shall remain in position on the pipe joint.

the interior joint recess shall be filled with mortar of stiff consistency mixed in proportions of one part cement to 2 parts sand. The mortar shall be tightly packed into the joint recess and troweled flush with the interior surface, and all excess shall be removed. At no point shall there be an indentation or projection of the mortar exceeding 1/16-inch.

bell shall be doubled with mortars (mortar composed of one part of a non-shrink, non-metallic cement to two parts sand, thoroughly mixed to the consistency of thick cream. Sand graduation shall conform to the requirements of ASTM C 33, except that 100 percent shall pass a No. 16 Sieve). When the section has been laid in place, the joint shall be finished by pulling a rubber ball or an equivalent through the joint to finish it off smooth with the inside surface of the lining.

appurtenances shall be coated with a minimum thickness of one inch of cement mortar having one part cement to not more than 2 parts plaster sand. Following coating with cement mortar, the appurtenances shall be coated with coal-tar epoxy in accordance with paragraph 2.6.A.

the valve. All joints shall be thoroughly cleaned and prepared prior to installation. The CONTRACTOR shall adjust all stem packing and operate each valve prior to installation to insure proper operation.

foreign material with a power wire brush. The gasket shall be centered and the connecting flanges drawn up watertight without unnecessarily stressing the flanges. All bolts shall be tightened in a progressive diametrically opposite sequence and torqued with a suitable, approved and calibrated torque wrench. All clamping torque shall be applied to the nuts only.

the Drawings. The CONTRACTOR shall exercise special care when installing these joints to prevent electrical conductivity across the joint. After the insulated joint is completed, an electrical resistance test will be performed by the INSPECTOR. Should the resistance test indicate a short circuit, the CONTRACTOR shall remove the insulating units to inspect for damages, replace all damaged portions, and reassemble the insulating joint. The insulated joint shall then be re-tested to assure proper insulation.

couplings and gaskets are clean and free of all dirt and foreign matter with special attention being given to the contact surfaces of the pipe, gaskets and couplings. The couplings shall be assembled and installed in conformity with the recommendation and instruction of the coupling manufacturer.

Coupling bolts shall be tightened so as to secure a uniform annular space between the follower rings and the body of the pipe with all bolts tightened approximately the same amount. Diametrically opposite bolts shall be tightened progressively and evenly. Final tightening shall be done with a suitable, approved and calibrated torque wrench set for the torque recommended by the coupling manufacturer. All clamping torque shall be applied to the nut only.

protected in accordance with the requirements of Section 09800 – Special Coatings.

shown on the Drawings. The pipe shall be cleaned to bare bright metal at the point where the bond is installed.

where shown, shall be furnished and installed by the CONTRACTOR.

- END OF SECTION -

**SECTION 02565  
DUCTILE IRON PIPE**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide ductile iron pipe and perform all appurtenant work, complete in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
ANSI/AWWA C105/A21.5	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings, 3-inches through 48-inches for Water and Other Liquids
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, 3-inches through 12-inches for Water and Other Liquids
AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances
ASTM C 150	Specification for Portland Cement
ASTM A746	Ductile Iron Gravity Sewer Pipe

B. Related Sections:

1. Section 02100 – Site Preparation
2. Section 02318 – Trenching
3. Section 02643 – Pipeline Testing and Disinfection

1.3 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 - Submittals.
- B. Shop Drawings: Submit shop drawings of pipe and fittings in accordance with the requirements in Section

01300 - Submittals, the requirements of the referenced standards, and the following supplemental requirements as applicable:

1. Dimensional drawings of all valves, fittings and appurtenances.
2. For pipe 24 inches in diameter and larger, line layout and marking diagrams which indicate the specific number of each fitting and the location and the direction of each fitting in the completed line. In addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained joints, or of concrete encasement.

#### 1.4 QUALITY ASSURANCE

- A. Inspection: All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards, as supplemented by the requirements herein.
- B. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

### **PART 1 – PRODUCTS**

#### 2.1 GENERAL

- A. Mortar-lined ductile iron pipe shall conform to ANSI/AWWA C151, C104 and C105, subject to the following supplemental requirements. The pipe shall be of the diameter and class noted in the Contract Documents. The pipe shall be furnished complete with rubber gaskets, with all specials and fittings provided as required under the Contract Documents.
- B. Markings: Legibly mark specials 24 inches in diameter and larger in accordance with the laying schedule and marking diagram. All fittings shall be marked at each end with top field centerline.
- C. Handling and Storage: The pipe shall be handled by devices acceptable to the ENGINEER, designed and constructed to prevent damage to the pipe coating/exterior. The use of equipment that might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be suitably supported and shall be secured to prevent accidental rolling. All other pipe handling equipment and methods shall be acceptable to the ENGINEER.
- D. Laying Lengths: Maximum pipe laying lengths shall be 20-feet with shorter lengths provided as required by the Drawings.
- E. Finish: The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness.
- F. Closures and Correction Pieces: Closures and correction pieces shall be provided as required so that closures may be made due to different headings in the pipe laying operation and so corrections may be made to adjust the pipe laying to conform to pipe stationing shown on the Drawings. The locations of correction pieces and closure assemblies are shown on the Drawings. Any change in location or number of said items shall be acceptable to the ENGINEER.

#### 2.2 PIPE DESIGN CRITERIA

- A. General: Ductile iron pipe shall be designed in accordance with the requirements of ANSI/AWWA C150 as applicable and as modified in this Section.
- B. Pipe Wall Thickness for Internal Pressure: The pipe shall be designed with a net thickness to withstand the

design pressure in accordance with the hoop stress formula.

- C. Pipe Wall Thickness for External Load: The pipe shall also be designed with a net thickness to withstand external loads using ANSI/AWWA C150 Design Equation (2) with the appropriate bending moment and deflection coefficients for Laying Condition Types 4 and 5 as applicable.
- D. The pipe deflection shall be checked using ANSI/AWWA C150 Design Equation (3) and the coefficients stated above. The allowable deflection shall not exceed the manufacturer's recommended amount.
- E. In lieu of ANSI/AWWA C150 Design Equation (4), the earth loads will be computed using the following 2 equations for trench or embankment loading as applicable:

- 1. Trench Condition:

$$W_d = C_d w B_d^2$$

Where:

- $W_d$  = Earth Load in pounds per linear foot
- $C_d$  = Calculation Coefficient
- $Ku'$  = [0.13]
- $w$  = [120] lb. /ft<sup>3</sup>
- $B_d$  = Trench width at top of pipe, feet

- 2. Positive Projecting Embankment Condition:

$$W_e = C_e w B_e^2$$

Where:

- $W_e$  = Earth Load in pounds per linear foot
- $C_e$  = Calculation Coefficient (based on  $r_{sd}P$  of 0.25)
- $Ku$  = [0.19]
- $w$  = [120] lb. /ft<sup>3</sup>
- $B_e$  = Outside diameter of pipe, feet

- F. The above 2 formulas are based on a depth of cover of 10-feet or greater. For depths of cover of less than 10-feet, HS-20 live load shall be included. For depths of cover of 3-feet or less, HS-20 live load plus impact shall be included. The determination of live load and impact factors shall be as recommended by AASHTO in "Standard Specifications for Highway Bridges."
- G. If the calculated deflection exceeds 0.0225 times the nominal diameter, the pipe class shall be increased.
- H. Minimum Pipe Wall Thickness: In addition to the requirements of this Section, the minimum wall thickness shall be in accordance with Table 50.5 of ANSI/AWWA C150.

## 2.3 MATERIALS

- A. Ductile Iron Pipe: Pipe materials shall conform to the requirements of ANSI/AWWA C151.
- B. Cement: Cement for mortar lining shall conform to the requirements of ANSI/AWWA C104, provided, that cement for mortar lining shall be Type II or V. Cement shall not originate from kilns that burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement.

## 2.4 SPECIALS AND FITTINGS

- A. Fittings for ductile iron pipe shall conform to the requirements of ANSI/AWWA C153/A21.53 for diameters 3-inches through 24 inches and shall have a minimum pressure rating of 350 psi. Ductile iron fittings larger than 24 inches shall conform to the above referenced standard with the necessary modifications for the larger size.

## 2.5 DESIGN OF PIPE

- A. General: The pipe furnished shall be ductile iron pipe, with rubber-gasketed joints or as specified on the plans.

- B. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and except as hereinafter modified, shall conform to ANSI/AWWA C151.
- C. Pipe Dimensions: The pipe shall be of the diameter and class shown. The minimum wall thickness for each pipe size shall be as specified or shown.
- D. Fitting Dimensions: The fittings shall be of the diameter and class shown.
- E. Joint Design: Ductile iron pipe and fittings shall be furnished with mechanical joints, push-on joints, flanged joints and restrained joints as required.
  - 1. Mechanical and push-on joints shall conform to ANSI/AWWA C111/A21.11.
  - 2. Mechanical and push on joints gaskets shall be "Fast Grip" Gaskets by American Ductile Iron Pipe, or "Field Locks" Gaskets by U.S. Pipe, or Equal.
  - 3. Restrained joints shall be "Lok-Ring" Restrained Joint by American Ductile Iron Pipe, "TR FLEX" Restrained Joint by U.S. Pipe, or Equal. Joints shall be provided as indicated on the plans.
  - 4. Flanged joints shall conform to ANSI/AWWA C115/A21.15. Special ductile iron flanges to match up to 250 psi valve and equipment flanges shall meet ANSI/AWWA C110 and be specially drilled to ANSI/ASME B16.1 Class 250 standard dimensions with raised face.
- F. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself, will provide watertight joints under all operating conditions when properly installed. Require the pipe manufacturer to submit details complete with significant dimensions and tolerances and to submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted.
- G. Shop-applied interior linings and exterior coatings shall be held back from the ends of the pipe as shown or as otherwise acceptable to the ENGINEER.

2.6 CEMENT-MORTAR LINING

- A. Cement-Mortar Lining for Shop Application: Except as otherwise provided herein, interior surfaces of all ductile iron pipe, fittings and specials shown on the plans shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with ANSI/AWWA C104. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be of a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications.

The minimum lining thickness shall be as follows:

Nominal Pipe Diameter (inches)	Minimum Lining Thickness (inches)
3 - 12	1/8
14 - 24	3/16
30 - 64	1/4

- B. Protection of Pipe Lining/Interior: All shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with ANSI/AWWA C104.

2.7 EXTERIOR COATING OF PIPE

- A. Exterior Coating of Exposed Piping: The exterior surfaces of pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of rust-inhibitive

primer conforming to the requirements of Section 09800 - Protective Coating.

- B. Exterior Coating of Buried Piping: The exterior coating shall be an asphaltic coating per AWWA C104. Pipe shall be encased in double polyethylene sleeves per AWWA C105, unless noted otherwise.

## **PART 2 – EXECUTION**

### **3.1 INSTALLATION OF PIPE**

- A. Handling and Storage: All pipe, fittings, etc., shall be carefully handled and protected against damage, impact shocks, and free fall. All pipe handling equipment shall be acceptable to the ENGINEER. Pipe shall not be placed directly on rough ground but shall be supported in a manner that will protect the pipe against injury whenever stored at the trench site or elsewhere. No pipe shall be installed where the lining or coating show defects that may be harmful as determined by the ENGINEER. Such damaged lining or coating shall be repaired, or a new undamaged pipe shall be furnished and installed.
- B. All pipe that is damaged prior to Substantial Completion shall be repaired or replaced.
- C. Inspect each pipe and fitting prior to installation to insure that there are no damaged portions of the pipe.
- D. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance, which may have collected thereon, and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the WORK.
- E. Pipe Laying: The pipe shall be installed in accordance with ANSI/AWWA C600.
- F. Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.
- G. Each section of pipes 24 inches in diameter and larger shall be laid in the order and position shown on the laying schedule. In laying pipe, it shall be laid to the setline and grade, within approximately one inch plus or minus. On grades of zero slopes, the intent is to lay to grade.
- H. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the ENGINEER may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount that will be detrimental to the strength and water tightness of the finished joint.
- I. Except for short runs that may be permitted by the ENGINEER, pipes shall be laid uphill on grades exceeding 10%. Pipe that is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement. All bends shall be properly installed as shown.
- J. Shallow buried pipes and pipes underneath structures shall be concrete encased where noted in the Contract Documents.
- K. Cold Weather Protection: No pipe shall be installed upon a foundation into which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

- L. Pipe and Specials Protection: The openings of all pipe and specials shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water or any undesirable substance. At all times, means shall be provided to prevent the pipe from floating.
- M. Pipe Cleanup: As pipe laying progresses, the pipe interior shall be kept free of all debris. Completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints and any necessary interior repairs prior to testing and disinfecting the completed pipeline.

### 3.2 RUBBER GASKETED JOINTS

- A. Rubber Gasketed Joints: Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket lubricated with an approved vegetable-based lubricant shall be placed in the bell groove. The spigot end of the pipe shall be carefully cleaned and lubricated with a vegetable-based lubricant. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

### 3.3 INSTALLATION OF PIPE APPURTENANCES

- A. Protection of Appurtenances: Where the joining pipe is tape-coated, buried appurtenances shall be coated with cold-applied tape in accordance with ANSI/AWWA C209, Type II. Where pipe is encased in polyethylene sleeves, buried appurtenances shall also be encased in polyethylene.
- B. Installation of Valves: All valves shall be handled in a manner to prevent any injury or damage to any part of the valve. All joints shall be thoroughly cleaned and prepared prior to installation. Adjust all stem packing and operate each valve prior to installation to insure proper operation.
- C. All valves shall be installed so that the valve stems are plumb and in the location shown.

- END OF SECTION -

**SECTION 02643**  
**PIPELINE TESTING AND DISINFECTION**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Perform flushing and testing of all pipelines and appurtenant piping and disinfection of all pipelines and appurtenant piping for potable water, complete, in accordance with the Contract Documents and the CITY's requirements. Prior to any potable water connections, the CONTRACTOR shall pressure test and disinfect all newly constructed facilities in accordance with the City's requirements and all applicable AWWA standards and pass a bacteria contamination test. All disinfection and bacteria testing shall be under the observation of the City's representative.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
  - AWWA B300 Hypochlorites.
  - AWWA B301 Liquid Chlorine.
  - AWWA C651 Disinfecting Water Mains.

**PART 2 – PRODUCTS**

2.1 MATERIALS REQUIREMENTS

- A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, or other water control equipment and materials shall be selected and furnished, subject to the ENGINEER's review. No materials shall be used which would be injurious to the construction or its future function.
- B. Chlorine for disinfection may be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
- C. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:
  - 1. In combination with appropriate gas flow chlorinators and ejectors;
  - 2. Under the direct supervision of an experienced technician;
  - 3. When appropriate safety practices are observed.
- D. Sodium hypochlorite and calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

**PART 3 – EXECUTION**

3.1 GENERAL

- A. Unless otherwise indicated, water for testing and disinfecting water pipelines will be furnished however, all necessary provisions for conveying the water from the designated source to the points of use shall be made.
- B. All pressure pipelines shall be tested.
- C. Disinfection shall be accomplished by chlorination. All chlorinating and testing operations shall be performed in the presence of the ENGINEER.

- D. Disinfection operations shall be scheduled by as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the WORK is accepted.

### 3.2 HYDROSTATIC TESTING OF PIPELINES

- A. Prior to hydrostatic testing, pipelines shall be flushed or blown out as appropriate. Test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar has attained an age of 14 days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. Responsibility for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe is required. Any unharnessed sleeve-type couplings, expansion joints or other sliding joints shall be restrained or suitably anchored, prior to the test, to avoid movement and damage to piping and equipment. Provide sufficient temporary air tapping in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.
- B. The pipeline shall be filled at a rate that will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb what water it will and to allow the escape of air from any air pockets. During this period, bulkheads, valves and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the ENGINEER shall be taken.
- C. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 2 hours. Hydrostatic testing shall be performed as follows:
  - 1. The test pressure for pressure distribution and transmission pipelines shall be 125% of the pipe pressure class indicated measured at the highest point of the pipeline section being tested.
  - 2. The test pressure for forced mains shall be 2 times the operating pressure or 75% of the working pressure.
  - 3. Gravity feed lines shall be tested at 20 psi.
  - 4. All pipelines shall be tested as indicated above or at a pressure the ENGINEER finds to be acceptable without causing damage to the pipeline.
- D. The maximum allowable leakage for distribution and transmission pipelines shall be according to the following formula:

Where:  $L = \frac{S \times D \times P^{1/2}}{133,200}$

L = leakage (gallons per hour)

S = length (feet), the lessor of the actual length being tested or the maximum length for determining leakage. Maximum length for determining leakage is [2000 feet].

D = pipe diameter (inches)

P = test pressure (psi)

- E. The maximum leakage for yard piping shall be as shown on the Piping Schedule. Pipe with welded joints shall have no leakage.
- F. Pipelines that fail to pass the prescribed leakage test will be considered defective WORK, the cause of the leakage shall be determined, corrective measures necessary to repair the leaks shall be made, and the pipelines retested.

### 3.3 DISINFECTING PIPELINES

- A. General: All potable water pipelines except those appurtenant to hydraulic structures shall be disinfected in accordance with the requirements of ANSI/AWWA C651 using the Continuous-Feed Method as modified herein.

- B. Sampling Ports: Provide sampling ports along the pipeline as defined on AWWA C651. Taps may be made at man-ways and air valves to help facilitate the spacing requirement.

#### 3.4 CONNECTIONS TO EXISTING SYSTEM

- A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

- END OF SECTION -

**SECTION 02667**  
**TESTING AND DISINFECTION OF HYDRAULIC STRUCTURES**

**PART 1 – GENERAL**

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes cleaning, flushing, and testing, of all hydraulic structures and appurtenant piping, and disinfection of indicated hydraulic structures and appurtenant piping for potable water, including conveyance of test water and all disposal thereof.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
  - 1. Section 02643 Pipeline Testing and Disinfection
  - 2. Section 03300 Cast-in-Place Structural Concrete

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

ANSI/AWWA B300	Hypochlorites
ANSI/AWWA B301	Liquid Chlorine
ANSI/AWWA C652	Disinfection of Water-Storage Facilities
APHA/AWWA/WPCF	Standard Methods for the Examination of Water and Wastewater

1.4 TESTING PLAN

- A. The following shall be submitted in compliance with the shop drawing requirements of Section 01300:
  - 1. A testing schedule, including proposed plans for water conveyance, control, disinfection, and disposal shall be submitted in writing for approval a minimum of [14] days before testing is to start. The submittal shall include the methods to determine evaporation loss and the CONTRACTOR'S plan for the release of water from structures after testing and disinfection has been completed.

**PART 2 – PRODUCTS**

2.1 MATERIALS REQUIREMENTS

- A. Temporary valves, bulkheads, or other water control equipment and materials shall be as determined by the CONTRACTOR. No materials shall be used which would be injurious to the structure or its future function.
- B. Chlorine for disinfection shall be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
- C. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:
  - 1. In combination with appropriate gas flow chlorinators and ejectors;
  - 2. Under the direct supervision of an experienced technician;
  - 3. When appropriate safety practices are observed.
- D. Sodium hypochlorite and calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Except as otherwise indicated, potable water for testing will be furnished by the CITY who shall also make necessary arrangement for conveying the water to the points of use.
- B. All hydraulic structures and appurtenant pressure piping for potable shall be tested and shall be disinfected where indicated. Disinfection shall be accomplished by chlorination. All chlorinating and testing operations shall be done in the presence of the CONSTRUCTION MANAGER.
- C. In the case of a reservoir, testing and disinfecting operations shall be combined.
- D. Disinfection operations shall be scheduled by the CONTRACTOR as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the WORK is accepted by the CITY. [Bacteriological testing will be performed by a certified testing laboratory appointed and paid for by the CITY. Results of the bacteriological testing shall be satisfactory to the State Department of Health or other appropriate regulatory agency.]
- E. If industrial paint finishes or other protective coatings are to be applied to the interior surfaces of the hydraulic structure, such coatings shall be applied after all testing operations have been completed but prior to disinfection, except that in the case of reservoirs, such coatings shall be applied before the combined testing and disinfecting operations.
- F. Release of water from structures, after testing and disinfecting have been completed, shall be as reviewed by the CITY, however, this review shall not relieve the CONTRACTOR of his obligations and responsibilities under this Contract.

### 3.2 PRELIMINARY CLEANING AND FLUSHING

- A. Prior to both testing and disinfecting, all hydraulic structures shall be cleaned by thoroughly hosing down all surfaces with a high pressure hose and nozzle of sufficient size to deliver a minimum flow of 50 gpm. All water, dirt, and foreign material accumulated in this cleaning operation shall be discharged from the structure or otherwise removed.

### 3.3 TESTING OF HYDRAULIC STRUCTURES

- A. General: Testing shall be performed prior to backfilling, except where otherwise acceptable to the CITY. Testing for concrete structures shall not be performed sooner than 14 days after all portions of structure walls and associated roof systems have been completed. The test shall consist of filling the structure with water to the maximum operating water surface. The rate of filling shall not exceed 24 inches of depth per day. All visible leakage shall be repaired.
- B. Leakage Test and Repairs (for concrete hydraulic structures): After the structure has been filled, the water loss leakage test shall be performed as follows:
  - 1. An initial water level reading shall be made. Seven days following the initial reading, a second reading shall be made.
  - 2. The structure shall be considered to have passed the test if water loss during the 7-day period, as computed from the two water level readings, does not exceed 0.2 percent of the total volume of water in the structure, after allowance is made for evaporation loss.
  - 3. If intermediate readings or observed leakage indicate that the allowable leakage will be exceeded, the test may be terminated before the end of the 7-day period and appropriate action taken to correct the problem before commencing a new 7-day test period.

4. Should the structure fail to pass the test, the test shall be repeated for up to 3 additional 7-day test periods.
5. If, at the end of 28 days, the structure still fails to pass the leakage test, the CONTRACTOR shall empty the structure as acceptable to the CITY and shall examine the exterior and interior for evidence of any cracking or other conditions that might be responsible for the leakage. Any cracks shall be repaired and sealed with polyurethane sealant in accordance with Section 03300. Any evidence of leakage shall be repaired. Following these operations, the CONTRACTOR shall again test the hydraulic structure. In the case of a reservoir, the retesting shall again be combined with disinfection, exclusive of the spraying operation.

C. Acceptance: The structure will not be accepted as completed until the water loss leakage test is passed and all visible leakage repaired.

### 3.4 TESTING OF APPURTENANT PIPING

A. Piping appurtenant to hydraulic structures shall be tested as specified in Section 02643.

### 3.5 DISINFECTION OF HYDRAULIC STRUCTURES AND APPURTENANT PIPELINES

A. Disinfection of hydraulic structures shall be performed in accordance with the requirements of ANSI/AWWA C652 using a combination of chlorination Methods 2 and 3 as modified herein.

B. Chlorination: A strong chlorine solution (about 200 mg/l) shall be sprayed on all interior surfaces of the structure. Following this, the structure shall be partially filled with water to a depth of approximately one foot. During the partial filling operation, a chlorine-water mixture shall be injected by means of a solution-feed chlorinating device in such a way as to give a uniform chlorine concentration during the entire filling operation. The point of application shall be such that the chlorine solution will mix readily with the inflowing water. The dosage applied to the water shall be sufficient to provide a chlorine residual of at least 50 mg/l upon completion of the partial filling operation. Precautions shall be taken to prevent the strong chlorine solution from flowing back into the lines supplying the water. After the partial filling has been completed, sufficient water shall be drained from the lower ends of appurtenant piping to ensure filling the lines with the heavily chlorinated water.

C. Retention Period: Chlorinated water shall be retained in the partially filled structure and appurtenant piping long enough to destroy all non-spore-forming bacteria, and in any event, for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual in the structure and appurtenant piping shall be at least 25 mg/l. All valves shall be operated while the lines are filled with the heavily chlorinated water.

D. Final Filling of Structure: After the free chlorine residual has been checked, and has been found to satisfy the above requirement, the water level in the structure shall be raised to its final elevation by addition of [potable] water. Before final filling is commenced, the quantity of heavily-chlorinated water remaining in the structure after filling the piping shall, unless otherwise acceptable to the CONSTRUCTION MANAGER, be sufficient to produce a free chlorine residual of between 1 and 2 mg/l when the water level is raised to its final elevation. After the structures have been filled, the strength of the chlorinated water shall be determined. If the free chlorine residual is less than 1 mg/l, an additional dosage shall be applied to the water in the structure. If the free chlorine residual is greater than 2 mg/l, the structure shall be partially emptied and additional [potable] water added to produce a free chlorine residual of 1 to 2 mg/l. In no case shall water be released prior to the expiration of the required retention period.

### 3.6 BACTERIOLOGICAL SAMPLING AND TESTING

A. Disinfected water storage facilities will be sampled and tested by the CITY in accordance with ANSI/AWWA C652.

- END OF SECTION -

**SECTION 02772**  
**CONCRETE CURBS, GUTTERS, AND SIDEWALKS**

**PART 1 – GENERAL**

1.1 SUMMARY

- A. Section Includes: Concrete curbs, gutters, sidewalks, driveways, access ramps, and alley intersections.
- B. Related Sections:
  - 1. Section 02200 - Earthwork.
  - 2. Section 03150 - Concrete Accessories.
  - 3. Section 03300 - Cast-In-Place Concrete.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements: Construct various types of concrete curb, gutter, sidewalk, driveways, and alley intersections to dimensions and details indicated on the Drawings.

1.3 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 - Submittals.
- B. Product Data: Submit data completely describing products.
- C. Samples: Submit samples when requested.

**PART 2 – PRODUCTS**

2.1 MATERIALS

- A. Concrete: 4000 psi, conforming to the applicable requirements of Section 03300.
- B. Curb Finishing Mortar: 1 part Portland cement to two parts sand.
- C. Form Release Material: Light oil or other releasing agent of type which does not discolor concrete or interfere with the application of finishing mortar to curb tops and faces.
- D. Joint Materials:
  - 1. Expansion: Comply with requirements as specified in Section 03150.
  - 2. Construction: Steel dividers or plastic inserts.

**PART 3 – EXECUTION**

3.1 EXAMINATION

- A. Verification of Conditions: Verify field conditions, including subgrade condition and interferences, before beginning construction.

### 3.2 PREPARATION

#### A. Surface Preparation:

1. Subgrade:
  - a. Construct and compact true to grades and lines indicated on the Drawings and requirements as specified Section 02200.
  - b. Remove soft or unsuitable material to depth of not less than 6 inches below subgrade elevation and replace with satisfactory material.
2. Forms and Subgrade: Water immediately in advance of placing concrete.

### 3.3 INSTALLATION

#### A. Special Techniques:

1. CONTRACTOR's Option:
  - a. Construct concrete curbs and gutters by conventional use of forms, or by means of curb and gutter machine when acceptable to the ENGINEER.
  - b. When use of machines designed specifically for work of this Section are accepted by the ENGINEER, results must be equal to or better than those produced by use of forms.
  - c. Applicable requirements of construction that apply to use of forms also apply to use of machines.
  - d. Discontinue use of machines when results are not satisfactory to the ENGINEER.

#### B. Forms:

1. Carefully set to line and grade and securely stake in position forms conforming to dimensions of items to be constructed.
2. Thoroughly clean prior to each use and coat with form releasing material.

#### C. Expansion and Contraction Joints:

1. Expansion Joints:
  - a. Construct vertically, and at right angles to centerline of street and match joints in adjacent pavement or sidewalks.
  - b. Constructed at radius points, driveways, alley entrances, and at adjoining structures.
  - c. Fill joints with expansion joint filler material.
2. Contraction Joints:
  - a. Constructed not more than 15 feet apart.
  - b. Make joints of construction joint material, scoring or saw cutting to depth of not less than 1-1/2 inches, and matching joints in adjacent pavement or sidewalk.

#### D. Concrete:

1. Placing:
  - a. Thoroughly spade concrete away from forms so that no rock pockets exist next to forms and so that no coarse aggregate will show when forms are removed.
2. Compacting:
  - a. Compact by mechanical vibrators accepted by the ENGINEER.
  - b. Continue tamping or vibrating until mortar flushes to surface and coarse aggregate is below concrete surface.
3. Form Removal:
  - a. Front Form Faces: Do not remove before concrete has taken initial set and has sufficient strength to carry its own weight.
  - b. Gutter and Rear Forms: Do not remove until concrete has hardened sufficiently to prevent damage to edges. Take special care to prevent damage.

4. Finishing and Curing: Comply with requirements as specified in Section 03366 except as modified here:
  - a. As soon as curb face forms are stripped, apply finishing mortar to the top and face of curb and trowel to a smooth, even finish. Finish with fine haired broom in direction of work.
  - b. Where curb is installed without integral gutter, extend finish 2 inches below grade.
  - c. Edge concrete at expansion joints to 1/4-inch radius.
  - d. Flow lines of gutters shall be troweled smooth 4 inches out from curb face for integral curb and gutter and 4 inches on both sides of flowline for gutters without curbs.
- E. Backfilling: Unless otherwise specified, backfill behind curbs, gutters, or sidewalks with soil native to area and to lines and grades indicated on the Drawings.

### 3.4 FIELD QUALITY CONTROL

#### A. Tests:

1. Curbs and Gutters:
  - a. Test face, top, back, and flow line with 10-foot straight edge or curve template longitudinally along surface.
  - b. Correct deviations in excess of 1/4 inch.
2. Gutters:
  - a. Frequency of Testing: When required by the ENGINEER, where gutters have slope of 0.8 foot per hundred feet or less, or where unusual or special conditions cast doubt on capability of gutters to drain.
  - b. Test Method: Establish flow in length of gutter to be tested by supplying water from hydrant, tank truck, or other source.
  - c. Required Results:
    - 1) 1 hour after supply of water is shut off, inspect gutter for evidence of ponding or improper shape.
    - 2) In event water is found ponded in gutter to depth greater than 1/2 inch, or on adjacent asphalt pavement, correct defect or defects in manner acceptable to the ENGINEER without additional cost to the Contract.

### 3.5 ADJUSTING

- A. Repair portions of concrete damaged while stripping forms or, when damage is severe, replace such work at no additional cost to the Contract. Evidence of repairs shall not be noticeable in the finished product.
- B. Remove and replace sections of work deficient in depth or not conforming to requirements indicated on the Drawings and specified in the Specifications at no additional cost to the Contract. Removal and replacement shall be the complete section between two joints.

- END OF SECTION -



**SECTION 03100  
CONCRETE FORMWORK**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish all materials for concrete formwork, bracing, shoring and supports and shall design and construct all falsework, all in accordance with the provisions of the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Codes: All codes, as referenced herein, as specified in Section 01090 - Reference Standards.

- B. Government Standards:

PS 1	Construction and Industrial Plywood
PS 20	American Softwood Lumber Standard

- C. Commercial Standards:

ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 347	Guide to Formwork for Concrete
ACI 350R	Environmental Engineering Concrete Structures

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.

- B. Submittals shall include the following:

1. Proposed falsework showing general layout, sizes of members, anticipated stresses, grade of materials to be used in the falsework, means of protecting existing construction, which supports falsework, and typical soil conditions.
2. Form ties and all related accessories, including taper tie plugs, if taper ties are used.
3. Form gaskets.
4. Water stops
5. Joint location and pouring sequence.

1.4 QUALITY ASSURANCE

- A. Tolerances: The variation from established grade or lines shall not exceed ¼-inch in 10 feet and there shall be no offsets or visible waviness in the finished surface. All other tolerances shall be within the tolerances of ACI 117 and ACI 350R.

- B. Qualifications of Formwork Manufacturers: Use only forming systems manufactured by manufacturers having minimum 5 years' experience, except as otherwise specified, or accepted in writing by the ENGINEER.

- C. Regulatory Requirements: Install work of this Section in accordance with local, state, and federal regulations.

## PART 2 – PRODUCTS

### 2.1 GENERAL

- A. Except as otherwise expressly accepted by the ENGINEER, all lumber brought on the job site for use as forms, shoring, or bracing shall be new material. All forms shall be smooth surface forms and shall be of the following materials:
1. Walls - Steel or plywood panel
  2. Columns - Steel, plywood or fiber glass
  3. Roof and floor - Plywood
  4. All other work - Steel panels, plywood or tongue and groove lumber

### 2.2 FORM AND FALSEWORK MATERIALS

- A. Materials for concrete forms, formwork and falsework shall conform to the following requirements:
1. Lumber shall be Douglas Fir or Southern Yellow Pine, construction grade or better, in conformance with U.S. Product Standard PS 20.
  2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded; exterior type Douglas Fir or Southern Yellow Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.
  3. Form materials shall be metal, wood, plywood or other approved material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line and grade shown. Metal forms shall be an approved type that will accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.
- B. Unless otherwise shown, exterior corners in concrete members shall be provided with  $\frac{3}{4}$ -inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise shown.
- C. Forms and falsework to support the roof and floor slabs shall be designed for the total dead load, plus a live load of 50 psf (minimum). The minimum design load for combined dead and live loads shall be 100 psf.

### 2.3 FORM TIES

- A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 1½ inches; and all such fasteners shall be such as to leave holes of regular shape for reaming. Form ties for water-retaining structures shall have integral waterstops. Integral waterstops shall tightly fit the form tie so that they cannot be moved from mid-point of the tie. Form ties shall be **Burke Penta-Tie System by The Burke Company; Richmond Snap-Tys by the Richmond Screw Anchor Company;** or ENGINEER Approved Equal.
- B. Removable taper ties may be used when approved by the ENGINEER. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie. Use **Burke Taper-Tie System by The Burke Company; Taper-Ty by the Richmond Screw Anchor Company;** or ENGINEER Approved Equal.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The CONTRACTOR shall assume full responsibility for the adequate design of all forms, and any forms, which are unsafe or inadequate in any respect, shall promptly be removed from the WORK and replaced at the CONTRACTOR's expense. Provide worker protection from protruding reinforcement bars in accordance with applicable safety codes. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by CONTRACTOR personnel and by the ENGINEER, shall be in sufficient number, and properly installed. During concrete placement, the CONTRACTOR shall continually monitor plumb and string line form positions and immediately correct deficiencies.
- B. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Contract Drawings, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

### 3.2 FORM DESIGN

- A. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment to prevent the formation of ridges, fins, offsets or similar surface defects in the finished concrete. Plywood, 5/8-inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete. The forms shall be tight to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1 to 1½-inch diameter polyethylene rod held in position to the underside of the wall form. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number and location of such clean-outs shall be as acceptable to the ENGINEER. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in, the size and spacing needed to allow placement of concrete to the requirements of Section 03300 - Cast-in-Place Concrete. The size, number and location of such form windows shall be as acceptable to the ENGINEER.

### 3.3 CONSTRUCTION

- A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is shown. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.
- B. Construction Joints: Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the ENGINEER. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory affect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.

C. Form Ties:

1. Embedded Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers to leave the surface of the holes clean and rough before being filled with mortar as specified for "Finish of Concrete Surfaces" in Section 03300 - Cast-in-Place Concrete. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties, which cause spalling of the concrete upon form stripping or tie removal, will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1-inch back from the formed face or faces of the concrete.
2. Removable Ties: Where taper ties are approved for use, the larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and below-grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls, which are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a cement grout, which shall match the color and texture of the surrounding wall surface or approved equal.

3.4 REUSE OF FORMS

- A. Forms may be reused only if in good condition and only if acceptable to the ENGINEER. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces, which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the ENGINEER.

3.5 REMOVAL OF FORMS

- A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 75% of the 28-day strength specified in Section 03300 - Cast-in-Place Concrete; provided, that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained 75% of the specified 28-day strength and has been in place for a minimum of 7 days. The time required to establish said strength shall be as determined by the ENGINEER. The CONTRACTOR shall contract with a testing agency that will make several test cylinders for this purpose from concrete used in the first group of roof panels placed. If the time so determined is more than the 7-day minimum, then that time shall be used as the minimum length of time. Forms for all vertical walls of waterholding structures shall remain in place at least 36 hours after the concrete has been placed; or, timeframe based upon pre-approved CONTRACTOR pour schedule. Forms for all parts of the WORK not specifically mentioned herein shall remain in place for periods of time as recommended in ACI 347.

3.6 MAINTENANCE OF FORMS

- A. Forms shall be maintained at all times in good condition, particularly as to size, shape, strength, rigidity, tightness and smoothness of surface. Forms, when in place, shall conform to the established alignment and grades. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a nonstaining mineral oil or other lubricant acceptable to the ENGINEER. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the CONTRACTOR shall perform the oiling at least two weeks in advance of their use. Care shall be exercised

to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

### 3.7 FALSEWORK

- A. The CONTRACTOR shall be responsible for the design, engineering, construction, maintenance, and safety of all falsework, including staging, walkways, forms, ladders, and similar appurtenances, which shall equal or exceed the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction and the requirements specified herein.
- B. All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads. Falsework for the support of a superstructure shall be designed to support the loads that would be imposed if the entire superstructure were placed at one time.
- C. Falsework shall be placed upon a solid footing, safe against undermining, and protected from softening. When the falsework is supported on timber piles, the maximum calculated pile loading shall not exceed 20 tons. When falsework is supported on any portion of the structure, which is already constructed, the load imposed by the falsework shall be spread, distributed and braced in such a way as to avoid any possibility of damage to the structure.

- END OF SECTION -

**SECTION 03200  
REINFORCEMENT STEEL**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish, fabricate and place all concrete reinforcement steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete construction and perform all appurtenant work, including installation of all the wires, clips, supports, chairs, spacers, and other accessories, all in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Codes: All codes, as referenced herein are specified in Section 01090 - Reference Standards.
- B. Commercial Standards:
  - ACI 315                      Details and Detailing of Concrete Reinforcement
  - ACI 318                      Building Code Requirements for Reinforced Concrete
  - CRSI MSP-1                Concrete Reinforcing Steel Institute Manual of Standard Practice
  - AWS D1.4                  Structural Welding Code - Reinforcing Steel
  - ASTM A 82                 Specification for Steel Wire, Plain, for Concrete Reinforcement
  - ASTM A 615                Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - ASTM A 775                Specification for Epoxy-Coated Reinforcing Steel Bars

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Submittals shall include shop bending diagrams, placing lists, drawings of all reinforcement steel prior to fabrication and mill test reports.
- C. Details of the concrete reinforcement steel and concrete inserts shall be submitted at the earliest possible date after receipt by the CONTRACTOR of the Notice to Proceed. Said details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements specified and shown. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall include bar placement diagrams, which clearly indicate the dimensions of each bar splice.
- D. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, submit manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and size of coupler used; and shop drawings which show the location of each coupler with details of how they are to be installed in the formwork.
- E. If reinforcement steel is spliced by welding at any location, submit mill test reports, which shall contain the information necessary for the determination of the carbon equivalent as specified in AWS D1.4. Submit a written welding procedure for each type of weld for each size of bar which is to be spliced by welding; merely a statement that AWS procedures will be followed is not acceptable.
- F. Submit all reinforcing product mill certificates.

## 1.4 QUALITY ASSURANCE

- A. If requested by the ENGINEER, the CONTRACTOR shall provide samples from each heat of reinforcement steel delivered in a quantity adequate for testing. Costs of all tests will be paid by the CONTRACTOR.
- B. If reinforcement steel is spliced by welding at any location, the CONTRACTOR shall submit certifications of procedure qualifications for each welding procedure used and certification of welder qualifications, for each welding procedure, and for each welder performing the work. Such qualifications shall be as specified in AWS D1.4.
- C. If requested by the ENGINEER, the CONTRACTOR shall provide samples of each type of welded splice used in the WORK in a quantity and of dimensions adequate for testing. At the discretion of the ENGINEER, radiographic testing of direct butt-welded splices will be performed. The CONTRACTOR shall provide assistance necessary to facilitate testing. The CONTRACTOR shall repair any weld, which fails to meet the requirements of AWS D1.4. The costs of testing will be paid by the CONTRACTOR.

## PART 2 – PRODUCTS

### 2.1 REINFORCEMENT STEEL

- A. Reinforcement Steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:
  - 1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement or as otherwise shown.
  - 2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 and the details shown; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.
  - 3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82.
- B. Accessories:
  - 1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating, which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.
  - 2. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.
- C. Epoxy coating for reinforcing and accessories, where specified or shown, shall conform to ASTM A 775.

### 2.2 MECHANICAL COUPLERS

- A. Mechanical couplers shall be provided where shown and where approved by the ENGINEER. The couplers shall develop a tensile strength, which exceeds 125% of the yield strength of the reinforcement bars being spliced at each splice.
- B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied. This shall apply to all mechanical splices, including those splices intended for future connections.

- C. The reinforcement steel and coupler used shall be compatible for obtaining the required strength of the connection. Straight threaded type couplers shall require the use of the next larger size reinforcing bar or shall be used with reinforcing bars with specially forged ends which provide upset threads which do not decrease the basic cross section of the bar.
- D. Couplers shall be **Lenton Form Saver as manufactured by Erico Products; Dowel Bar Splicer System as manufactured by Richmond Screw Anchor Company;** or ENGINEER approved equal.

### 2.3 WELDED SPLICES

- A. Welded splices shall be provided where shown and where approved by the ENGINEER. All welded splices of reinforcement steel shall develop a tensile strength, which exceeds 125% of the yield strength of the reinforcement bars, which are connected.
- B. All materials required to conform the welded splices to the requirements of AWS D1.4 shall be provided.

### 2.4 EPOXY GROUT

- A. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature and orientation of the hole to be filled. Epoxy grout shall meet the requirements found in Section 03315 - Grout.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. All reinforcement steel, welded wire fabric, couplers and other appurtenances shall be fabricated, and placed in accordance with the requirements of the Building Code and the Supplementary Requirements specified herein.

### 3.2 FABRICATION

- B. General:
  - 1. Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Contract Drawings. Stirrups and tie bars shall be bent around a pin having a diameter not less than 1½-inch for No. 3 bars, 2-inch for No. 4 bars, and 2½-inch for No. 5 bars. Bends for other bars shall be made around a pin having a diameter not less than 6 times the bar diameter, except for bars larger than 1-inch, in which case the bends shall be made around a pin of 8 bar diameters. Bars shall be bent cold.
  - 2. The CONTRACTOR shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists and placing drawings. Said drawings, diagrams and lists shall be prepared by the CONTRACTOR as specified under Section 01300 - Submittals.
- C. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:
  - 1. Sheared length: + 1-inch
  - 2. Depth of truss bars: + 0, - ½-inch
  - 3. Stirrups, ties and spirals: + ½-inch
  - 4. All other bends: + 1-inch

### 3.3 PLACING

- A. Reinforcement steel shall be accurately positioned as shown, and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel

shall be supported by concrete, plastic or metal supports, spacers or metal hangers, which are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties, which are embedded in the blocks. For concrete over formwork, the CONTRACTOR shall furnish concrete, metal, plastic or other acceptable bar chairs and spacers.

- B. Limitations on the use of bar support materials shall be as follows:
  - 1. Concrete Dobies: Permitted at all locations except where architectural finish is required.
  - 2. Wire Bar Supports: Permitted only at slabs over dry areas, interior dry wall surfaces and exterior wall surfaces.
  - 3. Plastic Bar Supports: Permitted at all locations except on grade.
- C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
- D. Bars additional to those shown which may be found necessary or desirable by the ENGINEER for the purpose of securing reinforcement in position shall be provided by the CONTRACTOR at its own expense.
- E. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the Building Code.
- F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be as acceptable to the ENGINEER.
- G. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

### 3.4 SPACING OF BARS

- A. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars nor less than  $1\frac{1}{3}$  times the maximum size of the coarse aggregate, nor less than 1-inch.
- B. Where reinforcement in beams or girders is placed in two (2) or more layers, the clear distance between layers shall be not less than one inch.
- C. In columns, the clear distance between longitudinal bars shall be not less than  $1\frac{1}{2}$  times the bar diameter, nor less than  $1\frac{1}{2}$  times the maximum size of the coarse aggregate, nor less than  $1\frac{1}{2}$  inches.
- D. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

### 3.5 SPLICING

- A. General:
  - 1. Reinforcement bar splices shall only be used at locations shown. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the ENGINEER.
  - 2. Unless, otherwise indicated, dowels shall match the size and spacing of the spliced bar.

C. Splices of Reinforcement:

1. The length of lap for reinforcement bars, unless otherwise shown shall be in accordance with ACI 318-89, Section 12.15.1 for a Class B splice.
2. Splices in column spiral reinforcement, when necessary, shall be made by welding or by a lap of 1½ turns.

D. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner, which will injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold, unless otherwise permitted by the ENGINEER. No bars partially embedded in concrete shall be field-bent except as shown or specifically permitted by the ENGINEER.

E. Couplers, which are located at a joint face, shall be a type, which can be set either flush or recessed from the face as shown. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. Couplers intended for future connections shall be recessed a minimum of ½-inch from the concrete surface. After the concrete is placed, the coupler shall be plugged with plastic plugs, which have an O-ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged.

F. Unless noted otherwise, mechanical coupler spacing and capacity shall match the spacing and capacity of the reinforcing shown for the adjacent section.

### 3.6 CLEANING AND PROTECTION

A. Reinforcement steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be reinserted and, if necessary recleaned.

### 3.7 EMBEDMENT OF DRILLED REINFORCING STEEL DOWELS

A. Hole Preparation:

1. The hole diameter shall be as recommended by the epoxy manufacturer but shall be no larger than 0.25-inch greater than the diameter of the outer surface of the reinforcing bar deformations.
2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless noted otherwise.
3. The hole shall be drilled by methods, which do not interfere with the proper bonding of epoxy.
4. Existing reinforcing steel in the vicinity, of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars.
5. The hole shall be blown clean with clean, dry compressed air to remove all dust and loose particles.
6. Epoxy shall be injected into the hole through a tube placed to the bottom of the hole. The tube shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that insures that excess material will be expelled from the hole during dowel placement.
7. Dowels shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

- END OF SECTION -

**SECTION 03290**  
**JOINTS IN CONCRETE**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Construct all joints in concrete at the locations shown. Joints required in concrete structures are of various types and will be permitted only where shown, unless specifically accepted by the ENGINEER.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Related Sections:

1. Section 01300 – Submittals
2. Section 01400 – Quality Control.
3. Section 03150 – Concrete Accessories

B. Commercial Standards:

ASTM C 920	Specifications for Elastomeric Joint Sealants
ASTM D 412	Test Methods for Rubber Properties in Tension
ASTM D 624	Test Method for Rubber Property -- Tear Resistance
ASTM D 638	Test Method for Tensile Properties of Plastics
ASTM D 746	Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 747	Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam
ASTM D 1056	Specification for Flexible Cellular Materials -- Sponge or Expanded Rubber
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 2240	Test Method for Rubber Property -- Durometer Hardness
ASTM D 2241	Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)

1.3 TYPES OF JOINTS

- A. Construction Joints: Provide where shown on the plans. When fresh concrete is placed against a hardened concrete surface, the joint between the two (2) pours is called a construction joint. Unless otherwise specified, all joints in water bearing members shall be provided with a waterstop and sealant groove of the shape specified and shown. The space so formed shall be filled with a joint sealant material as specified in Section 07920 – Caulking and Joint Sealant.
- B. Contraction Joints: Provide where shown on the plans. Contraction joints are similar to construction joints except that the fresh concrete shall not bond to the hardened surface of the first pour, which shall be coated with a bond breaker. The slab reinforcement shall be stopped 4½ inches from the joint; which is provided with a sleeve-type dowel, to allow shrinkage of the concrete of the second pour. Waterstop and/or sealant groove shall also be provided when specified or shown.
- C. Expansion Joints: Provide where shown on the plans. To allow the concrete to expand freely, a space is provided between the two pours, the joint shall be formed as shown. This space is obtained by placing a filler joint material against the first pour, which acts as a form for the second pour. Unless otherwise specified, all expansion joints in water bearing members shall be provided with a waterstop as shown.

- D. The space so formed shall be filled with a joint sealant material as specified in Section 07920 – Caulking and Joint Sealant. In order to keep the two (2) walls or slab elements in line the joint shall also be provided with a sleeve-type dowel as shown.
- E. Control Joints: The function of the control joint is to provide a weaker plane in the concrete, where shrinkage cracks will probably occur. A groove, of the shape and dimensions shown, is formed or saw-cut in the concrete. This groove is afterward filled with a joint sealant material as specified in Section 07920 – Caulking and Joint Sealant.

#### 1.4 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Waterstops: Prior to production of the material required under this contract, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used, and shall be accomplished so that the material and workmanship represents in all respects the material to be furnished under this contract. The balance of the material to be used under this contract shall not be produced until after the ENGINEER has reviewed the qualification samples. As defined in Section 03150 - Concrete Accessories.
- C. Joint Location: Submit placement shop drawings showing the location and type of all joints for each structure. Along with the associated pour sequence.

#### 1.5 QUALITY ASSURANCE

- A. Waterstop Inspection: It is required that all waterstop field joints shall be subject to rigid inspection, and no such work shall be scheduled or started without having made prior arrangements with the ENGINEER to provide for the required inspections. Not less than 24 hours' notice shall be provided to the ENGINEER for scheduling such inspections.
- B. All field joints in waterstops shall be subject to rigid inspection for misalignment, bubbles, inadequate bond, porosity, cracks, offsets and other defects, which would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material, which shall pass said inspection, and all faulty material shall be removed from the site and disposed of at no additional cost.
- C. The following waterstop defects represent a partial list of defects, which shall be grounds for rejection:
  - 1. Offsets at joints greater than 1/16-inch or 15% of material thickness, at any point, whichever is less.
  - 2. Exterior crack at joint, due to incomplete bond, which is deeper than 1/16-inch or 15% of material thickness, at any point, whichever is less.
  - 3. Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16-inch or 15% of material thickness at any point, whichever is less.
  - 4. Misalignment of joint, which result in misalignment of the waterstop in excess of ½-inch in 10 feet.
  - 5. Porosity in the welded joint as evidenced by visual inspection.
  - 6. Bubbles or inadequate bonding which can be detected with a penknife test. (If, while prodding the entire joint with the point of a pen knife, the knife breaks through the outer portion of the weld into a bubble, the joint shall be considered defective.)
- D. Waterstop Samples: Prior to use of the waterstop material in the field, a sample of a fabricated mitered cross and a tee constructed of each size or shape of material to be used shall be submitted to the ENGINEER for review. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this contract. Field samples of fabricated fittings (crosses, tees, etc.) may be selected at random by the ENGINEER for testing by a laboratory at no additional expense to the ENGINEER. When tested, they shall have a tensile strength across the joints equal to at least 600 psi.
- E. Construction Joint Sealant: See Section 07920 – Caulking and Joint Sealant

## PART 2 – PRODUCTS

### 2.1 PVC WATERSTOPS

- A. General: As defined in Section 03150 – Concrete Accessories.

### 2.2 BACKING ROD

- A. Backing rod shall be an extruded closed-cell, polyethylene foam rod. The material shall be compatible with the joint sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25% at 8 psi. The rod shall be 1/8-inch larger in diameter than the joint width except that a 1-inch diameter rod shall be used for a 3/4-inch wide joint.

### 2.3 BOND BREAKER

- A. Bond breaker shall be **Super Bond Breaker as manufactured by Burke Company, San Mateo, California; Select Cure CRB as manufactured by Select Products Co., Upland, California;** or ENGINEER approved equal. It shall contain a fugitive dye so that areas of application will be readily distinguishable. Provide where shown on the plans.

### 2.4 SLIP DOWELS

- A. Slip dowels in joints shall be A36 smooth epoxy-coated bars, conforming to ASTM A 775. Provide where shown on the plans.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Waterstops of the type specified herein shall be embedded in the concrete across joints as shown. All waterstops shall be fully continuous for the extent of the joint. Splices necessary to provide such continuity shall be accomplished in conformance to printed instructions of manufacturer of the waterstops. Suitable precautions and means to support and protect the waterstops during the progress of the work and shall repair or replace at its own expense any waterstops damaged during the progress of the work shall be taken. All waterstops shall be stored so as to permit free circulation of air around the waterstop material.
- B. When any waterstop is installed in the concrete on one side of a joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

### 3.2 SPLICES IN WATERSTOPS

- A. When applicable, splices in waterstops shall be performed by heat-sealing the adjacent waterstop sections in accordance with the manufacturer's printed recommendations. It is essential that:
  - 1. The material not be damaged by heat sealing.
  - 2. The splices have a tensile strength of not less than 60 percent of the unspliced materials tensile strength.
  - 3. The continuity of the waterstop ribs and of its tubular center axis be maintained.
- B. Butt joints of the ends of two (2) identical waterstop sections may be made while the material is in the forms.
- C. All joints with waterstops involving more than two (2) ends to be jointed together, and all joints which involve an angle cut, alignment change, or the joining of two (2) dissimilar waterstop sections shall be prefabricated prior to placement in the forms, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon being inspected and approved, such prefabricated waterstop joint assemblies shall be installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.

- D. Where a centerbulb waterstop intersects and is jointed with a non-centerbulb waterstop, care shall be taken to seal the end of the centerbulb, using additional PVC material if needed.

### 3.3 JOINT CONSTRUCTION

- A. Setting Waterstops: In order to eliminate faulty installation that may result in joint leakage, particular care shall be taken of the correct positioning of the waterstops during installation. Adequate provisions must be made to support and anchor the waterstops during progress and to insure the proper placement and or embedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the joints. The center axis of the waterstops shall be coincident with the joint openings. Maximum density and imperviousness of the concrete shall be insured by thoroughly working it near all joints.
- B. In placing flat-strip hydrotite waterstops in the forms, means shall be provided to prevent them from being folded over by the concrete as it is placed. Unless otherwise shown, all hydrotite waterstops shall be held in place with light wire ties on 12-inch centers, which shall be passed through the edge of the hydrotite waterstop and tied to the curtain of reinforcing steel. Horizontal hydrotite waterstops, with their flat face in a vertical plane, shall be held in place with continuous supports to which the top edge of the hydrotite waterstop shall be tacked. In placing concrete around horizontal hydrotite waterstops, with their flat face in a horizontal plane, concrete shall be worked under the hydrotite waterstops by hand so, as to avoid the formation of air and rock pockets.
- C. In placing centerbulb waterstops in expansion joints, the centerbulb shall be centered on the joint filler material.
- D. Waterstop in vertical wall joints shall stop 6 inches from the top of the wall where such waterstop does not connect with any other waterstop and is not to be connected to for a future concrete placement.
- E. Joint Location: Construction joints, and other types of joints, shall be provided where shown. When not shown, construction joints shall be provided at 25-foot maximum spacing for all concrete construction, unless noted otherwise. Where joints are shown spaced greater than 40-feet apart, additional joints shall be provided to maintain the 25-foot maximum spacing. The location of all joints, of any type, shall be submitted for acceptance by the ENGINEER.
- F. Joint Preparation: Special care shall be used in preparing concrete surfaces at joints where bonding between two (2) sections of concrete is required. Unless otherwise shown, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared in accordance with the requirements of Section 03300 - Cast-in-Place Concrete. Except on horizontal wall construction joints, wall to slab joints or where otherwise shown or specified, at all joints where waterstops are required, the joint face of the first pour shall be coated with a bond breaker as shown on the plans.
- G. Construction Joint Sealant: Construction joints in water-bearing floor slabs, and elsewhere as shown, shall be provided with tapered grooves, which shall be filled with a construction joint sealant. The material used for forming the tapered grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant. After removing the forms from the grooves, all laitance and fins shall be removed, and the grooves shall be sandblasted. The grooves shall be allowed to become thoroughly dry, after which they shall be blown out; immediately thereafter, install the joint sealant per Section 07920 – Caulking and Joint Sealant they shall be primed, bond breaker tape placed in the bottom of the groove, and filled with the construction joint sealant. The primer used shall be supplied by the same manufacturer supplying the sealant. No sealant will be permitted to be used without a primer. Care shall be used to completely fill the sealant grooves. Areas designated to receive a sealant fillet shall be thoroughly cleaned, as outlined for the tapered grooves, prior to application of the sealant.

- END OF SECTION -

**SECTION 03300  
CAST-IN-PLACE CONCRETE**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish all materials for concrete in accordance with the provisions of this Section and form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.
- B. The following types of concrete are covered in this Section:
  - 1. Structural Concrete: Concrete to be used in all cases except where indicated otherwise in the Contract Documents.
  - 2. Sitework Concrete: Concrete to be used for curbs, gutters, catch basins, sidewalks, pavements, fence and guard post embedment, underground duct bank encasement and all other concrete appurtenant to electrical facilities unless otherwise indicated.
  - 3. Lean Concrete: Concrete to be used for thrust blocks, pipe trench cut-off blocks and cradles that are detailed on the Drawings as un-reinforced. Lean concrete shall be used as protective cover for dowels intended for future connection.
- C. The term "hydraulic structure" used in these specifications means environmental engineering concrete structures for the containment, treatment or transmission of water, wastewater or other fluids.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Related Sections:

- 1. Section 01300 – Submittals.
- 2. Section 01400 – Quality Control
- 3. Section 03100 – Concrete Formwork
- 4. Section 03200 – Reinforcement Steel
- 5. Section 03290 – Joints in Concrete.
- 6. Section 03315 – Grout
- 7. Section 03931 – Epoxy Injection System
- 8. Section 03936 – Water Leakage Test for Concrete Structures

B. Commercial Standards:

ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 214	Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 301	Structural Concrete for Buildings
ACI 306.1	Cold Weather Concreting
ACI 309	Consolidation of Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete
ACI 350R	Environmental Engineering Concrete Structures
ASTM C 31	Practices for Making and Curing Concrete Test Specimens in the Field

ASTM C 33	Concrete Aggregates
ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	Ready-Mixed Concrete
ASTM C 136	Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143	Test Method for Slump of Hydraulic Cement Concrete
ASTM C 150	Portland Cement
ASTM C 156	Test Methods for Water Retention by Concrete Curing Materials
ASTM C 157	Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
ASTM C 192	Practices for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 1077	Practice for Laboratories Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Laboratory Evaluation
ASTM D 175	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D 448	Classifications for Sizes of Aggregate for Road and Bridge Construction
ASTM D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E 119	Method for Fire Tests of Building Construction and Materials

### 1.3 SYSTEM DESCRIPTIONS

#### A. Performance Requirements:

1. General:
  - a. Except as otherwise specified, provide concrete composed of Portland cement, aggregate, and water so proportioned and mixed as to produce plastic, workable mixture in accordance with requirements as specified in this Section and suitable to specific conditions of placement.
  - b. Proportion materials in a manner such as to secure lowest water-cement ratio which is consistent with good workability, plastic, cohesive mixture, and one which is within specified slump range.
  - c. Proportion fine and coarse aggregate in a manner such as not to produce harshness in placing nor honeycombing in structures.
2. Water tightness of Concrete Work: It is intent of this Section to secure for every part of the Work concrete and grout of homogeneous structure, which when hardened will have required strength, water tightness, and durability. As provided in ACI 350.1/350.1R Concrete for Environmental Structures.
  - a. It is recognized that some surface hairline cracks and crazing will develop in the concrete surfaces.
  - b. Construction, contraction, and expansion joints have been positioned in structures as indicated on the Drawings, and curing methods specified, for purpose of reducing number and size of these expected from specified concrete mixes.
  - c. Watertight: Repair cracks as described in this Section which develop in walls or slabs and repair cracks which show any signs of leakage until all leakage is stopped.
  - d. If patching does not stop the leakage and at the engineer's discretion the installing CONTRACTOR shall pressure inject visible cracks, other than hairline cracks and crazing, in following areas with epoxy as specified in Section 03931.
    - 1) Floors and walls of water bearing structures.
    - 2) Walls and overhead slabs of passageways or occupied spaces, outsides of which are exposed to weather or may be washed down and are not specified to receive separate waterproof membrane.

- 3) Other Items Not Specified to Receive Separate Waterproof Membrane: Slabs over water channels, wet walls, reservoirs, and other similar surfaces.
3. Workmanship and Methods: Provide concrete work, including detailing of reinforcing, conforming with best standard practices and as set forth in ACI 318, Manuals, and Recommended Practices.

#### 1.4 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Product Data: Submit data completely describing products.
- C. Information on Heating Equipment to Be Used for Cold Weather Concreting: Submit information on type of equipment to be used for heating materials and/or new concrete in process of curing during excessively cold weather.
- D. For conditions that promote rapid drying of freshly placed concrete such as low humidity, high temperature, and wind: Submit corrective measures proposed for use prior to placing concrete.
- E. Copies of Tests of Concrete Aggregates: Submit certified copies in triplicate of commercial laboratory tests not more than 90 days old of all samples of concrete aggregates.
  1. Fine Aggregate:
    - a. Clay lumps.
    - b. Reactivity.
    - c. Shale and chert.
    - d. Soundness.
    - e. Color.
    - f. Decantation.
  2. Coarse Aggregate:
    - a. Clay lumps and friable particles.
    - b. Reactivity.
    - c. Shale and chert.
    - d. Soundness.
    - e. Abrasion loss.
    - f. Coal and lignite.
    - g. Materials finer than 200 sieve.
- F. Sieve Analysis: Submit sieve analysis of fine and coarse aggregates being used in triplicate at least every 3 weeks and at any time there is significant change in grading of materials.
- G. Concrete Mixes: Submit full details, including mix design calculations for concrete mixes proposed for use for each class of concrete.
  1. Include information on correction of batching for varying moisture contents of fine aggregate.
  2. Submit source quality test records with mix design submittal.
    - a. Include calculations for  $f'c$  based on source quality test records.
- H. If There is Change in Aggregate Source, Aggregate Quality from Same Source: Submit new set of design mixes covering each class of concrete.
- I. If Either Fine or Coarse Aggregate Is Batched from More than One Bin: Submit analyses for each bin, and composite analysis made up from these, using proportions of materials to be used in mix.
- J. Cement Mill Tests: Include alkali content, representative of each shipment of cement for verification of compliance with specified requirements.
- K. Pozzolan Certificate of Compliance: Identify source of pozzolan and certify compliance with requirements of ASTM C 618.

- L. Information on mixing equipment.
  - M. Drying shrinkage test data.
  - N. Packing and Shipping:
    - 1. Deliver, store, and handle concrete materials in manner as to prevent damage and inclusion of foreign substances.
    - 2. Deliver and store packaged materials in original containers until ready for use.
    - 3. Deliver aggregate to mixing site and handle in such a manner that variations in moisture content will not interfere with steady production of concrete of specified degree of uniformity and slump.
  - O. Acceptance at Site: Reject material containers or materials showing evidence of water or other damage.
  - P. Test Batch Test Data:
    - 1. Submit data for each test cylinder.
    - 2. Submit data that identifies mix and slump for each test cylinder.
  - Q. Sequence of Concrete Placing: Submit proposed sequence of placing concrete showing proposed beginning and ending of individual placements.
  - R. Ties to be used and the tie hole patching procedure and methods and materials.
  - S. Curing Compound Other than Specified Compound: Submit complete data on proposed compound.
  - T. Repair of Defective Concrete: Submit mix design for grout or product data if mixed onsite.
  - U. Acceptance of Method of Concrete Repair: Make no repair until the ENGINEER has accepted method.
- 1.4 QUALITY ASSURANCE
- A. General
    - 1. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
    - 2. Tests for compressive strength and shrinkage of concrete shall be performed as indicated herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.
    - 3. The cost of all laboratory tests on concrete will be borne by the CONTRACTOR. The laboratory will meet or exceed the requirements of ASTM C 1077.
    - 4. Concrete for testing shall be supplied by the CONTRACTOR at no additional cost to the CONTRACTOR, and the CONTRACTOR shall assist the ENGINEER in obtaining samples, and disposal and cleanup of excess material.
  - B. Field Testing of Concrete:
    - 1. During progress of construction, the CONTRACTOR will have tests made to determine whether the concrete, as being produced, complies with requirements specified.
    - 2. Tests will be performed in accordance with ASTM C 31, ASTM C 39, and ASTM C 172.
    - 3. The testing company will make and deliver test cylinders to the laboratory and testing expense will be borne by the CONTRACTOR.
    - 4. Required Number Cylinders:
      - a. Not less than 3 cylinder specimens, 6 inch diameter by 12 inch long, will be tested for each 150 cubic yards of each class of concrete placed and not less than 3 specimens for each half day's placement.
      - b. One cylinder will be broken at 7 days and 2 at 28 days.

5. The Testing Agency shall:
  - a. Test slump of concrete using slump cone in accordance with the requirements of ASTM C143.
  - b. Furnish test equipment.
  - c. Do not use the concrete that does not meet specification requirements in regards to slump, but remove such concrete from project site.
  - d. Test slump at the beginning of each placement, as often as necessary to keep slump within the specified range, and when requested to do so by the ENGINEER.
  - e. Make provisions for and furnish concrete for test specimens, and provide manual assistance to the ENGINEER in preparing said specimens.
  - f. Assume responsibility for care of and providing of curing conditions for test specimens in accordance with ASTM C 31.

C. Enforcement of Strength Requirement:

1. Concrete is expected to reach higher compressive strength than that which is indicated on the drawings and herein as specified compressive strength  $f'c$ .
2. Strength Level of Concrete: Will be considered acceptable if the following conditions are satisfied.
  - g. Average of all sets of 3 consecutive test results is greater or equal to specified compressive strength  $f'c$ .
  - h. No individual strength test (average of 2 cylinders) falls below specified compressive strength  $f'c$  by more than 500 pounds per square inch.
  - i. Whenever one, or both, of 2 conditions stated above is not satisfied, provide additional curing of affected portion followed by cores taken in accordance with ASTM C 42 and ACI 318 and comply with the following requirements.
    - 1) If additional curing does not bring average of 3 cores taken in affected area to at least specified compressive strength  $f'c$ , designate such concrete in affected area as defective.
    - 2) The ENGINEER may require the CONTRACTOR to strengthen defective concrete by means of additional concrete, all at the CONTRACTOR's expense.

D. Construction Tolerances: The CONTRACTOR shall set and maintain concrete forms and perform finishing operations to ensure that the completed WORK is within tolerances. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the permissible variation from lines, grades, or dimensions indicated on the Drawings. Where tolerances are not stated in the specifications, permissible deviations will be in accordance with ACI 117.

1. The following construction tolerances apply to finished walls and slab unless otherwise indicated:

<u>Item</u>	<u>Tolerance</u>
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/4-inch; In 20 feet or more: 1/2-inch
Variation from the level or from the grades shown.	In 10 feet: 1/4-inch In 20 feet or more: 1/2-inch
Variation from the plumb	In 10 feet: 1/4-inch; In 20 feet or more: 1/2-inch
Variation in the thickness of slabs and walls.	Minus 1/4-inch; Plus 1/2-inch
Variation in the locations and sizes of slabs and wall openings	Plus or minus 1/4-inch
Variation in weirs hydraulic control structures	Max deviation in elevation 1/4 inch (total)

## 1.5 PROJECT CONDITIONS

### A. Environmental Requirements:

1. Hot weather concreting:
  - a. When Ambient Air Temperature Is Above 90 Degrees Fahrenheit: Prior to placing concrete, cool forms and reinforcing steel to by water cooling to below 90 degrees Fahrenheit.
  - b. Temperature of Concrete Mix at Time of Placement: Keep temperature below 90 degrees Fahrenheit by methods which do not impair quality of concrete.
2. Cold Weather Concreting:
  - a. Concrete placed below ambient air temperature of 45 degrees Fahrenheit and falling or below 40 degrees Fahrenheit: Make provision for heating water.
  - b. If materials have been exposed to freezing temperatures to degree that any material is below 35 degrees Fahrenheit: Heat such materials.
  - c. Heating Water, Cement, or Aggregate Materials:
    - 1) Do not heat in excess of 160 degrees Fahrenheit.
  - d. Protection of Concrete in Forms:
    - 2) Protect by means of covering with tarpaulins, or other acceptable covering.
    - 3) Provide means for circulating warm moist air around forms in manner to maintain temperature of 50 degrees Fahrenheit for at least 5 days.
3. For conditions that promote rapid drying of freshly placed concrete such as low humidity, high temperature, and wind: Take corrective measures to minimize rapid water loss from concrete.
  - a. Furnish and use sufficient number of maximum and minimum self-recording thermometers to adequately measure temperature around concrete.

## 1.6 SEQUENCING AND SCHEDULING

- A. Schedule placing of concrete in such a manner as to complete any single placing operation to construction, contraction, or expansion joint.

## PART 2 – PRODUCTS

### 2.1 CONCRETE MATERIALS

#### A. Aggregate

1. General:
  - a. Provide concrete aggregates that are sound, uniformly graded, and free of deleterious material in excess of allowable amounts specified.
  - b. Grade aggregate in accordance with ASTM D 75 and C 136.
  - c. Provide unit weight of fine and coarse aggregate which produces in place concrete with weight of not less than 140 pounds per cubic foot.

#### B. Fine Aggregate:

1. Provide fine aggregate for concrete or mortar consisting of clean, natural sand or of sand prepared from crushed stone or crushed gravel.
2. Do not provide aggregate having deleterious substances in excess of the following percentages by weight of contaminating substances. In no case shall total exceed percent listed.

Item	Test Method	Percent
Removed by decantation (dirt, silt, etc.)	ASTM C 117	3
Shale or Chert	ASTM C 295	1
Clay Lumps	ASTM C 142	1

3. Except as otherwise specified, grade fine aggregate from coarse to fine in accordance with requirements of ASTM C 33.

C. Coarse Aggregate:

1. General: Provide coarse aggregate consisting of gravel or crushed stone made up of clean, hard, durable particles free from calcareous coatings, organic matter, or other foreign substances.
2. Weight: Not exceeding 15 percent, for thin or elongated pieces having length greater than 5 times average thickness.
3. Deleterious Materials: Not in excess of following percentages by weight, and in no case having total of all deleterious substances exceeding 2 percent.

Item	Test Method	Percent
Shale or chert	<b>ASTM C 295</b>	1
Coal and lignite	<b>ASTM C 123</b>	¼
Clay Lumps and friable particles	<b>ASTM C 142</b>	¼
Materials finer than Number 200 sieve	<b>ASTM C 117</b>	½*
Note: (*) Except when material finer than Number 200 sieve consists of crusher dust, maximum amount shall be 1 percent>		

4. Grading:
  - a. Aggregate: As specified in ASTM C 33, Size Number 57, except as otherwise specified or authorized in writing by the ENGINEER.
  - b. Aggregate for Concrete for Encasement of Electrical Conduits:
    - 1) Graded as specified in ASTM C 33, Size Number 8.
    - 2) Provide concrete utilizing this aggregate equal to 2500 psi concrete in all other respects, and is designated as Class CE.

D. Portland Cement:

1. General: Conform to specifications and tests for ASTM C 150, Types II or III, Low alkali, except as specified otherwise.
2. Low Alkali Portland: Have total alkali containing not more than 0.60 percent.
3. Exposed Concrete in Any Individual Structure: Use only one brand of Portland cement.
4. Cement for Finishes: Provide cement from the same source and of same type as concrete to be finished.

E. Admixtures:

1. General:
  - a. Do not use admixtures of any type, except as specified, unless written authorization has been obtained from the ENGINEER.
  - b. Compatible with concrete and other admixtures.
  - c. Do not use admixtures containing chlorides calculated as chloride ion in excess of 0.5 percent by weight.
  - d. Use in accordance with manufacturer's recommendations and add each admixture to concrete mix separately.
2. Water Reducing Admixture:
  - a. May be used at the CONTRACTOR's option.
  - b. Conform to ASTM C 494, Type A or Type D.
  - c. Not contain air entraining agents.
  - d. Liquid form before adding to the concrete mix.
  - e. No decrease in cement is permitted as result of use of water reducing admixture.
3. Superplasticizers or Flyash: Are not to be used without acceptance by ENGINEER.

F. Water:

1. Water for Concrete, Washing Aggregate, and Curing Concrete: Clean and free from oil and deleterious amounts of alkali, acid, organic matter, or other substances.

2. Chlorides and Sulfate Ions:
  - a. Water for Conventional Reinforced Concrete: Use water not containing more than 1,000 (mg/L) of chlorides calculated as chloride ion, no more than 1,000 (mg/L) of sulfates calculated as sulfate ion.
  - b. Water for Pre-stressed or Post-tensioned Concrete: Use water not containing more than 650 (mg/L) milligrams per liter of chlorides calculated as chloride ion, nor more than 800 (mg/l) of sulfates calculated as sulfate ion.
  
- G. Conduit Encasement Coloring Agent:
  1. Color: Red color concrete used for encasement of electrical ducts, conduits, and similar type items.
  2. Manufacturers: One of the following or equal.
    - a. Frank D, Davis Company, Red Oxide Number 117.
    - b. I. Reiss Company, Inc., equivalent product.
  3. Conduit Encasement Concrete: Mix into each cubic yard of concrete 10 pounds of coloring agent.
  
- H. Keyway Material: Lumber.
  
- I. All curing compounds shall be white pigmented and resin based conforming to ASTM C 309, Type D. Sodium silicate compounds shall not be allowed. Concrete curing compound shall be **Kurez by Euclid Chemical Company; MB-429 as manufactured by Mater Builders; L&M Cure R;** or equal. Water based resin curing compounds shall be used only where local air quality regulations prohibit the use of a solvent based compound. Water based curing compounds shall be **Aqua-Cure by Euclid Chemical Company; Masterkure-W by Master Builders; L&M Cure R-2;** or equal.
  
- J. Manufacturers: One of the following or equal.
  1. WR Meadows
  2. CGM Incorporated
  
- K. Plastic Membrane Curing: Use polyethylene film.
  1. Color: White
  2. Thickness: Minimum 6 mils.
  3. Loss of Moisture: Not to exceed 0.055 grams per square centimeter of surface when tested in accordance with ASTM C 156.

## 2.2 CONCRETE DESIGN REQUIREMENTS

- A. General: Concrete shall be composed of cement, admixtures, aggregates, and water of the qualities indicated. The exact proportions in which these materials are to be used for different parts of the work will be determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage, and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the CONTRACTOR. All changes shall be subject to review by the ENGINEER.

- C. Fine Aggregate Composition: In mix designs for structural concrete, the percentage of fine aggregate in total aggregate by weight, shall be as indicated in the following table.

Fine Aggregate	
Fineness Modulus	Maximum Percent
2.7 or less	41
2.7 to 2.8	42
2.8 to 2.9	43
2.9 to 3.0	44

For other concrete, the maximum percentage of fine aggregate of total aggregate, by weight, shall not exceed 50.

- D. Water-Cement Ratio and Compressive Strength: Concrete shall have the following minimum properties unless noted otherwise on the plans:

Type of Work	Min 28-Day Compr. Strength (psi)	Max Size Aggregate (in)	Minimum Cement per cu yd (lbs)	Non Air Max W/C Ratio (by weight)
Structural Concrete:	5,000	1	564	*
	4,500	1	564	.038
	4,000	1	564	0.45
Pea Gravel Mix	4,000	3/8	752	0.40
Sitework concrete	3,000	1	470	0.50
Lean concrete	2,000	1	376	0.60

NOTES: See the Structural Plan notes for strength application and location.

- The CONTRACTOR is cautioned that the limiting parameters above are not a mix design. Additional cement or water reducing agent may be required to achieve workability required by the CONTRACTOR's construction methods and aggregates. The CONTRACTOR is responsible for providing concrete with the required workability.
- \*For strengths above 4500 psi (non-air) concrete proportions shall be established from either existing field data or trial mixes. This information shall be submitted by the ready mix company through the CONTRACTOR for review by the ENGINEER before it will be approved. The average compressive strength from the test record must equal or exceed the ACI 318 requirements for average compressive strength.

- E. Adjustments to Mix Design: The mixes shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish, and the CONTRACTOR shall be entitled to no additional compensation because of such changes.

### 2.3 CONSISTENCY

- A. The quantity of water in a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation and which can be compacted by vibratory methods to give the desired density, impermeability, and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

<b>Part of Work</b>	<b>Slump (in)</b>
All concrete, unless indicated otherwise	3 inches plus or minus 1-inch
With high range water reducer added	7 inches plus or minus 2 inches
Pea gravel mix	7 inches plus or minus 2 inches
Ductbanks	5 inches plus or minus 1-inch

## 2.4 MIXES

### A. Measurements of Materials:

1. Measure materials by weighing, except as otherwise specified or where other methods are specifically authorized in writing by the ENGINEER.
2. Furnish apparatus for weighing aggregates and cement that is suitably designed and constructed for this purpose.
3. Accuracy of Weighing Devices: Furnish devices that have capability of providing successive quantities of individual material that can be measured to within one percent of desired amount of that material.
4. Measuring or Weighing Devices: Subject to review by the ENGINEER, and bear valid seal of the Sealer of Weights and Measures having jurisdiction.
5. Weighing Cement:
  - a. Weigh cement separately.
  - b. Cement in Unbroken Standard Packages (Sacks): Need not be weighed.
  - c. Bulk Cement and Fractional Packages: Weigh such cement.
6. Mixing Water: Measured by volume or by weight.

### B. Concrete Proportions and Consistency:

1. Concrete Consistency and Composition:
  - a. Provide concrete that can be worked readily into corners and angles of forms and around reinforcement without excessive vibration and without permitting materials to segregate or free water to collect on surface.
  - b. Prevent unnecessary or haphazard changes in consistency of concrete.
2. Ratio of Coarse Aggregate to Fine Aggregate: Not less than 1.0 nor more than 2.0 for all concrete Classes, with exception of Class CE.
3. Aggregate:
  - a. Obtain aggregate from source which is capable of providing uniform quality, moisture content, and grading during any single day's operation.
4. Concrete Mix Water to Cement Ratio, Minimum Cement Content, and Slump Range:  
Conform to values specified in Table A in this Section.
5. Concrete Batch Weighs: Control and adjust so as to secure maximum yield, and at all times maintain proportions of concrete mix within specified limits.
6. Mixture Modification: If required, by the ENGINEER, modify mixture within limits set forth in this Section.

### C. Concrete Mixes:

1. Proportioning of Concrete Mix: Proportion mixes on required average on compressive strength  $f_c$  as defined in the contract documents.

2. Mixes:
  - a. Adjusting of Water: After acceptance, do not change mixes without acceptance by ENGINEER, except that at all times adjust batching of water to compensate for free moisture content of fine aggregate.
  - b. Total Water Content of Each Concrete Class: Not exceed those specified in Table A of this Section.
  - c. Checking Moisture Content of Fine Aggregate: Furnish satisfactory means at batching plant for checking moisture content of fine aggregate.
3. Change in Mixes: Undertake new trial batch and test program as specified in this Section.

D. Hand Mixed Concrete:

1. Hand mix concrete only when acceptable to the ENGINEER.
2. Prepare hand mixed concrete on watertight, level platform in batches not to exceed 1/3 cubic yard each.
3. Aggregate:
  - a. First spread required amount of coarse aggregate on platform in an even and uniform layer, and then over such aggregate spread proper proportion of fine aggregate.
  - b. Combined Depth of Both Such Layers: Not be greater than one foot.
4. Cement:
  - a. First evenly spread required quantity of cement over fine aggregate.
  - b. Then turn entire batch with shovels at least twice before adding water.
5. Water:
  - a. Then uniformly sprinkle or spray proper amount of water over batched materials.
  - b. Then turn with shovels not less than three times before being removing from platform.

## 2.5 SOURCE QUALITY CONTROL

A. Tests:

1. Concrete Mixes:
  - a. After concrete mixes have been accepted by ENGINEER, have trial batches of the accepted mix designs prepared by testing laboratory acceptable to the ENGINEER.
  - b. Prepare trial batches by using specified cement and aggregates proposed to be use for the work.
  - c. Trial Batches: Provide batches of sufficient quantity to determine slump, workability, consistency, and finishing characteristics, and to provide sufficient test cylinders.
  - d. Test Cylinders: Provide cylinders having six inch diameter by 12 inch length and that are prepared in accordance with ASTM C 31 for tests specified in this Section.
  - e. Determine slump in accordance with ASTM C 143.
  - f. Test Cylinders from Trial Batch:
    - 1) Test 8 cylinders for compressive strength in accordance with ASTM C 39.
      - a) Test 4 cylinders at 7 days and 4 at 28 days.
      - b) Establish ratio between 7 day and 28 day strength for mix. Seven day strength may be taken as satisfactory indication of 28 day strength provided effects on concrete of temperature and humidity between 7 day and 28 day are taken into account.
    - 2) Average Compressive Strength of 4 Test Cylinders Tested at 28 Days: Equal to or greater than required average compressive strength  $f'_c$  on which concrete mix design is based.
  - g. Drying Shrinkage:
    - 1) Prepare 5 drying shrinkage specimens in accordance with ASTM C 157, except as modified herein.
    - 2) Remove drying shrinkage specimens from molds at age of 23 hours plus or minus 1 hour after trial batching, then immediately place them in water at 73 degrees Fahrenheit plus or minus 3 degrees for at least 30 minutes and then measure specimens within 30 minutes thereafter to determine original length. Then submerge specimens in saturated lime

- water at 73 degrees Fahrenheit plus or minus three degrees for moist curing.
- 3) Make measurements to determine expansion expressed as percentage of original length at age 7 days. Use length at age 7 days as base length for drying shrinking calculations.
  - 4) Immediately store specimens in humidity controlled room maintained at 73 degrees Fahrenheit plus or minus 3 degrees and 50 percent plus or minus 4 relative humidity for remainder of the test.
  - 5) Make and report measurements to determine shrinkage expressed as percentage of base length separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.
  - 6) Drying Shrinkage Deformation:
    - a) Measure drying shrinkage deformation of each specimen as difference between base length and length after drying at each test age.
    - b) Measure average drying shrinkage deformation of specimens to nearest 0.0001 inch at each test age.
    - c) If drying shrinkage of any specimen departs from average of test age by more than 0.0004 inch, disregard results obtained from that specimen and test another specimen.
    - d) Shrinkage of trial batch concrete at 28 days drying age shall not exceed 0.045 percent maximum.
  - h. If trial batch tests do not meet specified requirements for slump, strength, workability, consistency, drying shrinkage, and finishing, change concrete mix design proportions and, if necessary, source of aggregate. Make additional trial batches and tests until an acceptable trial batch is produced that meets requirements of this Section.
  - i. Perform test batches and tests required to establish trial batches and acceptability of materials without change in Contract Price.
  - j. Do not place concrete until the concrete mix design and trial batch have been accepted by ENGINEER.
2. Required Average Compressive Strength:
- a. Determine required average compressive strength ( $f'c$ ) for selection of concrete proportions for mix design, for each class of concrete, using calculated standard deviation and its corresponding specified compressive strength  $f'c$ , in accordance with ACI 318, Part 3, Chapter 5.
  - b. When test records of at least 30 consecutive tests that span period of not less than 45 calendar days are available, establish standard deviation as described in ACI 318, Part 3, Chapter 5 and as modified as follows herein.
  - c. Provide test records from which to calculate standard deviation that represent materials, quality control procedures, and conditions similar to materials, quality control procedures, and conditions expected to apply in preparation of concrete for the Work.
  - d. Provide changes in materials and proportions within test records that are more restricted than those for the Work.
  - e. Specified Compressive Strength ( $f'c$ ) of Concrete Used in Test Records: Within 1,000 pounds per square inch of that specified for the Work.
  - f. When lacking adequate test records for calculation of standard deviation meeting requirements, determine required average compressive strength  $f'cr$  from the following table B.

TABLE B	
Specified Compressive Strength $f'c$ (pounds per square inch)	Required Average Compressive Strength $f'c$ (pounds per square inch)
Less than 3,000	$f'c + 1,000$
3,000 to 5,000	$f'c + 1,200$
Over 5,000	$f'c + 1,400$

3. Pozzolan:
  - a. Sampling and Testing:
    - 1) Sample and test pozzolan in accordance with ASTM C 311.
    - 2) In Computing Water to Cement Ratio and Cement Content per Cubic Yard of Concrete: Consider cement weight to be weight of Portland cement plus 100 percent of weight of fly ash.

4. Aggregate:
  - a. Testing of concrete aggregate is at CONTRACTOR's expense.
  - b. Sieves:
    - 1) Use sieves with square openings for testing grading or aggregates.
    - 2) Sieve Analysis: If sieve analysis indicates significant change in materials, the ENGINEER may require that new mix design be submitted and accepted before further placing of concrete.
  - c. Sample aggregate in accordance with ASTM D 75 and C 136.
  - d. Fine Aggregate:
    - 1) Provide fine aggregate not containing strong alkali nor organic matter which gives color darker than standard color when tested in accordance with ASTM C 40.
    - 2) Provide aggregate having soundness complying with requirements of ASTM C 33 when tested in accordance with ASTM C 88.
    - 3) Provide aggregate complying with reactivity requirements of ASTM C 33 when tested in accordance with ASTM C 289.
  - e. Coarse Aggregate:
    - 1) Soundness when tested in accordance with ASTM C 88: Have loss not greater than 10 percent when tested with sodium sulfate.
    - 2) Abrasion Loss: Not exceed 45 percent after 500 revolutions when tested in accordance with ASTM C 131.
    - 3) Reactivity: Not exceed limits specified in Appendix of ASTM C 33 when tested in accordance with ASTM C 289.
  - f. Portland Cement:
    - 4) Determination Alkali Content: Determine by method set forth in ASTM C 114.

### **PART 3 – EXECUTION**

#### **3.1 PROPORTIONING AND MIXING**

- A. Proportioning: Proportioning of the mix shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301.
- B. Mixing: Mixing shall conform to the requirements of Chapter 7 of said ACI 301 Specifications.
- C. Slump: Slumps shall be as indicated herein.
- D. Retempering: Retempering of concrete or mortar which has partially hardened shall not be permitted.

#### **3.2 PREPARATION OF SURFACES FOR CONCRETING**

- A. General: Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud and debris at the time of placing concrete.
- B. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the concrete has been stopped or interrupted so that, as determined by the ENGINEER, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bonding. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, foreign material, and be roughened to a minimum 1/4-inch amplitude. Such cleaning and roughening shall be accomplished by hydroblasting or sandblasting (exposing aggregate) followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.
- C. After the surfaces have been prepared, all approximately horizontal construction joints shall be covered with a 6-inch lift of a pea gravel mix. The mix shall be placed and spread uniformly. Wall concrete shall follow immediately and shall be placed upon the fresh pea gravel mix.

- D. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the ENGINEER.
  - E. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the ENGINEER at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from previous work shall be cleaned before the surrounding or adjacent concrete is placed.
  - F. All inserts or other embedded items shall conform to the requirements herein.
  - G. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms at locations indicated on the Drawings or shown by shop drawings and shall be acceptable to the ENGINEER before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.
  - H. Casting New Concrete Against Old: Where concrete is to be cast against old concrete (any concrete which is greater than 180 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting or sandblasting (exposing aggregate). The joint surface shall be coated with an epoxy bonding agent unless indicated otherwise by the ENGINEER.
  - I. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the WORK. No concrete shall be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, shall be subject to the review of the ENGINEER.
  - J. Corrosion Protection: Pipe, conduit, dowels and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.
  - K. Openings for pipes, inserts for pipe hangers and brackets, and anchors shall, where practicable, be provided during the placing of concrete.
  - L. Anchor bolts shall be accurately set and shall be maintained in position by templates while being embedded in concrete.
  - M. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.
- 3.3 HANDLING, TRANSPORTING, AND PLACING
- A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.
  - B. Non-Conforming Work or Materials: Concrete which during or before placing is found not to conform to the requirements indicated herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by the CONTRACTOR at no additional cost to the CONTRACTOR.
  - C. Unauthorized Placement: No concrete shall be placed except in the presence of a duly authorized representative of the ENGINEER. The CONTRACTOR shall notify the ENGINEER in writing at least 24 hours in advance of placement of any concrete.

- D. Placement in Wall and Column Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, means such as hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4-feet in walls and 8-feet in columns below the ends of ducts, chutes or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6-feet in horizontal direction. Concrete in wall forms shall be deposited in uniform horizontal layers not deeper than 2-feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in wall forms shall not exceed 5-feet of vertical rise per hour. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.
- E. Casting New Concrete Against Old: Epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where hydrotite waterstop is provided. See Section 03290 - Joints in Concrete.
- F. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the CONTRACTOR'S conveying, hoisting, and placing system shall be designed and arranged so that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the ENGINEER. Chutes longer than 50-feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the indicated consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered.
- G. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.
- H. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 55 degrees F for sections less than 12 inches thick nor less than 50 degrees for all other sections. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the minimum temperature. When the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The CONTRACTOR shall not be entitled to any additional compensation on account of the foregoing requirements.
- I. Cold Weather Placement:
1. Placement of concrete shall conform to ACI 306.1 - Cold Weather Concreting, and the following.
  2. Remove all snow, ice, and frost from the surfaces, including reinforcement, against which concrete is to be placed. Before beginning concrete placement, thaw the subgrade to a minimum depth of 6 inches. All reinforcement and embedded items shall be warmed to above 32 degrees F prior to concrete placement.
  3. Maintain the concrete temperature above 50 degrees F for at least 5 days after placement.

### 3.4 PUMPING OF CONCRETE

- A. General: If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

- C. Pumping Equipment: The pumping equipment shall have two (2) cylinders and be designed to operate with one cylinder in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.
- D. The minimum diameter of the hose conduits shall be in accordance with ACI 304.2R.
- E. Pumping equipment and hose conduits that are not functioning properly shall be replaced.
- F. Aluminum conduits for conveying the concrete shall not be permitted.
- G. Field Control: Concrete samples for slump and test cylinders will be taken at the placement end of the hose.

### 3.5 ORDER OF PLACING CONCRETE

- A. The order of placing concrete in all parts of the WORK shall be acceptable to the ENGINEER. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints at the indicated locations. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 5-days for hydraulic structures and 2-days for all other structures before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the two (2) adjacent wall panels have cured at least 10 days for hydraulic structures and 4-days for all other structures.
- B. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least ¾-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about ½-inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

### 3.6 TAMPING AND VIBRATING

- A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete. Vibrators shall be Group 3 per ACI 309, high speed power vibrators (8000 to 12,000 rpm) of an immersion type in sufficient number and with at least one standby unit as required. Group 2 vibrators may be used only at specific locations when accepted by the ENGINEER.
- B. Care shall be used in placing concrete around hydrotite waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type hydrotite waterstops are placed horizontally, the concrete shall be worked under the hydrotite waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the hydrotite waterstops shall be given additional vibration over and above that used for adjacent concrete placement to assure complete embedment of the hydrotite waterstops in the concrete.
- C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred or worked with suitable appliances, tamping bars, shovels or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the required results within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall not contact the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

### 3.7 FINISHING CONCRETE SURFACES

- A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from

the alignment, profiles and dimensions shown are defined as tolerances and are indicated in Part 1, above. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

- B. Formed Surfaces: No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects. Where architectural finish is required, it shall be as indicated. Surface holes larger than 1/2-inch in diameter or deeper than 1/4-inch are defined as surface defects in basins and exposed walls and shall be patched per Section 3.11 Treatment of Surface Defects.
- C. Unformed Surfaces: After proper and adequate vibration and tamping, all unformed top surfaces of slabs, floors, walls and curbs shall be brought to a uniform surface with suitable tools. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks. The classes of finish specified for unformed concrete surfaces are designated and defined as follows:
  - 1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.
  - 2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where indicated or as determined by the ENGINEER.
  - 3. Finish U3 - After the finish U2 surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.
  - 4. Finish U4 - Trowel the Finish U3 surface to remove local depressions or high points. In addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise indicated. The resulting surface shall be rough enough to provide a nonskid finish.
- D. Unformed surfaces shall be finished according to the following schedule:

**UNFORMED SURFACE FINISH SCHEDULE**

<u>Area</u>	<u>Finish</u>
Grade slabs and foundations to be covered with concrete or fill material	U1
Water bearing slabs with slopes 10 percent and less	U3
Water bearing slabs with slopes greater than 10 percent	U4
Slabs not water bearing	U4
Top surface of walls	U3

**3.8 CURING**

- A. General: All concrete shall be cured for not less than 7 days after placing, in accordance with the methods indicated below for the different parts of the WORK.

<u>Surface to be Cured or Damp proofed</u>	<u>Method</u>
Wall sections with forms removed	1
Construction joints between footings and walls, and between floor slab and columns	2
Encasement concrete and thrust blocks	1 or 2
All concrete surfaces not specifically indicated in this paragraph	1
Floor slabs on grade in hydraulic structures	1 or 2
Slabs not on grade	1 or 2

- B. **Method 1:** The surface shall be sprayed with a liquid white pigmented curing compound.
1. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.
  2. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the 7-day curing period. If the seal is damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.
  3. Wherever curing compound has been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.
  4. Curing compound shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces and within 2 hours after removal of forms. Repairs to formed surfaces shall be made within the 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound.
  5. At all locations where concrete is placed adjacent to a panel which has been coated with curing compound, the panel shall have curing compound
- C. **Method 2:** This method applies to both walls and slabs.
1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least seven (7) consecutive days beginning immediately after the concrete has reached final set or forms have been removed.
  2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed.
  3. Curing blankets shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held substantially in contact with the concrete surface to prevent being dislodged by wind or any other causes. All edges shall be continuously held in place.
  4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.
  5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted and curing compound shall be immediately applied in accordance with Method 4 above.
  6. The CONTRACTOR shall dispose of excess water from the curing operation to avoid damage to the work.

### 3.9 PROTECTION

- A. The CONTRACTOR shall protect all concrete against injury until final acceptance at the CONTRACTOR's own expense and at no additional cost to the CONTRACTOR
- B. Fresh concrete shall be protected from damage due to rain, hail, sleet or snow. The CONTRACTOR shall provide such protection while the concrete is still plastic and whenever precipitation is imminent or occurring.

### 3.10 CURING IN COLD WEATHER

- A. The CONTRACTOR shall protect all concrete against injury from cold weather until final acceptance at the CONTRACTOR's own expense and at no additional cost to the CONTRACTOR.
- B. Concrete cured by an application of curing compound will require no additional protection from freezing if

the protection at 50 degrees F for 72 hours is obtained by means of approved insulation in contact with the forms or concrete surfaces; otherwise the concrete shall be protected against freezing temperatures for 72 hours immediately following 5 days protection at 50 degrees F. Concrete cured by water shall be protected against freezing temperatures for 3 days immediately following the 72 hours of protection at 50 degrees F.

- C. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than three (3) successive days, the specified 72-hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.
- D. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is otherwise permitted by these Specifications.

### 3.11 TREATMENT OF SURFACE DEFECTS

- A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately patched or ground in a satisfactory manner in order to secure a smooth, uniform and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the ENGINEER. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired as indicated below. Concrete containing extensive voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced. All repairs and replacements herein required shall be promptly executed at no increased cost to the CONTRACTOR.
- B. Defective surfaces to be repaired shall be cut back from true line a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, plus not less than 1/32-inch depth of the surface film from all hard portions by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces underneath will remain moist but not so wet as to overcome the suction upon which a good bond depends. The material used for repair proposed shall consist of a mixture of one sack of cement to 3-cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white Portland cement as is required to make the color of the patch match the color of the surrounding concrete. In hydraulic structure the material used for repair shall be hydraulic cement as defined in this Section under Products.
- C. Holes left by tie-rod cones shall be rubber stopped and grouted. Holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section and other imperfections having a depth greater than their least surface dimension shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.
- D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.
- E. Prior to filling any structure with water, all cracks that may have developed shall be "vee'd" as indicated in specs or in the field and filled with sealant conforming to the requirements of Section 03290 - Joints in Concrete. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces

of members in contact with fill, which are not covered with a waterproofing membrane shall also have cracks repaired as indicated herein.

### 3.12 PATCHING HOLES IN CONCRETE

#### A. Patching Small Holes:

1. Holes which are less than 12 inches in the least dimension and extend completely through concrete members shall be filled.
2. Small holes in members which are water-bearing or in contact with soil or other fill material shall be filled with non-shrink grout or hydraulic cement in wet tanks. Where a face of the member is exposed to view, the non-shrink grout shall be held back 2 inches from the finished surface. The remaining 2 inches shall then be patched according to the Paragraph entitled "Treatment of Surface Defects."
3. Small holes through all other concrete members shall be filled with non-shrink grout or hydraulic cement, with exposed faces treated as above.

#### B. Patching Large Holes:

1. Holes which are larger than 12 inches in the least dimension shall have a keyway chipped into the edge of the opening all around, unless a formed keyway exists. The holes shall then be filled with concrete as indicated herein.
2. Holes which are larger than 24 inches in the least dimension and which do not have reinforcing steel extending from the existing concrete, shall have reinforcing steel set in grout in drilled holes. The reinforcing added shall match the reinforcing in the existing wall unless indicated otherwise.
3. Large holes in members which are water bearing or in contact with soil or other fill shall have a bentonite type hydrotite waterstop material placed around the perimeter of the hole in accordance with Section 03290 - Joints in Concrete, unless there is an existing hydrotite waterstop in place.

### 3.13 CARE AND REPAIR OF CONCRETE

- A. The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress or any other cause until final acceptance. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed WORK, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at no additional cost to the CONTRACTOR.

- END OF SECTION -

**SECTION 03315**  
**GROUT**

**PART 1 – GENERAL**

2.1 THE REQUIREMENT

- A. Provide and place grout in accordance with the Contract Documents.
- B. Section Includes:
  - 1. Concrete Mortar
  - 2. Grout
  - 3. Drypack Mortar
  - 4. Non-shrink Grout.
  - 5. Epoxy grout.
  - 6. Non-shrink epoxy grout.
- C. Related Sections:
  - 1. Section 03931 – Epoxy Injection System

2.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. C 109 – Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2 inch or 50 millimeter cube specimens).
  - 2. C 230 – Standard Specification For Flow Table For Use In Tests Of Hydraulic Cement.
  - 3. C 531 – Test Method for Liner Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes.
  - 4. C 579 – Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacing.
  - 5. C 827 – Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
  - 6. C 939 – Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
  - 7. C 1090 – Test Method for Measuring Change in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
  - 8. C 1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (non-shrink).
  - 9. C 1181 – Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.

2.3 SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Submittals.
- B. Grout: Submit manufacturer's Literature and certified test data prior to installation of any grout mixes.

2.4 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be delivered to the jobsite in their original, unopened packages or containers, clearly labeled with the manufacturer's product identification and printed instructions.

- B. All materials shall be stored in a cool dry place and in accordance with the manufacturer's recommendations.
- C. All materials shall be handled in accordance with the manufacturer's instructions.

## 2.5 PROJECT/SITE CONDITIONS

- A. Refer to manufacturer's literature or contact the manufacturer for any special physical or environmental limitations that may be required for use of products.

## 2.6 WARRANTIES

- A. Non-shrink Grout: The manufacturer shall warranty that the non-shrink grout will never go below its initial placement volume when tested in accordance with ASTM C 1107.
- B. Non-shrink Epoxy Grout: The manufacturer shall warranty that the non-shrink epoxy grout will show negligible shrinkage or expansion when tested in accordance with ASTM C 531.

## PART 2 – PRODUCTS

### 3.1 MATERIALS

- A. Concrete Mortar:
  - 1. General: Consist of concrete mixture with coarse aggregate removed and water quantity adjusted as required.
  - 2. At Exposed Concrete Surfaces Not to Be Painted or Submerged in Water: White Cement.
- B. Grout: Consist of mixture of Portland cement and sand.
- C. Dry-pack:
  - 1. Mortar consists of mixture of Portland cement and sand.
  - 2. Hydraulic Cement Manufacturers
    - a. Aqua Plug
    - b. Unitex Hydraulic Cement
    - c. Thoro Water Plug
- D. Non-shrink Grout:
  - 1. Manufacturers: One of the following or equal:
    - a. Five Star Products, Inc., Fairfield, CT, Five Star Grout.
    - b. Master Builders, Inc., Cleveland, OH, Masterflow 928.
    - c. L&M Construction Chemicals, Inc., Omaha, NE, CRYSTEX
  - 3. Non-shrink grout shall be a proportioned and prepackaged cement-based mixture. It shall contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings. It shall require only the addition of potable water.
  - 4. Potable water for pre-soaking, mixing, and curing shall be clean and free of oils, acids, alkalies, organics, and any other deleterious matter.
  - 5. Bleeding: Non-shrink grout shall be free from the emergence of mixing water from within or the presence of water on its surface.
  - 6. Non-shrink grout shall be in accordance with ASTM C 1107.
  - 7. Consistency: Non-shrink grout shall remain at a minimum flowable consistency for at least 45 minutes after mixing at 45 degrees Fahrenheit to 90 degrees Fahrenheit when tested in accordance with ASTM C 230. If at a fluid consistency, it shall be verified in accordance with ASTM C 939.

8. Dimensional Stability (height change): Non-shrink grout shall be in accordance with ASTM C 1107, volume-adjusting Grade B or C at 45 degrees to 90 degrees. It shall show 90 percent or greater bearing area under bases or baseplates.
9. Compressive Strength: Non-shrink grout shall show minimum compressive strengths at 45 degrees Fahrenheit to 90 degrees Fahrenheit in accordance with ASTM C 1107 for various periods from the time of placement, including 5,000 pounds per square inch at 28 days when tested in accordance with ASTM C 109 as modified by C 1107.

E. Epoxy Grout:

1. Consist of mixture of epoxy and sand.
2. Sand: Clean, bagged, graded, and kiln dried silica sand.

F. Non-shrink Epoxy Grout:

1. Manufacturers: One of the following or equal:
  - a. Five Star Products, Inc., Fairfield, CT, Five Star Epoxy Grout.
  - b. Master Builders, Inc., Cleveland, OH, Masterflow 648 CP Plus.
  - c. L&M Construction Chemicals, Inc., Omaha, NE, EPOGROUT.
3. Non-shrink epoxy grout shall be a 100 percent solids, pre-measured, prepackaged system containing a two-component thermosetting epoxy resin and inert aggregate
4. Consistency: Non-shrink epoxy grout shall maintain a flowable consistency for at least 45 minutes at 70 degrees Fahrenheit.
5. Dimensional Stability (height change):
  - a. Non-shrink epoxy grout shall have negligible shrinkage or expansion (less than 0.0006 in/in) when tested in accordance with ASTM C 531.
6. Compressive Strength: Non-shrink epoxy grout shall show a minimum compressive strength of 10,000 pounds per square inch at 24 hours and 14,000 pounds per square inch at 7 days when tested in accordance with ASTM C 579, Method B.
7. Compressive Creep: The compressive creep for non-shrink epoxy grout shall not exceed 0.0027 in/in when tested under a 400 pounds per square inch constant load at 140 degrees Fahrenheit in accordance with ASTM C 1181.
8. Thermal Capability: The coefficient of thermal expansion for non-shrink epoxy grout shall not exceed 0.000018 inches per inch per degree Fahrenheit when tested under ASTM C 531, Method B.

### 3.2 MIXES

A. Concrete Mortar Mix:

1. Use water-cement ratio that is no more than that specified for concrete being repaired.
2. At Exposed Concrete Surfaces Not to Be Painted or Submerged in Water: Use sufficient white cement to make color of finished patch match that of surrounding concrete.

B. Grout Mix:

1. For Concrete Repair: Mix in same proportions used for concrete being repaired, with only sufficient water to give required consistency for spreading.
2. For Spreading over the Surfaces of Construction or Cold Joints: Mix with no more water used than allowed by water-cement ratio specified for concrete.
3. For Other Applications: Mix in proportions by weight of one part cement to four parts of concrete sand.

C. Dry-pack Mortar and Hydraulic Cement Mix: Use only enough water so that resulting mortar will crumble to touch after being formed into ball by hand.

- D. Non-shrink Grout: Mix in accordance with manufacturer's installation instructions such that resulting mix has fluid or flowable consistency and is suitable for placing by pouring.
- E. Epoxy grout: Mix in accordance with manufacturer's installation instructions for mixing.
- F. Non-shrink Epoxy Grout: Mix in accordance with manufacturer's installation instructions.

### **PART 3 – EXECUTION**

#### **3.1 EXAMINATION**

- A. Inspect concrete surfaces to receive grout or mortar and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints, impregnations and all loose material or foreign matter likely to affect the bond or performance of grout or mortar.
- B. Inspect baseplate and anchor systems for rust, oil, and other deleterious substances that may affect the bond or performance of grout.
- C. Confirm that newly placed concrete has been cured sufficiently to attain its design strength and limit further shrinkage.
- D. Verify that temperature of cementitious or epoxy grout does not exceed manufacturer's recommendations.

#### **3.2 PREPARATION**

##### **A. Surface Preparation:**

1. Roughen all concrete surfaces by heavy sandblasting, chipping, or other mechanical means to assure bond. Loose or broken concrete shall be removed.
2. All grease, oil, dirt, curing compounds, laitance, and other deleterious materials that may affect bond that were identified in the inspection process shall be completely removed from concrete and bottoms of baseplates. All metal surfaces should have a 2 to 3 mil peak-to-valley profile for epoxy grouts.
3. For cementitious mortars and grouts, concrete surfaces shall be saturated surface dry. Any standing water shall be removed prior to placing grouts.
4. For epoxy grouts, do not wet concrete surfaces with water. Instead, where required, wet surfaces with epoxy for horizontal work or epoxy gel for vertical or overhead work prior to placing epoxy grouts.

##### **B. Forms and Headboxes for Grouts (Cementitious or Epoxy):**

1. Forms for grouts shall be built of material with adequate strength to withstand the placement of grouts.
2. Forms must be rigid and liquid tight. All cracks and joints shall be caulked with an elastomeric sealant. All forms shall be lined with polyethylene for easy grout release. Forms carefully waxed with two coats of heavy-duty paste wax shall also be acceptable.
3. Forms shall be 4 to 6 inches higher than the baseplate on one side of the baseplate configuration when using head pressure for placement.
4. A sufficient number of headboxes shall be built to facilitate placement of grouts.
5. Air relief holes a minimum 1/8 inch in diameter shall be provided when required by a baseplate configuration to avoid entrapping air underneath.

#### **3.3 APPLICATION**

##### **A. Cement Mortar and Grout:**

1. For Defective Concrete Repair:
  - a. Filling: Filling of voids around items through the concrete.
  - b. Grout Spreading: Spread over construction joints, cold joints, and similar type items.

2. Concrete Surfaces: Apply epoxy bonding agent to clean, roughened, and dry surfaces before placing mortar or grout.
3. Placing:
  - a. Exercise particular care in placing Portland cement mortar or grout since they are both required to furnish structural strength or impermeable water seal or both.
  - b. Do not use cement mortar or grout that has not been placed within 30 minutes after mixing.

B. Epoxy Grout:

1. Apply in accordance with manufacturer's installation instructions.
2. Use where specified herein or where indicated on the Drawings.

### 3.4 PLACEMENT

A. The CONTRACTOR shall make arrangements to have a grout manufacturer's representative present for a preconstruction meeting and during the initial grout placement. Grout shall only be installed after the final equipment alignment is correct and accepted by the ENGINEER.

1. Grouts shall be mixed in accordance with the manufacturer's recommendations.
2. A mortar mixer with moving paddles shall be used for mixing grouts. For cementitious grouts, pre-wet the mixer and empty out excess water before beginning mixing.
3. Cementitious Grouts:
  - a. Non-shrink cementitious grout shall be added to a pre-measured amount of water that does not exceed the manufacturer's maximum recommended water content.
  - b. Mix cementitious grouts per manufacturer's instructions for uniform consistency.
  - c. Grouts may be drypacked, flowed, or pumped into place. All baseplate grouting shall take place from one side of a baseplate to the other to avoid trapping air. Do not overwork grouts.
  - d. Do not retemper grout by adding more water after stiffening.
  - e. Hydrostatic head pressure shall be maintained by keeping the level of the grout in the headbox above the bottom of the baseplate. The headbox should be filled to maximum level and the grout worked down to top of baseplate.
4. Epoxy Grouts:
  - a. Epoxy grouts shall be mixed in complete units. Do not vary the ratio of components or add solvent to change the consistency of the mix.
  - b. Pour the hardener into the resin and mix for at least one minute and until each mixture is uniform in color. Pour the chemical components into the mortar mixer wheelbarrow and add the aggregate. Mix until aggregate is uniformly wetted. Overmixing will cause air entrapment in the mix.
  - c. All epoxy grout shall be flowed into place using a headbox. All grouting shall take place from one side of a baseplate to the other in a continuous flow to avoid trapping air.
  - d. Hydrostatic head pressure shall be maintained by keeping the level of grout in headboxes above the bottom of baseplates. Headboxes shall be filled to the maximum level and grout worked down to the bottom of the baseplates.
  - e. Epoxy grouts shall not be cut back after setting. The final level of grout will be as installed with all chamfer edges built into the formwork.

### 3.5 CURING

A. Cementitious Grouts:

1. Grouts must be cut back to the lower edge of baseplates after reaching initial set. Provide a 45 degree angle cut back.
2. Clean equipment and tools as recommended by the grout manufacturer.

3. Cure Grouts in accordance with the manufacturer's specifications and recommendations. Keep grout moist for a minimum of 3 days. The method needed to protect grouts will depend on temperature, humidity, and wind. Wet burlap, a soaker hose, sun shading, ponding and in extreme conditions, a combination of methods shall be employed.
4. Grouts shall be maintained above 40 degrees Fahrenheit until they have attained a compressive strength of 3,000 pounds per square inch or above 70 degrees Fahrenheit for a minimum of 24 hours to avoid damage from subsequent freezing.

B. Epoxy Grouts:

1. Cure grouts in accordance with manufacturer's specifications and recommendations. Do not wet cure epoxy grouts.
2. Consult the manufacturer for appropriate cure schedule. In no case should any surface in contact with grout be allowed to fall below 50 degrees Fahrenheit for a minimum of 48 hours after placement.
3. Equipment and tools shall be cleaned immediately with a strong liquid detergent and water solution before grout hardens.

3.6 FIELD QUALITY CONTROL

- A. Non-shrink grouts shall be tested for 84 hour compressive strength in accordance with ASTM C 109.
- B. Non-shrink grouts shall be tested for 24 hour compressive strength in accordance with ASTM C 579 (Method B).

- END OF SECTION -

**SECTION 03700**  
**CONCRETE SAW-CUTTING AND CORE-DRILLING**

**PART 1- GENERAL**

1.1 DESCRIPTION

- A. The work of this section consists of saw-cutting and/or core-drilling new openings in existing concrete.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Submittals
- B. Section 03100 – Concrete Formwork
- C. Section 03300 – Cast-In-Place Concrete

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Submit drawings and commentary showing and describing the proposed cutting procedures and proposed equipment for each type of cut.

**PART 2- MATERIALS (Not Used)**

**PART 3- EXECUTION**

3.1 SAFETY REGULATIONS

- A. Comply with all applicable safety regulations including the requirements of “The Construction Safety Orders” of the State of California and OSHA.
- B. Provide equipment in good and safe working order, adequate to perform the work.
- C. Provide necessary scaffolding, lighting, access, debris removal equipment and devices, and appropriate safety measures.

3.2 CONCRETE CUTTING

- A. Perform concrete cutting as shown on the drawings and as specified herein and in accordance with the approved submittals.
- B. Openings shall be cut to the dimensions shown on the drawings and shall not be over-cut.
- C. In straight-cut openings, the face opposite the saw shall be chipped to achieve the opening dimension.

3.3 PATCHING

- A. Where existing reinforcing bars are cut at new opening, countersink by means of drilling or back-gouging the reinforcing bars a minimum of 1-inch below adjacent concrete.

- B. Patch the resulting void at existing reinforcing bars and the surface of chipped opening surfaces with an approved polymer – modified Portland cement mortar in accordance with Section 03100 – Concrete, to achieve a smooth, uniform surface.
- C. Paint the patch exposed surfaces with Epoxy Paint per Section 09800 (Coating System 2.5).

#### 3.4 DISPOSAL

- A. Remove cut material and dispose off-site in a safe and orderly manner. Do not allow debris to accumulate on the site exposed to view.
- B. Inside structures, cuttings, chippings and patching grout droppings must be removed completely. No debris shall be washed into the plant's process system.
- C. Upon completion of the work of this section, the surfaces of all structures shall be clean and free of cuttings, slurry and debris.

- END OF SECTION -



**SECTION 04200**  
**REINFORCED CONCRETE BLOCK MASONRY**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide concrete masonry and other appurtenant work, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:

ANSI/ASTM C 5	Quicklime for Structural Purposes
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 90	Load-Bearing Concrete Masonry Units
ASTM C 129	Non load bearing Concrete Masonry Units
ASTM C 140	Test Methods of Sampling and Testing Concrete Masonry Units
ASTM C 144	Aggregate for Masonry Mortar
ASTM C 150	Portland Cement
ASTM C 207	Hydrated Lime for Masonry Purposes
ASTM C 404	Aggregates for Masonry Grout
ASTM E 447	Test Methods for Compressive Strength of Masonry Prisms
UBC 21-16	Field Test Specimens for Mortar

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.

1. Samples:

- a. Samples of concrete masonry unit colors with texture ranges indicated for selection of color. Full size samples of the blocks selected shall be submitted for final approval by the ENGINEER after color selection, if requested. If the specified product is a colored and textured unit, the samples shall be colored and textured units.
- b. Samples of mortar colors for color selection.
- c. A 4-foot minimum square free standing sample panel shall be prepared for approval before starting masonry work if required. The panel shall remain at the Site for reference until all masonry work is completed.

2. Documentation:

- a. Reports from testing Masonry units. Letter of certification that units meet ASTM standards. Recent test reports on units from independent testing company.
- b. Reports from Mortar and Grout testing will be obtained from on site testing company.

3. Grout and Mortar Mix Design:

- a. Proportions for all components
- b. Mill Tests for Cement
- c. Admixture Certification, include chloride ion content
- d. Aggregate Graduation and Certification
- e. Lime Certification

## 1.4 QUALITY ASSURANCE

- A. Applicable Standards: Concrete masonry shall conform to the local Building Code, and other applicable codes and standards of governing authorities.
- B. All work shall conform to the standard of quality established by the approved free-standing sample panel.
- C. Concrete block masonry units and ready mix grout from the job site shall be sampled and tested in accordance with applicable ASTM standards by onsite testing company.
- D. Inspection: Whenever required under the provisions of the Building Code, work hereunder will be subject to continuous inspection by a Special Inspector selected by the ENGINEER and approved by the local Building Official having jurisdiction. The Special Inspector will work under the supervision of the ENGINEER.
- E. Weather Conditions: Concrete masonry units shall not be placed when air temperature is below 40 degrees Fahrenheit (4 degrees Centigrade) and shall be protected against direct exposure to the wind and sun when erected when the ambient air temperature exceeds 100 degrees Fahrenheit (37 degrees Centigrade) in the shade with relative humidity less than 50%. Cold weather installation shall be per code and Reference Standards and as approved by the ENGINEER.
- F. Product Storage: Cement, lime and other cementitious materials shall be delivered and stored in dry, weather-tight sheds or enclosures, in unbroken bags, barrels, or other approved containers, plainly marked and labeled with the manufacturers' names and brands. Mortar and grout shall be stored and handled in a manner, which will prevent the inclusion of foreign materials and damage, by water or dampness. Masonry units shall be handled with care to avoid chipping and breakage, and shall be stored on wooden pallets. Materials stored on newly constructed floors shall be stacked in such manner that the uniformly-distributed loading does not exceed 50 psf. Masonry materials shall be protected from contact with the earth and exposure to the weather and shall be kept dry and clean until used.

## PART 2 – PRODUCTS

### 2.1 CONCRETE MASONRY UNITS

- A. Concrete masonry units shall conform to ASTM C 90, Type I, with maximum linear shrinkage of 0.6% from standard to oven-dried condition. Units shall be medium weight units unless indicated otherwise.
- B. Concrete masonry units shall be modular size as shown or indicated on the drawings, with split-faces or smooth finish as indicated on the plans. Units shall be integrally-colored or standard unit color with painted exterior as indicated on the drawings with color selections from light and medium color range (white, black and dark green not included in color range).
- C. All bond beam, corner, lintel, sill and other specially shaped blocks shall be provided where required or necessary. Specially shaped non-structural blocks may be constructed by saw cutting. Color and texture shall match that of adjacent units. No exposed grouted block cells will be allowed. All exposed masonry surfaces of openings and window and door openings such as sills, heads and jambs shall be finish block surfaces, not formed surfaces, unless indicated otherwise. Closed bottom bond beam blocks shall be used at heads and sills.
- D. Concrete masonry units hidden from view entirely may be natural color units the same size as other adjacent masonry units.

### 2.2 MATERIALS

- A. Portland cement shall be Type I or II, low alkali, conforming to ASTM C 150. No masonry cement will be allowed.

- B. Hydrated lime shall be Type S, conforming to ASTM C 207. Pulverized quicklime shall conform to ANSI/ASTM C 5, shall pass a No. 20 sieve, and 90% shall pass a No. 50 sieve.
- C. Sand shall conform to ASTM C 144. Coarse aggregate shall conform to ASTM C 404.
- D. Water for mixing shall be clear potable water.
- E. Reinforcing steel shall be deformed bars conforming to ASTM A 615, Grade 60.
- F. Any admixtures must be pre-approved prior to usage. See Section 2.4 B.
- G. Veneer ties shall be per local governing code and shall be Hot Dip Galvanized per ASTM 153-B2.
- H. Horizontal Joint Reinforcement shall be Hot Dip Galvanized laddertype per ASTM 153-B2

### 2.3 MORTAR

- A. Mortar for concrete block masonry shall be Type S, with a minimum 28-day compressive strength of 1500 psi.
- B. Mortar for use with colored masonry units shall have integral color as approved by the ENGINEER.

### 2.4 GROUT

- A. Grout shall have a minimum 28-day compressive strength of 2000 psi. Where the grout space is less than 4 inches, pea gravel shall be omitted.
- B. Admixtures may only be used when approved by the ENGINEER. When it has been approved for use, it shall be used in accordance with the manufacturer's published recommendations for the grout.

## **PART 3 – EXECUTION**

### 3.1 GENERAL

- A. Measurements for mortar and grout shall be accurately made. Mortar proportions shall be accurately controlled and maintained.
- B. Work shall be performed in accordance with the provisions of the applicable code for reinforced concrete hollow-unit masonry.
- C. Set or embed all anchors, bolts, reglets, sleeves, conduits, and other items as required.
- D. All block cutting shall be by machine.
- E. Reinforcing steel shall be cleaned of all loose rust and scale, and all oil, dirt, paint, laitance, or other substances, which may be detrimental to or reduce bonding of the steel and concrete.
- F. Immediately before starting work, the concrete upon which the masonry will be laid shall be cleaned with water under pressure.
- G. Full mortar bed for first course shall be provided.
- H. Units shall be shoved tightly against adjacent units to assure good mortar bond.
- I. All equipment for mixing and transporting the mortar and grout shall be clean and free from set mortar, dirt, or other foreign matter.

### 3.2 MIXING

- A. Mortar shall be mixed according to ASTM C 270. After all ingredients are in the mixer, they shall be mechanically mixed for not less than 5 minutes. Retempering shall be done on the mortar board by adding water within a basin formed within the mortar, and the mortar reworked into the water. Mortar, which is not used within 2 1/2 hours, shall be discarded per ASTM requirements.

### 3.3 ERECTION OF CONCRETE BLOCK MASONRY

- A. Masonry work shall be erected in-plane, plumb, level, straight, and true to dimensions and executed in accordance with acceptable practices of the trade.
- B. Unless indicated otherwise, masonry shall be laid up in straight uniform courses with running bond.
- C. All masonry shall be erected to preserve the unobstructed vertical continuity of the cells measuring not less than 3-inch x 3-inch in cross-section. Cross webs shall be full bedded in mortar, to prevent grout leakage. All head (or end) joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.

### 3.4 JOINTS

- A. Vertical and horizontal joints shall be uniform and approximately 3/8-inch wide. Exterior joints and interior exposed block joints shall be concave-tooled to form dense surface. Special care shall be used in tooling joints so as to match existing construction. Interior or exterior non-exposed masonry and masonry behind plaster shall have flush joints.

### 3.5 CLEANOUTS

- A. Cleanout openings shall be provided at the bottoms of all cells to be filled at each lift or pour of grout, where such lift or pour is over 4-feet in height. Any overhanging mortar larger than 1/2 inch or other obstructions or debris shall be removed from the insides of such cells. The cleanouts shall be sealed before grouting and after inspection. Cleanout openings shall match the finished wall in exposed masonry.

### 3.6 REINFORCEMENT

- A. Bond beam blocks shall be used where horizontal reinforcing steel is embedded.
- B. Knock-out openings shall have no steel or joint reinforcing running through the opening. Head, jambs and sill blocks shall be used to provide an even finish surface to install window when blocks are removed. Joints at head, jambs and sills shall be stacked and continuous.
- C. Vertical reinforcement shall be held in position at top and bottom and at intervals as defined on the drawings.
- D. Horizontal joint reinforcing to 16" o.c. in all masonry walls.
- E. Veneer ties shall be provided per Building Code and trade standards where veneered surfaces are indicated and shall be spaced no less than 16" o.c. each way.

### 3.7 GROUTING

- A. All cells and bond beam containing reinforcement shall be filled solidly with grout. Grouting shall not be started until the wall has cured for 24 hours.
- B. All grout shall be consolidated at time of pouring by vibrating. Where the grouting operation has been stopped for one hour or longer, horizontal construction joints shall be formed by stopping the grout pour 1 1/2 inches below the top of the uppermost unit.

3.8 PROTECTION

- A. Wall surfaces shall be protected from droppings of mortar or grout during construction.

3.9 FINISHING AND CLEANING

- B. Masonry shall not be wet-finished unless exposed to extreme hot weather or hot wind and then only by using a nozzle-regulated fog spray sufficient only to dampen the face but not of such quantity to cause water to flow down over the masonry.
- C. Finish masonry shall be cleaned and pointed in a manner satisfactory to the ENGINEER, based upon the approved sample panel.
- D. All interior and exterior colored masonry work exposed to view shall be cleaned to remove all stains and other imperfections.

- END OF SECTION -



**SECTION 05120  
STRUCTURAL STEEL**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide structural steel for building construction including sub-framing units, which are part of the general framing system. Include anchors, bases, bearing plates, bracing, lintels when part of structural framing and detail fittings.
- B. Modify existing structural steel systems and components to accommodate remodeling and new work.

1.2 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 – Submittals.

1.3 QUALITY ASSURANCE

- A. Comply with Governing Codes and Regulations. Provide products of acceptable manufacturers. Use experienced installers. Deliver, handle and store materials in accordance with manufacturer's instructions.

**PART 2 – PRODUCTS**

2.1 MATERIALS

- A. Steel shapes plates and bars:           ASTM A 36 or ASTM A 572, Grade 50
- B. Steel pipe:                                 ASTM A 53
- C. Anchor bolts:                             ASTM A 307
- D. High strength threaded fasteners:    ASTM A 325
- E. Non-metallic shrinkage resistant grout; Euclid Euco NS, L&M Crystex, Sonneborn Sonnegrout or ENGINEER approved equal. Compressive strength suited for Project Requirements.
- F. Shop finish for structural steel in accordance to Section 09900 – Painting.
- G. Galvanized lintels:                     Hot Dip Galvanized ASTM A 123
- H. Welding:                                 AWS D1.1

**PART 3 – EXECUTION**

3.1 INSTALLATION

- A. Comply with AISC Codes and Specifications and with AWS "Structural Welding Code."
- B. Employ a registered ENGINEER to check elevations and plumb and level tolerances; certify that installed work is within AISC Standards. Testing/inspection agency may be employed to inspect welded and bolted connections.
- C. Architecturally exposed steel: Fabricate with special care using materials carefully selected for best appearance. Store materials off ground and keep clean. Cut, fit and assemble work with surfaces smooth, square and with complete contact at joints. Set all cambers up. Weld all work continuously; grind smooth and flush to make seams invisible after priming. Prepare surfaces to comply with SSPC-SP6; apply prime coat within 24 hours after cleaning.

- D. Touch-up field welds and abraded areas in accordance with Section 09900 - Painting.
- E. Provide all necessary bolt, fasteners, anchors, etc. to install or construct this scope of the work.

- END OF SECTION -

**SECTION 05500**  
**MISCELLANEOUS METAL FABRICATIONS**

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Ferrous and non-ferrous metal fabrications not described in other Sections. Items include but are not necessarily limited to:
  - 1. Rough hardware.
  - 2. Access ladders
  - 3. Loose bearing and leveling plates.
  - 4. Miscellaneous framing and supports for:
    - a. Door frames, curtainwall and storefront framing.
    - b. HVAC water lines
    - c. Primary roof conductors and secondary roof conductors
    - d. Applications not specified in other Sections.
  - 5. Angles, plates, supports, and anchors embedded in concrete and masonry.
  - 6. Miscellaneous steel trim, including:
  - 7. Edgings.
  - 8. Pipe bollards.
- B. Related Sections:
  - 1. Section 03300 - Cast-In-Place Concrete: Concrete fill for bollards.
  - 2. Section 05120 - Structural Steel: Structural steel framing system components.
  - 3. Division 9: Painting and Coatings

1.2 PERFORMANCE REQUIREMENTS

- A. General: Fabricate and install metal fabrications to withstand specified loads without exceeding the allowable working stress of the materials involved, including anchors and connections.
  - 1. Apply each load to produce the maximum stress in each component.
  - 2. Allow for thermal movement resulting from a 100 degree F. change (range) in ambient temperature, to prevent buckling, opening up of joints, and overstressing of welds and fasteners.
- C. Metal Plank Gratings: Capable of withstanding a uniform load of 50 lbs. per sq. ft. or a concentrated load of 250 lbs., whichever produces the greater stress.

1.3 SUBMITTALS

- A. Product Data: Submit specifications and installation recommendations for manufactured products furnished under this Section, including paint products and grout. List items by manufacturer name and brand name or catalog number.
- B. Design Calculations: For items specified to meet performance criteria, provide structural data to demonstrate compliance with requirements. Data shall be sealed and signed by a professional Civil or Structural Engineer licensed by the State of California to provide this type of engineering.

- C. Shop Drawings: Submit fabrication and erection drawings including plans, elevations, sections, and details of all metal fabrications and their connections. Show anchorage and accessory items. Provide templates for items to be installed under other Sections.
  - D. Samples: Submit samples of materials or products as requested by Authorized Representative.
  - E. Welder Certificates: Submit certification specified under “Quality Assurance”.
- 1.4 QUALITY ASSURANCE
- A. Reference Standards: Comply with applicable requirements of the following, unless otherwise specified.
    - 1. “Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings” including “Commentary on the AISC Specifications” of the American Institute of Steel Construction (AISC).
    - 2. “Specifications for the Design of Cold-Formed Steel Structural Members” of the American Iron and Steel Institute (AISI).
    - 3. AWS D1.1 “Structural Welding Code - Steel”, D1.3 “Structural Welding Code - Sheet Steel”, and D1.2 “Structural Welding Code - Aluminum” of the American Welding Society (AWS).
  - B. Welders: Certify that each welder has satisfactorily passed all appropriate AWS qualification tests for welding processes involved and that certifications are current.
- 1.5 TESTING LABORATORY SERVICES
- A. Work to Be Tested: The Testing Laboratory specified in “Section 01450 - Testing Laboratory Services” shall inspect welded and bolted connections of the following:
    - 1. Lintel angles and relieving angles.
  - B. Test Procedures: The Testing Laboratory shall inspect and report on shop fabrication and field assembly as follows:
    - 1. Visual weld inspection, according to AWS standards.
    - 2. Radiographic (ASTM E 390) or ultrasonic (ASTM E 164) inspection of welds.
    - 3. Visual and torque inspection of high strength bolted connections, using an inspecting wrench, according to AISC “Specification for Structural Joints”.
- 1.6 PROJECT CONDITIONS
- A. Delivery, Storage and Handling: Deliver materials in undamaged condition. Store items above ground and under cover. Protect from corrosion and contamination by dirt, grease and other foreign material.
  - B. Field Measurements: Before fabrication, field-verify dimensions of construction to which metal fabrications must fit. Show critical dimensions on shop drawings.
  - C. Coordination: Coordinate and cooperate with metalwork supplier to maintain critical construction dimensions.
    - 1. Coordinate and cooperate with metalwork supplier to maintain critical construction dimensions.
    - 2. Coordinate fabrication schedule with construction progress to avoid delay of work.
    - 3. Coordinate location, quantity and dimensions of metal fabrications with related work.

## PART 2 - PRODUCTS

### 2.1 FERROUS METALS

- A. Steel Plates, Shapes and Bars: ASTM A 36.
- B. Rolled Steel Floor Plates: ASTM A 786. Raised diamond tread pattern (Pattern No. 2).
- C. Steel Tubing: ASTM A 500, Grade B, (cold-formed), or ASTM A 501, (hot-formed), structural tubing. Provide tubing with galvanized finish for exterior applications and wherever specified; provide black finish elsewhere.
- D. Steel Sheet: ASTM A 611, Grade A (cold-rolled) or ASTM A 570, Grade 33 unless otherwise specified (hot-rolled).
- E. Galvanized Sheet: ASTM A 446, Grade A, G90 coating designation.
- F. Pipe: ASTM A 53, standard weight (Schedule 40) unless otherwise indicated, Type E, F or S. Provide pipe with galvanized finish for exterior applications and wherever specified; provide black finish elsewhere.
- G. Castings: Gray iron, ASTM A 48, Class 30, or malleable iron, ASTM A 47, grade 32510.
- H. Stainless Steel: Commercial quality, AISI type 302/304, complying with ASTM A-167, finish as indicated.

### 2.2 ALUMINUM

- A. General: Alloy and temper recommended by the manufacturer or specified for the required forming and finishing methods.
- B. Gratings: ASTM B 221 extrusions, alloys as follows:
  - 1. 6061-T6 or 6063-T6 for bearing bars and shapes.
  - 2. 6061-T1 for cross bars.
- C. Use fasteners made of same basic metal as fastened metal except use galvanized fasteners complying with ASTM A 153 for Fasteners for Aluminum Gratings: exterior aluminum units, unless otherwise indicated. Do not use metals that are corrosive or incompatible with metals joined.

### 2.3 GROUT AND ANCHORING CEMENT

- A. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with CE CRD-C 621.
  - 1. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
  - 2. Approved Products/Manufacturers:
    - a. "B-6 Construction Grout"; W. R. Bonsal Co.
    - b. "Euco N-S Grout"; Euclid Chemical Co.
    - c. "Five Star Grout"; Five Star Products.
    - d. "Crystex"; L & M Construction Chemicals, Inc.
    - e. "Masterflow 713"; Master Builders.
    - f. "Sika Grout 212"; Sika Corporation.
    - g. "SonogROUT 14" Sonneborn Building Products Div., Rexnord Chemical Products, Inc.

- B. Epoxy Grout: 100% solids, pre-proportioned epoxy/aggregate non-shrink grout.
  - 1. Provide grout specifically recommended by the manufacturer for interior and exterior applications of type specified in this Section.
  - 2. Approved Products/Manufacturers:
    - a. "Por-Rok Epoxy Grout"; Minwax Construction Products.
    - b. "Euco High Strength Grout"; Euclid Chemical Company.
    - c. "Sikadur 42 Grout-Pak"; Sika Corporation.

## 2.4 CONNECTIONS

- A. General: Use materials same as or compatible with metal being connected. For steel, provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
- B. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported items, unless otherwise indicated.
- C. Expansion Bolts: USM "Parabolt", Red Head "Sleeve Anchors", Hilti "Kwik-Bolt", or similar expanding shield type anchor bolt, galvanized or stainless steel.
- D. Concrete Inserts: Threaded or wedge type capable of sustaining, without failure, the imposed load with a safety factor of 4; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- E. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.
- F. Bolts and Nuts: Regular hexagon head bolts, ASTM A 307, Grade A, with ASTM A 563 hex nuts and flat washers.
- G. High Strength Bolts and Nuts: ASTM A 325 and A 490, as indicated.
- H. Machine Screws: ANSI B18.6.3.
- I. Lag Bolts: ANSI B18.2.1.
- J. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.

## 2.5 PAINT

- A. Shop Primer for Ferrous Metal (where indicated to receive paint under Section 09910): Manufacturer- or fabricator-selected lead-free, modified alkyd primer, which is resistant to normal atmospheric corrosion, compatible with finish paint systems indicated, and able to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Primer for Ferrous or Galvanized Metal (where indicated to receive coating under Section 09910): Use primer as specified in "Section 09910."
- C. Galvanizing Repair Paint: All repairs to damaged galvanized coatings, including but not limited to damage due to welding, shall be performed with zinc-based solder (stick galvanizing) in accordance with ASTM A780. Only where specifically approved by the Professional of Record, high zinc dust content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with ASTM A 780 may be used.
- D. Bituminous Paint: Cold-applied asphalt mastic containing no asbestos fibers.

- E. Zinc Chromate Primer: Alkyd type lead-free zinc chromate protective coating.

## 2.6 CONCRETE FILL AND REINFORCING MATERIALS

- A. Concrete Materials and Properties: Comply with requirements of "Section 03300" for normal weight, ready-mix concrete with minimum 28 day compressive strength of 3,000psi, and a W/C ratio of 0.55 maximum, unless otherwise indicated.
- B. Non-Slip Aggregate Finish: Factory-graded, packaged aluminum oxide grits or crushed emery; rustproof and non-glazing; unaffected by freezing, moisture or cleaning materials.
- C. Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.
- D. Welded Wire Fabric: ASTM A185, unless otherwise indicated.

## 2.7 FABRICATION, GENERAL

- A. Metal Surfaces: For metal fabrications exposed to view in the completed work, select materials for surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller and extrusion marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Materials: Form metal fabrications from materials of type and kind, size, thickness, and shapes indicated but not less than that needed to comply with performance requirements specified.
  - 1. Basic materials specified are acceptable minimum for size, strength and quality. Use materials of higher strength, better quality and larger dimension if necessary because of fabricator's shop practices, materials availability and to comply with specified performance requirements.
- C. Methods: Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
  - 1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
  - 2. Shear and punch metals cleanly and accurately. Remove burrs.
  - 3. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
  - 4. Remove sharp or rough areas on surfaces exposed to contact by building occupants.
  - 5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use Phillips flat-head (countersunk) screws and bolts for exposed fasteners, unless another type is indicated. Locate joints where least conspicuous.
  - 6. Provide for anchorage of type indicated. Coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
  - 7. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
  - 8. Fabricate joints that will be exposed to weather to exclude water. Provide weep holes where water may accumulate.
- D. Shop Welds: Weld corners and seams continuously, to comply with AWS recommendations and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- E. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping, handling, and installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

## 2.8 ROUGH HARDWARE

- A. Anchors and Supports: Furnish bent and otherwise custom fabricated bolts, plates, anchors, hangers, brackets, dowels and other miscellaneous steel and iron shapes for framing, supporting, and anchoring or securing metal fabrications and woodwork to concrete, masonry or other construction. Straight bolts and other stock rough hardware items for anchoring wood members are specified in "Section 06100."
- B. Counter Brackets: For support where indicated, provide stainless, galvanized or prime painted, (material and sizes as indicated on Drawings) steel brackets. Grind smooth all edges, corners and surfaces to eliminate cutting and snagging hazards.
- C. Clip Angles: For attachment where indicated, provide prime painted steel clip angles, 1-1/4" x 1-1/4" x 1/8" (or 11 gauge) 1-1/2" long, spaced not more than 24 inches o. c.
- D. Fabrication: Fabricate items to sizes, shapes and dimensions required. Furnish malleable-iron washers for heads and nuts, which bear on wood; elsewhere, furnish steel washers.

## 2.9 LOOSE BEARING AND LEVELING PLATES

- A. Description: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Plates shall be flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.
- B. Finish: Galvanize after fabrication.

## 2.10 LOOSE STEEL LINTELS

- A. Description: Fabricate loose structural steel lintels from steel angles and shapes of size and at locations indicated. Weld adjoining members to form a single unit where indicated.
- B. Length: Size lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- C. Finish: Galvanize lintels located in exterior walls. Provide prime-painted finish for lintels in interior walls.

## 2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports, which are not a part of structural steel framework, as indicated and necessary for support, bracing and connection of other construction. Fabricate from structural steel shapes, plates and bars of welded construction, for field assembly and connection. Cut, drill and tap units to receive hardware, hangers, and similar items.
- B. Anchors: Equip units with welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, provide steel straps 1-1/4 inches wide x 1/4 inch x 8 inches long, spaced 24 inches o. c.
- C. Finish: Galvanize miscellaneous framing and supports in exterior locations. Provide shop-primed finish for interior locations.

## 2.12 STAINLESS STEEL

- A. Metal Surfaces, General: For surfaces exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Tubing: ASTM A 554, Grade MT 304.
- C. Pipe: ASTM A 312/A 312M, Grade TP 304.
- D. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- E. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
- F. Bars and Shapes: ASTM A 276, Type 304.
- G. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

## 2.13 STAINLESS STEEL FINISHES

- A. General:
  - 1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
  - 2. All exposed work below 8'-0" above Finished Floor shall be Class 1 (Architectural Metals).
  - 3. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.
  - 4. Remove or blend tool and die marks and stretch lines into finish.
  - 5. Grind and polish surfaces to produce uniform directional, textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Exposed Surfaces: Provide the following finish for all exposed surfaces.
  - 1. Bright, Directional Polish: Match AISI No. 4 finish.
  - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## 2.14 STRUCTURAL STEEL DOOR FRAMES

- A. Description: Fabricate steel door frames from structural shapes and bars of size and to dimensions indicated, fully welded. Plug weld built-up members, and continuously weld exposed joints.
- B. Anchors: Secure door frames to adjoining concrete or masonry. Provide 1/8" x 2" straps with a minimum 8" embedment, unless otherwise indicated. Weld anchors to frame jambs not more than 12" from both bottom and head of frame and space intermediate anchors not more than 32" apart.
- C. Finish: Galvanize frames and anchors in exterior locations. Provide prime-painted finish for interior locations.

## 2.15 STEEL PIPE GUARDRAILS AND HANDRAILS

- A. General: Fabricate pipe guardrails and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads. Guardrails and handrails at steel framed stairs are specified under METAL STAIRS in Section 05510.

- B. Exterior Steel Railings: Form from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Interior Steel Railings: Form from steel pipe with black finish. Provide nongalvanized steel or iron fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- D. Joints: Connect railing members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
- E. Fabrication:
  - 1. Form changes in direction of railing members by radius bends.
  - 2. Form simple and compound curves by bending pipe in jigs to produce uniform curvature. Maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
  - 3. Close exposed ends of pipe by welding 3/16" thick steel plate in place or with prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4" or less.
  - 4. Connect railing posts to steel framing by direct welding unless otherwise indicated.
  - 5. For railing posts set in concrete fabricate sleeves from steel pipe not less than 6" long and with an inside diameter not less than 1/2" greater than the outside diameter of post, with steel plate closure welded to bottom of sleeve.
  - 6. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/24 of post height. Provide socket covers designed and fabricated to resist accidental dislodgement.
- F. Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or if not indicated, use 4" high x 1/4" steel plate welded to, and centered between, each railing post.
- G. Brackets, Flanges, Fittings and Anchors: Provide brackets, end closures, flanges, miscellaneous fittings and anchors for interconnections of railings and attachment to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.
  - 1. For galvanized railings, provide galvanized brackets, flanges, fittings and anchors.
  - 2. For nongalvanized railings, provide nongalvanized brackets, flanges, fittings and anchors, except provide galvanized anchors embedded in exterior concrete and masonry.

## 2.16 WHEEL GUARDS

- A. Description: Provide wheel guards of 3/4" thick, hollow core, gray-iron castings, of size and shape indicated. Provide holes for countersunk anchor bolts and grouting.

## 2.17 FLOOR ACCESS DOORS

- A. Description: Upward-acting single leaf aluminum floor door.
  - 1. Frame: 1/4" thick extruded aluminum with built-in neoprene cushion and strap anchors bolted to exterior surface.
  - 2. Door Leaf: 1/4" thick aluminum diamond plate, reinforced if necessary to support 150 lbs./sq. ft. live load without deflection more than 1/150 of span.

3. Hardware: Steel can action hinges, torsion bar counterbalance mechanism; doors shall automatically lock in 90 degree open position. Stainless steel snap lock with removable release handle on upper side. Release and closing of open door by means of vinyl grip handle.

B. Acceptable Products: One of the following, or pre-bid approved equal:

1. Bilco Co., Model K.
2. Dur-Red Products, Model SEA.

## 2.18 SHELF AND RELIEVING ANGLES

A. Description: Fabricate shelf and relieving angles from steel angles of sizes indicated. Provide slotted holes to receive  $\frac{3}{4}$ -inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o. c., unless otherwise indicated. Align expansion joints in angles with expansion joints in masonry.

1. Furnish wedge-type concrete inserts, complete with fasteners, for attachment of angles to cast-in-place concrete.
2. Provide brackets to support angles at cavity walls from back-up masonry and structural framing.

B. Finish: Galvanize angles and bolts for exterior masonry.

## 2.19 PIPE BOLLARDS

A. Fabricate pipe bollards from galvanized Schedule 80 steel pipe.

1. Bollards shall be 8" diameter, 48" high and 48" in ground unless otherwise shown on Drawings.

B. Sleeve Anchorage: Fabricate sleeves for bollard anchorage from steel pipe with 1/4 inch thick steel plate welded to bottom of sleeve, and with an inside diameter not less than 1/2 inch greater than bollard outside diameter.

1. Fill bollards with concrete as shown on Drawings.

## 2.20 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes. Finish items after fabrication.

B. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process after fabrication. Comply with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and non-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

C. Prime Painted Finish: Apply shop primer to all surfaces of metal fabrications, except those with galvanized finish. Do not paint contact surfaces, which are to be welded, high strength bolted and riveted.

1. Preparation for Shop Priming: Clean ferrous metal of scale, rust, oil, moisture, and dirt before applying paint. Comply with SSPC Articles SP-1, "Solvent Cleaning", and SP-3 "Power Tool Cleaning" or SP-7, "Brush-Off Blast Cleaning".

D. Stainless Steel Finish: Bright, Directional Polish: No. 4 finish

1. Remove or blend tool and die marks and stretch lines into finish.
2. Grind and polish surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
3. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## 2.21 Floor Drains

- A. General: Unless noted otherwise, all floor drains shall consist of an 8-inch coated cast iron floor drain with a P-Trap and outlet drain size per plan.
- B. Manufacturers: Zurn Z415B or equal.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Examination: Examine surfaces and spaces to receive metal work. Inspect for proper size, structural soundness, and location. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Coordination: Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery and installation of such items.

### 3.2 INSTALLATION, GENERAL

- A. Embedded Items: Set sleeves and other metal fabrications embedded in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.
- B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications and for properly transferring loads to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- C. Cutting, Fitting and Placement: Perform cutting, drilling, shimming, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrications accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; and measured from established lines and levels. Use metal, same as item being installed, for shimming; for exposed work, fill shim space uniformly with non-shrink nonmetallic grout.
  - 1. Provide temporary bracing and support for items that are to be built into concrete, masonry and similar construction.
  - 2. Fit exposed connections accurately to form hairline joints. Weld connections, which are not to be left as exposed joints, but cannot be shop welded because of installation conditions or shipping size limitations. Do not weld, cut or abrade the surfaces of units, which have been hot-dip galvanized, and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

### 3.3 SETTING LOOSE PLATES

- A. Preparing Surfaces: Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Positioning: Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout.
- C. Grouting: Pack non-shrink nonmetallic grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Anchor supports securely to, and rigidly brace from, building structure.

### 3.5 INSTALLATION OF BOLLARDS

- A. Bollards: Fill bollards fully with concrete having a 28-day minimum compressive strength of 3,000psi. Finish top of concrete smooth and uniform, crowned to shed water.

### 3.6 INSTALLATION OF RAILINGS

- A. General: Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings.
  - 1. Set posts plumb in each direction within 1/8" in 3 feet.
  - 2. Align rails level (or properly sloped) within 1/4" in 12 feet.
  - 3. Do not cut, weld or abrade surfaces that have been finished after fabrication and are intended for field connection by mechanical or other means without further cutting and fitting.
- B. Anchoring Rail Ends:
  - 1. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
  - 2. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
- C. Wall-Mounted Handrails: Secure wall handrails with brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support design loads. Secure wall brackets and wall return fittings to building construction as follows:
  - 1. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
  - 2. For concrete and solid masonry, use drilled-in expansion shield and concealed hanger bolt.
  - 3. For hollow masonry anchorage, use toggle bolts having square heads.
  - 4. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.
  - 5. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

D. Railing Connections:

1. Non-welded Connections: Use mechanical joints for connecting components. Locate exposed fasteners in least conspicuous locations. Seal recessed holes of exposed locking screws with plastic filler cement, colored to match finish of rails.
2. Welded Connections: Use fully welded joints for connecting components. Cope or butt components to provide full contact, or use fittings designed for this purpose.

3.7 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanizing Repair: All repairs to damaged galvanized coatings, including but not limited to damage due to welding, shall be performed with zinc-based solder (stick galvanizing) in accordance with ASTM A780. For galvanized surfaces clean welds, bolted connections and abraded areas and apply zinc-based solder to comply with ASTM A 780.
  1. Only where specifically approved by the Professional of Record, high zinc dust content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with ASTM A 780 may be used.
- C. Completion: Completed metal work shall be securely anchored, free from rattles and excessive vibration during use. Items shall be plumb, level, straight and properly aligned. Exposed grouting shall be neat, uniform, and without holes and gaps.
  1. Joints shall be snug fitting and uniform; exposed welds shall be ground smooth and touched-up, and free of crevices, spatter and flux. Bolts, screws, nuts and other threaded fasteners shall occur only where permitted, and shall be drawn up tightly but not over-tightened; exposed heads and nuts shall be undamaged.
  2. Remove, adjust and reinstall, or remove and replace, items, which are not in compliance due to improper installation and materials, and items, which are defective or damaged.
  3. Clean finished surfaces, which are soiled and marked by metal work installation. Remove and replace other materials, which cannot be cleaned and those damaged by metal work installation.

-END OF SECTION-

**SECTION 05501**  
**MISCELLANEOUS METALS, FASTENERS AND SPECIAL FINISHES**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

A. Provide all labor, materials, bolts, fasteners, equipment and service necessary for fabrication and erection of structural steel and aluminum and for fabrication and installation of miscellaneous non-ferrous metals in accordance with the Contract Documents and not specifically included under other Sections of these Specifications.

1. Erection
2. Shop and Erection Drawings
3. Shop Painting
4. Galvanizing
5. Aluminum Work Protection
6. Cleaning Aluminum Work
7. Miscellaneous Items
8. Loose Lintels
9. Sleeves and Inserts
10. Aluminum Pipe Railing
11. Plate Covers and Frames
12. Guard Chains
13. Lifting Hooks
14. Sand Trap Grating and Frame
15. Cast Iron Wheel Guard
16. Cast Aluminum Nosings
17. Floor Hatches and Frames
18. Access Doors

B. Related Sections:

1. Section 04200 – Reinforced Concrete Block Masonry
2. Section 05530 – Aluminum Grating

1.2 REFERENCES

A. All work under this Section shall be governed by:

1. Specifications for the design, fabrication and erection of structural steel for buildings – American Institute of Steel Construction, current edition.
2. Aluminum Construction Manual, Section 1, Specifications for Aluminum Structures – The Aluminum Association.
3. All welding shall conform to the latest code of the American Welding Society.
4. ASTM A 276

5. ASTM A 325
6. ASTM F 593, 294
7. Federal Specification FF-S-325
8. ASTM A 48
9. Federal Specification TT-V-51F
10. ANSI B94.12
11. ASTM A 12, A 153, A 384, A 593 and A 780
12. SSPC SP-1, SP-2, SP3, SP-7

### 1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. As required by the Specifications, submit for review completely detailed and certified shop and erection drawings of the miscellaneous metal work. All Coatings or other protection against corrosion to be applied at the shop or in the field shall be indicated on these drawings. The shop drawings for aluminum work shall show the alloys and tempers to be used, and the finish, if any to be applied.
- C. Shop drawings, giving complete information necessary for fabrication, layout and installation of metal work shall be submitted to the ENGINEER for review prior to fabrication.
- D. Preparation of shop drawings for fabricated metal items shall be coordinated with the manufacturers, of various equipment in order to comply with details, locations, openings and arrangements required by the manufacturers, of various equipment in order to comply with details, locations, openings and arrangements, required by the manufacturers.
- E. Field measurements shall be made to verify all dimensions in the field, which may affect installation of work before shop drawings are made and/or fabrication is performed.

### 1.4 QUALITY ASSURANCE

- A. The design, detail and workmanship of steel plates and structural steel shall conform to the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. Where welding is permitted or required, it shall conform to the current requirements of the American Welding Society for the type of work in question.
- C. Aluminum work shall be fabricated in a shop where the quality of work is in accordance with the highest standards for work of this type. All work shall be executed by mechanics skilled in the fabrication of aluminum, and shall be true to detail with sharp, clean profiles, fitted with proper joints and intersections and with finishes as specified.
- D. All miscellaneous metal work shall be formed to shape and size with sharp lines and angles. Shearing and punching shall leave clean true lines and surfaces.

### 1.5 RESPONSIBILITY FOR DIMENSIONS

- A. The general design and dimensions of the miscellaneous metal work are indicated on the Drawings, correctness of the details and dimensions of the finished articles is required. Verification of conditions at the job before fabrication and coordination of the work with that of all other trades to prevent interference.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Steel plated and structural steel shapes shall conform to ASTM Standard Specification for Structural Steel, Designation A36.
- B. Sheet steel shall be cold rolled or hot rolled carbon sheet steel conforming to ASTM Standard Specification for Steel, Carbon, Cold Rolled Sheet, Commercial Quality, Designation A36 or ASTM Standard Specification for Steel, Carbon (0.15 maximum, percent), Hot Rolled Sheet and Strip, Commercial Quality, Designation A569, as appropriate.
- C. Steel pipe shall conform to ASTM Standard Specifications for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless, Designation A53.
- D. Stainless steel shall be Type 304 unless otherwise indicated or specified.
- E. Aluminum work shall be fabricated of plates, rolled or extruded shapes, sheets or casting conforming (unless otherwise permitted or indicated) to the following alloy and temper designations of the Aluminum Association:
  - 1. Structural rolled or extruded shapes 6061-T6.
  - 2. Extruded shapes 6063-T5.
  - 3. Plates 6061-T6.
  - 4. Gratings (bearing bars) 6061-T6 (crimp bars) 6063-T6.
  - 5. Castings 214.
  - 6. Sheets 3003-F.
  - 7. Bolts and nuts 2024-T4.
  - 8. Pipe Railing 6063-T6.

### 2.2 STEEL

- A. Structural steel shall conform to the requirements of ASTM A-36. Structural tubing, where used, shall conform to the requirements of ASTM A-500, Grade B, and the ends of the tubing shall be properly sealed to protect the internal surfaces. Steel anchor bolts shall be ASTM A-36 hot rolled threaded rod or bar stock, except where stainless steel is indicated on the Drawings.
- B. Structural steel members as required shall conform to ASTM Standard shapes.
- C. Base and bearing plates shall be provided where necessary to provide maximum bearing value of not more than 200psi on solid concrete masonry units not more than 750psi on concrete and shall be grouted in place.
- D. Steel lintels shall be provided for all square head openings in masonry where shown and where other lintels are not indicated on the Drawings. Lengths of bearing at each end of lintels shall be not less than 1 inch per foot of span, but in no case less than 8 inches shall be increased or the lintels shall be fitted with bearing plates as required to provide unit pressures in pounds per square inch of not more than 200 on solid concrete masonry units and 625 on concrete. All new steel lintels shall be shop primed and ready to receive coatings as specified under Section 09900 Painting. Finish coats are specified in Division 09 – Finishes.

### 2.3 SHOP PAINTING

- A. Painting of miscellaneous ferrous metal work is specified under Division 9.

## 2.4 GALVANIZING

- A. Items of miscellaneous iron work and steel work indicated on the Drawings or specified to be galvanized shall be zinc coated by the hot dip process in conformity with ASTM Standard Specification for Zinc (hot galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip, Designation A123-78; or ASTM Standard Specifications for Zinc Coating (hot-dip) on Iron and Steel Hardware, Designation A153-78, as appropriate. Galvanizing is specified under Article 3.04, "Hot-Dip Galvanizing."

## 2.5 ALUMINUM

- A. All structural and miscellaneous aluminum shall be Alloy 6061 (Alloy 6063 for extrusions), Temper T6, unless otherwise noted, indicated or accepted by the CITY. Where welding is necessary in fabrication, it shall be done in conformance with Section 7 "Welded Construction" of Specification for Aluminum Structures, referenced hereinbefore.

## 2.6 ALUMINUM WORK PROTECTION

- A. Aluminum surfaces which after erection would otherwise be in contact with concrete or brick masonry or with mortar, shall be protected from contact therewith by a coat of bitumastic super service black manufacturer by the Koppers Company, Inc. Pittsburgh, PA; Tarmastic 100 manufactured by Porter Coating Division, Porter Paint Company, North Kansas City, MO; or an acceptable equivalent product. Areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as directed so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected. Before application of coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil and other foreign substances and shall be immersed in or swabbed with an acceptable solvent. Next the surfaces shall be rinsed with clear water and thoroughly dried.
- B. Attention of the Specifications in regard to protection against electrolysis where aluminum is to be used in conjunction with dissimilar metals is required.
- C. Where a shop coating of methacrylate lacquer has been specified on aluminum work to protect the surface from stain, the protective coating of lacquer worn off during handling or erection shall be replaced in the field by a new coating of lacquer of the same type.
- D. During construction, care shall be taken to prevent damage to the aluminum work from splashing or the accumulation of paint, concrete, mortar, or other similar materials.

## 2.7 STAINLESS STEEL

- A. Stainless steel shapes shall be ANSI Type 304 or 316 in accordance with ASTM A-276. Miscellaneous bar stock products such as pipe straps shall be 300 Series stainless steel. Anchor bolts, nuts and washers shall be ANSI Series 300 stainless steel.

## 2.8 FASTENERS

- A. Bolts, Nuts and Washers:
  - 1. Structural bolts shall be ANSI Type 300 Series stainless steel in accordance with ASTM F-593, with ASTM F-594 nuts. All bolts shall have hexagonal heads.
  - 2. Anchors and bolts including nuts and washers shall be provided where necessary for securing the work in place. Sizes, types and spacings of anchors and bolts not indicated or specified otherwise shall be as necessary for their purposes. Anchor bolts and anchors for the erection of structural steel shall be stainless steel Type 316. Anchored bolts, nuts, and washers for all other uses including, but not limited to, underwater use and for the installation of equipment, piping, pumps and motors shall be stainless steel Type 316.

B. Expansion Anchors (In Concrete):

1. Expansion anchors shall be of three (3) types:
  - a. Stainless steel wedge type.
  - b. Self-drilling plated type with stainless steel bolt and stainless steel washer.
  - c. Type of expansion anchor desired shall be noted on Drawings.
2. Stainless steel wedge type anchors shall be ITW Ramset/Red Head or ENGINEER approved equal of Type 316 stainless steel. Anchors shall meet or exceed latest Government GSA Federal Specifications FF-S-325, Group II, Type 4, Class 1. Anchor shall be used with 300 series stainless steel bolt and washer.
3. Self-drilling plated anchors shall be ITW Ramset/Red Head or ENGINEER approved equal. Anchors shall meet or exceed latest Government GSA Federal Specification FF-S-325, Group III, Type 1. Self-drilling anchors shall be electro-deposited zinc plated and chromate dipped, to meet or exceed the requirements of the latest Federal Specification QQ-Z-325, Type II, Class 3. Cutting teeth shall have minimum hardness of 82 Rockwell A scale.
4. Steel expansion anchors shall be installed in accordance with manufacturer's recommendations.
5. Self-drilling expansion anchors shall be installed in accordance with manufacturer's recommendations. To insure full development strength, all self-drilling expansion anchors shall be expanded over the plug in the final set, by using a bolt screwed into the female threads and impacted by hand with a suitable hammer. The final set shall not be accomplished by using the drilling tool.
6. After installation, pull-out tests by the anchor manufacturer's representative may be requested by the Engineer. If so, the Engineer will specify the number and location of the tests.

2.9 MISCELLANEOUS ITEMS

- A. Items of miscellaneous metal work not particularly specified hereinafter shall be of the shape, size, materials and details indicated on the Drawings or suitable for the purpose intended.

2.10 LOOSE LINTELS

- A. Furnish all loose lintels as indicated on the Drawings or required by the Work. The loose lintels shall be fabricated from structural steel shapes and plates. All loose lintels shall be shop primed and ready to receive coatings as specified under Section 09900 - Painting.

2.11 SLEEVES AND INSERTS

- A. Attention is directed to the requirements of the Specifications regarding sleeves and inserts.

2.12 ALUMINUM PIPE RAILING

- A. The aluminum pipe railing shall be the product of company normally engaged in the manufacture of pipe railing. Railing shall be shop assembled in lengths not to exceed 24-feet for field erection.
- B. Handrails and stair rails shall be designed to withstand a 200 pound concentrated load applied in any direction at any point on the top rail. Handrails and stair rails shall also be designed to withstand a load of 50 pounds per foot applied horizontally to the top rail. The 200 pound load will not be applied simultaneously with the 50 pounds per foot load. In addition, the handrails shall be designed to withstand a load of 100 pounds per foot horizontal load. The 100 pounds per foot vertical load does not apply to stair rails.
- C. The manufacturer shall submit calculations to the Engineer for approval. Testing of base castings or base extrusions by an independent lab or manufacturer's lab (if manufacturer's lab meets the requirements of the Aluminum Association) will be an acceptable substitute for calculations. Calculations will be required for approval of all other design aspects.

- D. Post spacing shall be a maximum of 6-feet 0 inches. Posts and railings shall be a minimum of 1½ inches Schedule 40 aluminum pipe alloy 6063-T6, ASTM B 429 or ASTM B 221. The handrail manufacturer shall show that their posts are of adequate strength, the manufacturer may reduce the post spacing or add reinforcing dowels or may do both in order to meeting loading requirements.
- E. The handrail shall be made of pipes joined together with component fittings. Samples of all components, bases, toe plate and pipe must be submitted for approval. Components that are glued at the joints will not be acceptable. Handrail and components shall be Kee Clamp, Inc., Golden Railings or approval equal.
- F. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminators.
- G. The midrail at a corner return shall be able to withstand a 200 pound load without loosening.
- H. Expansion bolts shall be spaced 10 diameters apart and 5-diameter edge distance for not reduction in pullout strength. A safety factor of four shall be used on expansion bolt pullout values published by the manufacturer.
- I. Toe plate shall conform to OSHA Standards. Toe plate shall be a minimum of 4 inches high and shall be an extrusion that attaches to the posts with clamps, which allow for expansions and contraction between posts. Toe plates shall be set ¼-inch above the walking surface. Toe plates shall be provided on handrails as required by OSHA and/or as shown on Drawings. Toe plates shall be shipped loose in stock lengths with pre-manufactured corners for field installation.
- J. Openings in the railing shall be guarded by a self-closing gate. Safety chains shall not be used unless specifically shown on the Drawings.
- K. Finish shall be Aluminum Association M10-C22-A41 (215-R1). The pipe shall be plastic wrapped. The plastic wrap is to be removed after erection.
- L. Aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a coat of bituminous paint, mylar isolators or other approved material.

#### 2.13 PLATE COVERS AND FRAMES

- A. The plate covers and frames shall be the sizes indicated on the Drawings. The frames shall be aluminum angles of the sizes indicated with welded strap anchors for securing the frames in the concrete. The frames shall have mitered corners with welded joints ground smooth where exposed.
- B. The covers shall be ¼-inch thick aluminum tread plate having an acceptable nonskid surface and reinforced with aluminum bars welded to the underside of the cover in accordance with the details. Plate covers shall be capable of supporting a uniform superimposed load of 100 psf for the span with a deflection of less than ¼-inch based on allowable fiber stress of 16,000 psi. The covers shall be made to fit neatly and accurately in the frames.
- C. Hinged covers shall be furnished with heavy-duty stainless steel, plain bearing hinges with stainless steel pins. The hinges shall be fastened to the covers and frames with stainless steel machine screws. The hinged covers shall be provided with flush lift handles fabricated from ½-inch diameter aluminum rod, alloy 6061-T6511.
- D. A single leaf of hinged plate covers shall be no greater than 3 -feet x 5-feet in size.
- E. Removable plate covers shall have 1-inch diameters finger holes to facilitate removal. All edges of holes cut in the plate covers shall be ground smooth.
- F. Removable plate covers shall be no greater than 14 square feet in size with the longer dimension no greater than 7-feet.

- G. Gasket plate covers shall have continuous compressible neoprene seals between the cover and the frame at the perimeter. The covers shall be secured to the frames with countersunk, flathead, stainless steel machine screws spaced approximately 6 inches on centers.

#### 2.14 GUARD CHAINS

- A. Removable guard chains at openings in aluminum pipe railings shall be fabricated from wrought, non-welded aluminum chain having 12 links per foot. The chains shall be secured to aluminum eyes bolted or welded to pipe stanchion at one end of the opening. The free ends of the chains shall be provided with hooks formed from 1/4-inch diameter solid aluminum rod for attaching to similar eyes in the pipe stanchion at the opposite end of the opening.

#### 2.15 CAST IRON WHEEL GUARDS

- A. Wheel guards where indicated on the Drawings shall be cast iron guards of the sizes and types indicated on the Drawings as herein specified and shall be manufactured by Neenah Foundry Company, Neenah, WI; Flockhart Foundry Company, Newark, NJ; McKinley Iron Work, Fort Worth, TX or ENGINEER approved equal. Wheel guards shall be given one shop coat of rust inhibitive paint before shipment.
- B. Wheel guards shall be heavy-duty concrete fill type, cast iron wheel guards, No., R-4983-C manufactured by Neenah Foundry Company Type 706A manufactured by Flockhart Foundry Company or ENGINEER approved equal. The guards shall be set 2 inches into the pavement and shall be bolted to the masonry walls. The guards shall be filled with Class A concrete and the top of the fill sloped at a 15 degree angle from the building.

#### 2.16 CAST ALUMINUM NOSINGS

- A. The cast aluminum nosing shall be abrasive cast aluminum nosing securely fastened with stainless steel, flat head bolts and wing anchors set into the fresh concrete. The nosings shall be the products of Wooster Products, Inc., Wooster, OH; American Abrasive Metals Company, Irvington, NJ; Andco Building Specialties or ENGINEER approved equal.

#### 2.17 FLOOR HATCHES AND FRAMES

- A. The floor hatches and frames shall be flush floor hatches provided by manufacturer as shown in the Drawings or ENGINEER approved equal. Where noted, the hatches shall be H-20 rated. The hatches shall be double or single leaf type and of the sizes indicated on the Drawings. The hatches shall be factory assembled and shipped complete with frame for installation on the job. The hatches shall be furnished with hinges, hold open safety lock bars, and flush lift handles. Gutter type hatches shall have a 1 1/2-inch drainage coupling located in one corner of the channel frame.
- B. The floor hatches and frames shall be fabricated from aluminum with 1/4-inch extruded aluminum frames and 1/40 inch diamond checkered aluminum plate covers. The covers shall be reinforced to be capable of withstanding a uniform live load of 300 psf (min.).

#### 2.18 ACCESS DOORS

- A. Doors shall be flush panel access doors as manufactured Inryco, Inc., Milwaukee, WI; Karp Associates, Inc., Maspeth, NY; BOICO, Birmingham, AL or ENGINEER approved equal. Doors and frames to be steel with concealed hinge and flush screwdriver operated locks.

#### 2.19 CASTINGS

- A. All miscellaneous iron castings shall be of best quality materials free from flaws and unsightly defects. Gray cast iron shall be ASTM A 48 Class 35 (35,000 psi tensile strength). Furnish and install in the locations indicated casting of the type and size shown on the Drawings.

## 2.20 CARPENTERS IRON WORK

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing woodwork to concrete or other structures. Manufacture or fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for head and nuts which bear on wood structural connections, elsewhere, furnish steel washers.

## 2.21 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Provide miscellaneous steel framing and supports as required to complete the work. Fabricate miscellaneous units to the sizes, shapes and profiles shown or if not shown, of the required dimensions to receive adjacent grating plates, louvers, vents, grilles, screens or other work to be retained by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of all welded construction using mitered corners, welded brackets and splice plates and a minimum number of joints for filed connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the work.

## PART 3 – EXECUTION

### 3.1 ANCHORAGE ITEMS

- A. Furnish all bolts, nuts, shims, pins, screws, nails and other anchors, which, may be required by the Drawings or job conditions to secure all items permanently in place whether or not specifically called for or shown on the Drawings.

### 3.2 FABRICATION AND INSTALLATION OF METAL WORK

- A. General: All metal items shall be accurately fabricated and erected with exposed joints close fitting. All joints shall be such of character and so assemble that they will be as strong and rigid as adjoining sections. Joints shall be located where least conspicuous. Items shall have smooth finished surfaces except where otherwise shown or specified.
- B. Built-In Items: Members or parts to be built-in with masonry or concrete shall be in a form affording a suitable anchorage or shall be provided with approved anchors, expansion shields or other approved means of securing members.
- C. Dissimilar Metals: Ferrous and non-ferrous metals shall be insulated at all contacts with felt washer, strips or sheets, bitumastic paints, or other acceptable means. All aluminum surfaces in contact with concrete shall be coated with two (2) coats of Federal Specification TT-V51F Asphalt Varnish or ENGINEER approved equal.
- D. Connections:
  - 1. All required anchors, couplings, bolts and nuts required to support miscellaneous metalwork should be furnished and installed as required.
  - 2. Weights of connections and accessories shall be adequate to safely sustain and withstand stresses and strains to which they will be normally subjected.
  - 3. Connections shall be bolted except where welding is called for in the Drawings. Bolts shall be  $\frac{3}{4}$ -inch diameter unless noted or required otherwise.
- A. Expansions Anchors:
  - 1. Expansions anchors shall be installed in holes drilled into concrete with carbide tipped drill bits conforming to ANSI B94.12-1977, using a rotary impact hammer for  $\frac{1}{2}$ -inch and  $\frac{3}{8}$ -inch anchors. Hole depth shall equal or exceed the anchor manufacturer's minimum recommended embedment. Should hole depth equal anchor manufacturer's minimum recommended embedment, hole shall be cleaned out

by air pressure. The minimum hole depth shall be per anchor manufacturer's recommendations. Assure hole is perpendicular and conforms in size to anchor manufacturer's recommendation.

2. Washer and nut shall be assembled on anchor so that the top of the nut is flush with the top of the anchor. Then the anchor shall be driven into the hole through the work until the washer bears against the work. The anchor shall be expanded in accordance with the manufacturer's recommendations.
3. General: Provide stainless steel fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
4. Bolts and Buts: Regular hexagon head type, stainless steel, Grade A (within tankage)
5. Lag Bolts: Stainless steel (within tankage)
6. Machine Screws: Stainless steel
7. Wood Screws: Stainless steel
8. Plain Washers: Stainless steel
9. Masonry Anchorage Devices: Galvanized
10. Toggle Bolts: Stainless steel (within tankage)
11. Lock Washers: Stainless steel
12. Bolts, buts, lags, toggle bolts and lock washers above and exterior to tankage shall be galvanized

### 3.3 WELDING

- A. Welding procedures, welders and welding operators, both for shop and field welding, shall be qualified and certified in accordance with the requirements of AWS D1.1 "Welding in Building Construction" of the American Welding Society. Manufacturer's and fabricator's shop drawings shall clearly show complete information and all field welding shall be performed in conformance with this information regarding location, type, size and length of all weld, all in accordance with AWS A2.0 "Standard Welding Symbols" of the American Welding Society. Special conditions shall be fully explained by notes and details.

### 3.4 HOT-DIP GALVANIZING

- A. All fabrication, galvanizing and repair shall comply with ASTM Standards as they apply in accordance with the publication "ASTM Standard for Materials Hot-Dip Galvanized after Fabrication, 1981" issued by American Hot-Dip Galvanizers Association, Inc. In particular, the following specific standards shall apply to work under this contract: ASTM A 123, A 153, A 384, A 385, A 563 and A 780.
- B. Items to be galvanized shall be fabricated in accordance with ASTM A 385-80.
- C. Galvanizing for fabricated steel items, shall conform to ASTM A 123-78 and shall be done after fabrication. Steel assemblies shall be subject to safeguarding from warpage and distortion during galvanizing per ASTM A 384-76.
- D. Galvanizing for structural steel fasteners and hardware shall conform to ASTM A 153-80. Galvanized bolts, nuts and washers shall be centrifugally spun after galvanizing. Nuts shall have threads tapped oversize, after galvanizing, in accordance with ASTM A 563-80.
- E. Upon field erection, any damage measuring more than  $\frac{1}{10}$ -inch wide shall be repaired with a zinc-based solder or zinc-rich paint in accordance with ASTM A 780-80. Marred, damaged, or uncoated areas 4-square inches and less shall be patched with a zinc-based solder to a thickness of 5-milligrams; areas greater than 4-square inches shall be patched with an organic zinc-rich paint to a dry film, Devcon Z, LPS Instant Cold Galvanized or ENGINEER approved equal. The resident project representative shall determine the extent of damage, which would require recoating.

- F. Items subject to distortion during transit, such as thin, curved members, etc., shall be stacked on edge and/or blocked to prevent radius change or other distortion while in transit to and from the galvanizing plant.

### 3.5 PAINTING

- A. Painting of miscellaneous ferrous metal work is specified under Division 09 - Finishes.

### 3.6 MISCELLANEOUS METAL FABRICATIONS

#### A. Rough Hardware:

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structure. Straight bolts and other stock rough hardware items are specified in Division 05 - Metals.
2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts, which bear on wood structural connections; elsewhere, furnish steel washers.

#### B. Miscellaneous Steel Trim:

1. Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.
2. Galvanize miscellaneous steel trim where indicated.

- END OF SECTION -

**SECTION 05565**  
**COMMERCIAL STEEL SECURITY FENCE SYSTEM**

**PART 1 – GENERAL**

1.1 WORK INCLUDED

- A. The CONTRACTOR shall provide all labor, materials and appurtenances necessary for installation of the steel corrugated pale security fence system defined herein.

1.2 RELATED WORK

- A. Section 02200 - Earthwork
- B. Section 03300 - Concrete

1.3 SYSTEM DESCRIPTION

- A. The CONTRACTOR shall supply a steel security fence system (including the reinforced concrete footings) of a Welded and Steel Corrugated Pale Security (Trident Type) Fence System. The system shall be 8' height from the finished grade. The system shall include all necessary components (i.e., panels, posts, gates and hardware) needed for installation. CONTRACTOR and or manufacturer shall be responsible for providing the necessary coating of the provided Fence System per the contract documents.

1.4 QUALITY ASSURANCE

- A. The CONTRACTOR shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.5 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- C. ASTM D523 - Test Method for Specular Gloss. 0020
- D. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- E. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- F. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- G. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- H. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- I. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- J. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

## 1.6 SUBMITTAL

- A. Submittal shall include necessary structural calculations stamped by a licensed engineer in the State of California for the applicable site conditions. Submittal shall also include necessary layout drawings, detailed bill of materials, and intended Coatings System of the fence system shall also be included in the submittal.

## 1.7 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

## 1.8 PRODUCT WARRANTY

- A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.
- B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

## **PART 2 – MATERIALS**

### 2.1 MANUFACTURER

- A. Impasse II High Security Steel Fence System by Ameristar Fence
- B. Or Engineer Approved Equal.

### 2.2 MATERIAL

- A. Steel material for fence framework (i.e., corrugated pales, rails and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft<sup>2</sup> (276 g/m<sup>2</sup>), Coating Designation G-90.
- B. Material for corrugated pales shall be a nominal 2.75” x .75” x 14 Ga. Tamperproof fasteners shall be used to fasten each pale to rail at every intersection. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

### 2.3 FABRICATION

- A. Pales, rails and posts shall be pre-cut to specified lengths. All rails shall be pre-punched to accept tamperproof security fasteners. Post flange shall be pre-punched to accept rail to post attachment. Post web shall be punched providing a clear opening for interior of rails to align throughout the entire system for affixing conduit, video cabling, IDS wiring, and other components for a complete systems integration. All rails shall be attached to post flange providing a bracket-less design at each intermediate post.
- B. The manufactured galvanized framework shall be subjected to the PermaCoat® thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash, an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be (specify Black, Bronze,

White, or Desert Sand). The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

- C. Completed panels shall be capable of supporting a 400 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 30° change in grade.
- D. Fence system shall be designed to minimize the system impedance to comply with IEEE grounding requirements. No additional grounding material, beyond the structure grounding lug installation, will be required to create a safe low resistance fence system. By way of fence construction, the entire fence system is inherently grounded without the need for any additional work. Grounding location at the post is for taking the fence system to site ground.
- E. Swing gates shall be fabricated using 2" sq. x 12ga rail, 2" sq. x 12ga. gate ends, and 2.75" x .75" x 0.075 pales. Gates that exceed 6' in width will have a 2" sq. x 11ga. intermediate upright. All rail and upright intersections shall be joined by welding. All pale and rail intersections shall also be joined by welding.

### **PART 3 – EXECUTION**

#### **3.1 PREPARATION**

- A. All new installation shall be laid out by the CONTRACTOR in accordance with the construction plans.

#### **3.2 FENCE INSTALLATION**

- A. Fence post shall be spaced according to Table 3, plus or minus 1/4". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to the line and end posts with fasteners supplied by the manufacturer. Attachment to corner post shall be made using brackets and fasteners supplied by the manufacturer (See Figure 1). Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

#### **3.3 FENCE INSTALLATION MAINTENANCE**

- A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray.

#### **3.4 GATE INSTALLATION**

- B. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

#### **3.5 CLEANING**

- C. The CONTRACTOR shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

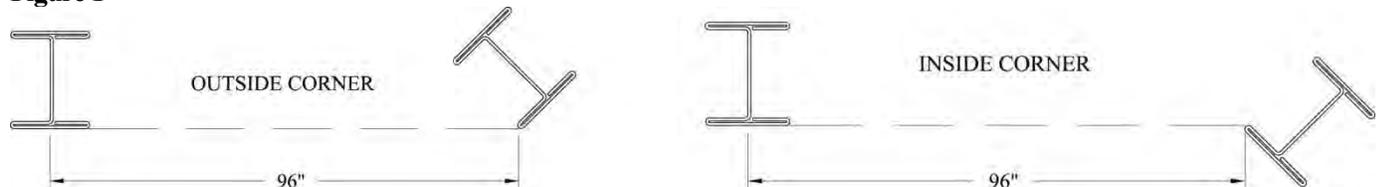
Table 1 – Minimum Sizes for Posts				
Fence Posts (Nominal)		Panel Height		
3" x 2.75" x 12 Ga. I-Beam		Up to & Including 8' Height		
4" x 2.75" x 11 Ga. I-Beam		Over 8' Height up to & including 10' Height		
Gate Leaf	Gate Height			
	Up to & Including 6'	Over 6' Up to & Including 8'	Over 8' Up to & Including 10'	Over 12'
Up to 4'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
4'1" to 6'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
10'1" to 12'	6" x 3/16"	6" x 3/16"	6" x 3/16"	8" x 1/4"
12'1" to 16'	6" x 3/16"	6" x 3/16"	8" x 1/4"	8" x 1/4"

Table 2 – Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Post Spacing		
Span	8" Nominal (95" Rail)	
	Line & End Posts	
Post Size	3" x 2.75" x 12 Ga. I-Beam	4" x 2.75" x 11 Ga. I-Beam
Post Settings ± 1/4" O.C.	96"	96"

\*For Corner Posts see Figure 1

Figure 1



- END OF SECTION -





**SECTION 07220  
ROOF ACCESSORIES**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish and install all roof accessories and appurtenant work as needed to construct a built-up roof, complete, including but not limited to roof ventilators and hatches, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Codes: All codes, as referenced herein, are specified in Section 01090 - Reference Standards.
- B. Trade Standards: National Roofing Contractors Association (NRCA)
- C. Manufacturer's Standards: In addition to the standards listed above, roof accessories and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken, packages, containers or bundles bearing the name of the manufacturer.
- B. Storage: All materials shall be carefully stored on wood blocking in an area that is protected from the elements. Storage shall be in a manner that will prevent damage or marring of finish.

**PART 2 – PRODUCTS**

2.1 ROOF VENTS

- A. Roof relief vents with bird screens shall be provided, where shown on the plans, and shall be of the type recommended by the National Roofing Contractors Association (NRCA) and approved by the roofing manufacturer.

2.2 ROOF ACCESS HATCHES

- A. Roof access hatches shall be provided where shown on the plans and shall be constructed of 14 gage (curb & cover) with cover operations being assisted by a fully enclosed compression spring operators as manufactured by KARP Assoc., Maspeth, NY or equal.

**PART 3 – EXECUTION**

3.1 GENERAL

- A. The installation shall conform to applicable codes and the manufacturer's published or written recommendations, specifications, and published installation instructions for the type of work being performed. The construction shall be coordinated with the work of other trades.
- B. All roof openings, roof-mounted equipment, duct openings and skylights shall be provided with a prefabricated curb unless the equipment above the roof opening is supplied with its own curb which extends to 8 inches or higher beyond the top of the roof insulation. Curb configuration shall match roofing typical.

- C. Roof hatches with ladders shall be provided with a ladder-up device.

### 3.2 INSTALLATION

- A. Roof Hatches, Openable Fire and Smoke Hatches and Roof Ventilators: Shall be installed over prepared openings with their own curbs or prefabricated curbs, and shall be fastened to roof deck in accordance with the manufacturer's printed directions. Lifting mechanisms and accessories shall be adjusted to insure proper operation. Abraded prime and finish coat surfaces shall be touched-up after completion of installation with the same type finish and the same dry-film thickness.
- B. Protective Coating: All roof accessories shall be coated in accordance with Section 09800 - Special Coating, to match the roofing color. Primer coats shall be compatible with finish coats.

- END OF SECTION -

**SECTION 07412**  
**METAL WALL AND SOFFIT PANELS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish and install metal wall and soffit panels for a complete weather-tight system in accordance to the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 – General Requirements, apply to this Section.
- B. This Section includes the following: Factory-formed and field-assembled, exposed-fastener, lap-seam metal wall panels.
- C. **Related Sections:**
1. Division 05 – Metals
  2. Division 07 – Thermal and Moisture Protection

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 – Submittals.
- B. **Product Data:** Include construction details, material descriptions, dimensions of individual components and profiles and finishes for each type of metal wall panel and accessory.
- C. **Shop Drawings:** Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures and accessories and special details. Distinguish between factory- and field-assembled work.
- D. **Samples for Verification:** For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Wall and Soffit Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
  2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
  3. Accessories: 12 inches (300 mm) long Samples for each type of accessory.
  4. Exposed Gaskets: 12 inches (300 mm) long.
  5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in ½-inch (13 mm) wide joints formed between two (2) 6-inch (150mm) long strips of material matching the appearance of metal wall panels adjacent to joint sealants.
- E. **Qualification Data:** For Installer.
- F. **Maintenance Data:** For metal wall panels to include in Maintenance Manuals.
- G. **Warranty:** Special warranties specified in this section.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An employer of workers trained and approved by manufacturer.

- B. **Source Limitations:** Obtain each type of metal wall panel through one source from a single manufacturer.
- C. **Product Options:** Drawings indicate size, profiles and dimensional requirements of metal wall panels and are based on the specific system indicated.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. **Preinstallation Conference:** Conduct conference at Project site to comply with Requirements as referenced in Section 01040 – Coordination. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
  - 1. Meet with CITY, Architect, testing and inspecting Agency Representative, metal wall panel Installer, metal wall panel Manufacturer's Representative, structural-support Installer and Installers whose work interfaces with or affects metal wall panels including Installers of doors, windows and louvers.
  - 2. Review and finalize Construction Schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
  - 3. Review Methods and Procedures related to metal wall panel installation, including Manufacturer's written Instructions.
  - 4. Examine support conditions for compliance with Requirements, including alignment between and attachment to structural members.
  - 5. Review flashings, special siding details, wall penetrations, openings and condition of other construction that will affect metal wall panels.
  - 6. Review Governing Regulations and Requirements for Insurance, Certificates and Testing and Inspecting, if applicable.
  - 7. Review Temporary Protection Requirements for metal wall panel assembly during and after installation.
  - 8. Review wall panel Observation and Repair Procedures after metal wall panel Installation.
  - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. **Storage:**
  - 1. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
  - 2. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
  - 3. Store metal-faced composite wall panels vertically, covered with suitable weather-tight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting or other surface damage. Do not allow storage space to exceed 120 degree F (49 degree C).
  - 4. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

5. Protect foam-plastic insulation as follows:
  - a. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - b. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
  - c. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## 1.6 PROJECT CONDITIONS

- A. **Weather Limitations:** Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. **Field Measurements:** Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.
  1. **Established Dimensions:** Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal wall panels without field measurements, or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

## 1.7 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure and noncorrosive installation.

## 1.8 WARRANTY

- A. **Special Warranty:** Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures, including rupturing, cracking, or puncturing.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  2. The manufacture shall provide a 2-year warranty.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  1. **Available Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
  2. **Available Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2.2 PANEL MATERIALS

- A. **Metallic-Coated Steel Sheet Prepainted with Coil Coating:** Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50; structural quality.
  2. Surface: Smooth, flat finish.
  3. Exposed Finishes: Zinalume Plus.

B. **Panel Sealants:**

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape ½-inch (13mm) wide and 1/8-inch (3mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.

2.3 SOUND ATTENUATION METAL PANEL

A. Panel system shall be constructed of a foam composite of two roll formed steel faces surrounded and entirely bonded to a close cell poured-in-place polyisocyanurate foam core. The exterior steel face shall be compositely bonded to the interior steel face but is otherwise isolated from contact. The integrated accessories shall allow for easy cladding attachments and panel installation.

1. Panel Thickness: 3”
2. Substrate: AZ50 Galvalume
3. Finish: Epoxy Primer – Both Sides
4. Support Requirement: See Plans
5. Attachment Method: Panel clips, pre-punched rails integrated with the panel joinery and integrated brick tie clips.
6. Sealing Method: Joint has factory applied sealant. Panel ends and marriage beads to factory sealant applied during installation.
7. Exterior Cladding Attachment Method: Subgrits attached to panel clips, rails integrated brick ties for brick installation.
8. Weight: 1.9 lbs/sq. ft.

B. Approved Manufacturers

1. Centria
2. Or Engineer Approved Equal

2.4 MISCELLANEOUS METAL FRAMING

- A. **Steel Sheet Components, General:** Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
- B. **Base or Sill Angles or Channels:** 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.
- C. **Fasteners for Metal Framing:** Of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates.

2.5 MISCELLANEOUS MATERIALS

A. **Fasteners:** Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.

1. Fasteners for Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.

- B. **Bituminous Coating:** Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.6 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. **General:** Provide factory-formed metal wall panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
- B. **Corrugated-Profile, Exposed-Fastener Metal Wall Panels:** Formed with alternating curved ribs spaced at 2.67 inches (68mm) o.c. across width of panel.
  - 1. Basis-of-Design Product: IMSA Building Products Nu-Wave Corrugated or a comparable product of one of the following:
    - a. AEP-Span.
    - b. ATAS International.
    - c. Berridge Manufacturing Company.
    - d. Flexospan Steel Buildings, Inc.
  - 2. Material: Aluminum-zinc alloy-coated steel sheet, 24 gauge for curved panels, 22 gauge for flat panels.
    - a. Exterior Finish: Zinalume Plus.
    - b. Color: Natural.
  - 3. Panel Coverage: 34.67-inch (881mm).
  - 4. Panel Height: 0.875-inch (22mm).

## 2.7 METAL SOFFIT PANELS

- A. **Metal Soffit Panels:** Match profile and material of metal wall panels.
  - 1. Finish: Match finish and color of metal wall panels or as indicated on Drawings.
- B. **Corrugated-Profile Metal Soffit Panels:** Perforated panels; with lapped joint between panels.
  - 1. Basis-of-Design Product: IMSA Building Products Nu-Wave Corrugated or a comparable product of one of the following:
    - a. AEP-Span.
    - b. ATAS International.
    - c. Berridge Manufacturing Company.
    - d. Flexospan Steel Buildings, Inc.
  - 2. Material: Same materials, finish, and color as metal wall panels, except perforated.
  - 3. Panel Coverage: 34.67-inche (881mm).
  - 4. Panel Height: 0.875-inch (22mm).
  - 5. Perforation: 60 Degree Staggered, 0.125-inch diameter, 0.250-inch center spacing, 22.7 % open area.

## 2.8 ACCESSORIES

- A. **Wall Panel Accessories:** Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
  - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell expanded cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch (25mm) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. **Flashing and Trim:** Formed from 0.0179-inch (0.45mm) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

## 2.9 FABRICATION

- A. **General:** Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
1. Form panel lines, breaks and angles to be sharp and true, with surfaces free from warp and buckle.
  2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.
- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. **Sheet Metal Accessories:** Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
  - 1. Examine primary and secondary wall framing to verify that angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Install flashings and other sheet metal to comply with requirements specified in Section 07620 – Flashing and Sheet Metal.
- C. **Miscellaneous Framing:** Install base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.
  - 1. Soffit Framing: Wire-tie furring channels to supports, as required to comply with drawings as indicated.

### 3.3 METAL WALL PANEL INSTALLATION, GENERAL

- A. **General:** Install metal wall panels in orientation, sizes and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Field cutting of metal wall panels by torch is not permitted.
  - 2. Shim or otherwise plumb substrates receiving metal wall panels.
  - 3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Pre-drill panels.
  - 4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
  - 5. Install screw fasteners in predrilled holes.
  - 6. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 7. Install flashing and trim as metal wall panel work proceeds.
  - 8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.

10. Align bottom of metal wall panels and fasten with blind rivets, bolts or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. **Fasteners:** Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.
- C. **Metal Protection:** Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.
- D. **Joint Sealers:** Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
  2. Prepare joints and apply sealants to comply with requirements in Section 07920 – Caulking and Sealants.

### 3.4 FIELD-ASSEMBLED METAL WALL PANEL INSTALLATION

- A. **Lap-Seam Metal Wall Panels:** Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
  2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal wall panels.
  3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
  4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads or panels. Install screws in predrilled holes.
  5. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
  6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
  7. At panel splices, nest panels with minimum 6-inch (150mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- B. **Metal Soffit Panels:** Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

### 3.5 ACCESSORY INSTALLATION

- A. **General:** Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips and similar items.

- B. **Flashing and Trim:** Comply with performance requirements, manufacturer's written installation instructions and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet (3 m) with no joints allowed within 24 inches (600mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch (25mm) deep, filled with mastic sealant (concealed within joints).

### 3.6 ERECTION TOLERANCES

- A. **Installation Tolerances:** Shim and align metal wall panel units within installed tolerance of 1/4-inch in 20-feet (6mm in 6m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3mm) offset of adjoining faces and of alignment of matching profiles.

### 3.7 FIELD QUALITY CONTROL

- A. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at CONTRACTOR's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.8 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

- END OF SECTION -

**SECTION 07723  
EQUIPMENT ROOF HATCHES**

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Provide equipment roof hatches to be installed as part of the shade structure for the pump.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data.
- B. Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.
- C. Warranty: Submit executed copy of manufacturer's standard warranty.

1.3 QUALITY ASSURANCE

- A. **Manufacturer:** A minimum of 5 years experience manufacturing similar products.
- B. **Installer:** A minimum of 2 years experience installing similar products.
- C. Manufacturer's Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

1.5 WARRANTY

- A. **Manufacturer's Warranty:** Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

**PART 2 - PRODUCTS**

2.1 MANUFACTURER

- A. **Basis-of-Design Manufacturer:** Type F Roof Hatch by The Bilco Company, P.O. Box 1203, New Haven, CT 06505, 1-800-366-6530, Fax: 1-203-933-8478, Web: [www.bilco.com](http://www.bilco.com).
- B. Or Engineer Approved Equal.

2.2 ROOF HATCH

- A. Furnish and install where indicated on plans metal roof hatch Type F, size width: 48" (1219mm) x length: 48" (1219mm). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.

**B. Performance characteristics:**

1. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m<sup>2</sup>) with a maximum deflection of 1/150th of the span or 20 psf (97kg/m<sup>2</sup>) wind uplift.
2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
3. Operation of the cover shall not be affected by temperature.
4. Entire hatch shall be weathertight with fully welded corner joints on cover and curb.

**C. Cover:** Shall be 11 gauge (2.3mm) aluminum with a 3" (76mm) beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

**D. Cover insulation:** Shall be fiberglass of 1" (25mm) thickness, fully covered and protected by an 18 gauge (1mm) aluminum liner.

**E. Curb:** Shall be 12" (305mm) in height and of [select: 14 gauge (1.9mm) paint bond G-90 galvanized steel or 11 gauge (2.3mm) aluminum]. The curb shall be formed with a 3-1/2" (89mm) flange with 7/16" (11mm) holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6" (153mm) on center, to be bent inward to hold single ply roofing membrane securely in place.

**F. Curb insulation:** Shall be rigid, high-density fiberboard of 1" (25mm) thickness on outside of curb.

**G. Lifting mechanisms:** Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe [for aluminum construction: welded to the curb assembly; for steel construction: through bolted to the curb assembly].

**H. Hardware**

1. Heavy pintle hinges shall be provided
2. Cover shall be equipped with a spring latch with interior and exterior turn handles
3. Roof hatch shall be equipped with interior and exterior padlock hasps.
4. The latch strike shall be a stamped component bolted to the curb assembly.
5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" (25mm) diameter red vinyl grip handle to permit easy release for closing.
6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed. [For installation in highly corrosive environments or when prolonged exposure to hot water or steam is anticipated, specify Type 316 stainless steel hardware].
7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

**I. Finishes:** Factory finish shall be [select: alkyd based red oxide primed steel or mill finish aluminum].

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

**A.** Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
  - 1. Test units for proper function and adjust until proper operation is achieved.
  - 2. Repair finishes damaged during installation.
  - 3. Restore finishes so no evidence remains of corrective work.

### 3.3 ADJUSTING AND CLEANING

- A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

-END OF SECTION-

**SECTION 07920  
CAULKING AND SEALANTS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish and install caulking and sealing as indicated in Division 03.

1.2 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Indicate manufacturers and brand names, colors available and locations where each will be used.

1.3 QUALITY ASSURANCE

- A. Comply with requirements of the general conditions except as noted below.
- B. Guarantee all work of this section for a period of 2 years.
- C. Guarantee all work against water leaks, air infiltration, sagging and pulling loose.
- D. Guarantee shall include replacement and/or repair of other work damaged by water leakage in caulking and sealant work.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver sealants in original sealed containers, each bearing manufacturer's name and product designation.
- B. Do not retain at the job site material, which has exceeded the shelf life recommended by its manufacturer.

**PART 2 – MATERIALS**

2.1 SEALANTS

- A. Types 1 to 4 Sealants: Polyurethane sealants conforming to Federal Specification TT-S-00227E Type II & ANSI A116.1.
  - 1. Type 1 Sealant: Two part 30-40 Shore A, non-sag
    - a. Manufacture Sikaflex – 2C or equal
  - 2. Type 2 Sealant: Two part, 35-45 Shore A, self-leveling.
  - 3. Type 3 Sealant: Two part, 20-35 Shore A, self-leveling.
  - 4. Type 4 Sealant: Two part, 20-35 Shore A, non-sag.
- B. Type 5 Sealant: One component, elastomeric gun grade polyurethane sealant conforming to ASTM C 920, Type S, Grade NS, Class 25. Use NT, M, A, G and I Federal Specifications TT-S-00230C Type 2, Class A.
  - 1. Manufacturer: Sonneborn Sonolastic NP 1 or equal.

2.2 ACCESSORIES

- A. Primers: As specified by sealant manufacturer
- B. Backup Materials: Closed cell polyethylene foam
- C. Bond Breaker: Polyethylene film.

## 2.3 COLOR

- A. Color for each location of use shall be as selected in accordance with the contract documents. Non-availability of a required color within a particular brand of otherwise approved material shall not act to relieve obligation to furnish material of required color and conforming to specifications.
- B. Colors shall be selected to best blend with adjoining materials.

## PART 3 – EXECUTION

### 3.1 LOCATIONS FOR SEALANT TYPES

- A. Type 1 Sealant: Use for all interior and exterior construction, expansion joints, etc. associated with sealing the joints in the concrete tanks
- B. Type 2 Sealant: Except as hereinafter specified, use for all interior and exterior horizontal joints subject to foot traffic.
- C. Type 3 Sealant: Except as hereinafter specified, or where Type 1 sealant is required, use for all exterior horizontal joint.
- D. Type 4 Sealant: Use for all exterior vertical surfaces.
- E. Type 5 Sealant: Use for all interior work except where Type 1 sealant is required.
- F. Caulk and seal all open joints, both interior and exterior; at junction of metal frames and walls; at other locations as noted on drawings.
- G. Generally, expansion joints in exterior concreted flatwork on grade, curbs and gutter for sitework, etc.; joint fillers will not require a joint sealant. Where sealant is noted on drawings for such joints, sealant shall be Type 1 and a bond breaker shall be installed along top of joint filler, full width of joint, to prevent contact between sealant and joint filler.

### 3.2 SEALANT AND JOINT DETAILS

- A. Joint Sizes:
  - 1. Types 1, 2, 3 and 4 Sealants:
    - a. Minimum joint size: ¼-inch x ¼-inch
    - b. Depth to width ration of joint shall be a recommended by sealant manufacturer.
    - c. Maximum width: Sealant manufacturer's recommended maximum.
  - 2. Type 4 Sealant: Maximum joint size shall be 3/8-inch x ½-inch.
- B. Joints deeper than above shall have backup material installed to maintain specified depth.
- C. With Types 1, 2, 3 and 4 sealants, a bond breaker shall be installed, unless backup material is used, so that sealant bonds only sides of joints.

### 3.3 SEALANT INSTALLATION

- A. Carefully and thoroughly clean surfaces with cleaner, and in matter recommended by sealant manufacturer.
- B. Prime surfaces where recommended by sealant manufacturer.
- C. Apply sealants smoothly and uniformly. Mask surfaces each side of joints to protect adjacent surface and to form straight, even edges.

- END OF SECTION -



**SECTION 08110**  
**STEEL DOORS AND FRAMES**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish and install steel doors, frames and related items, complete, operable, including all finish hardware, and all appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Codes: All codes, as referenced herein, are specified in Section 01090 - Reference Standards.
- B. Commercial Standards:
  - ASTM A 366                      Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality
  - ANSI A115 Series              Door and Frame Preparation
  - UL                                  Underwriters' Laboratories, Inc.
- C. Trade Standards: National Association of Architectural Metal Manufacturers (NAAMM) or Steel Door Institute (SDI).
- D. Manufacturers' Standards: In addition to the standards listed above, the steel doors and frames and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.3 SUBMITTALS

- A. Submittals shall be in accordance with Section 01300 - Submittals.
- B. Shop Drawings: Shop drawings shall show details of the products and systems and connections to adjoining materials. Schedules showing sizes, types, and locations of door louvers and glass shall be submitted along with manufacturer's installation instructions.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Doors and frames shall be shipped and stored with temporary stiffeners and spacers in place to prevent distortion.
- B. Doors and frames shall be delivered in original, unbroken packages, containers or bundles bearing the name of the manufacturer.
- C. Doors and frames shall be carefully stored on wood blocking in an area that is protected from the elements. Storage shall be in a manner that will prevent damage or marring of finish.

**PART 2 – PRODUCTS**

2.1 MATERIALS AND FABRICATION - GENERAL

- A. Shop Fabrication and Assembly: All steel doors and frames shall be shop fabricated and shop assembled, where possible. Temporary stiffeners, spacers, and other accessories necessary to facilitate handling and accurate erection shall be provided. After fabrication, all tool marks and other surface imperfections shall be filled and ground smooth.

- B. Fire Rating and Labeling: Doors and frames specified or shown as fire-rated shall bear a UL label indicating the type of rating for which certified. Designs and construction of such products shall have specific UL approval according to current procedures for the specified fire rating, either 3-hour, 1½-hour, ¾-hour or 20-minute as shown. Hollow steel doors and frames for fire-rated openings shall conform to Underwriters' Laboratories listing and shall be UL labeled.
- C. Materials for Doors and Frames: All hollow metal doors and frames shall be fabricated entirely from prime quality, commercial grade, cold-rolled steel conforming to ASTM A 366, Type II or III.
- D. Priming and Painting: Doors and frames shall be chemically treated to ensure maximum paint adhesion and shall have all exposed surfaces painted with a rust-inhibitive primer after fabrication.
- E. Hardware: Doors and frames shall be reinforced and drilled or tapped for fully templated hardware; and shall be reinforced with plates for surface-mounted hardware, meeting ANSI A115 Series requirements. Hardware shall be as specified in Section 08710 - Finish Hardware and/or as shown.

## 2.2 METAL FRAMES

- A. Pressed Metal Frames: Pressed steel frames for doors and other openings shall be combination buckled frame and trim of type and sizes as shown. Metal shall not be lighter than 16-gauge steel. Frames shall be of the welded unit type. Special frames, oversized frames and frames with transom shall be provided where shown.

## 2.3 FRAME ANCHORS

- A. Floor Anchors: Floor anchors shall be welded inside each frame jamb head, and holes shall be provided for floor anchorage. Minimum thickness of floor anchors shall be 14-gauge.
- B. Anchors for Masonry/Concrete Installations: Frames for installation in masonry and/or concrete walls shall be provided with variable jamb anchors of the T-strap, stirrups and strap or wire type. The number of anchors provided per frame jamb and head shall be as follows:
  1. Frames up to 7-feet 6 inches in height: Three (3) anchors.
  2. Frames over 7-feet 6 inches to 8-feet 0 inches in height: Four (4) anchors.
  3. Frames over 8-feet 0 inches in height: One (1) anchor for each 2-feet 0 inches or fraction in height.
  4. Frame head anchors shall be not less than those required in Section 01090 - Reference Standards.
  5. Curries.

## 2.4 SILENCER HOLES

- A. Appropriate holes for silencers shall be provided in the doorframes, which are not designated to receive weather stripping, seals or sound seals.

## 2.5 STEEL DOORS

- A. Design and Construction: Steel doors shall be of hollow metal construction and shall be of full flush design with no visible seams. Face sheets shall be not less than cold-rolled, stretcher-leveled, 18-gage steel. All doors shall have flush seamless face sheets with continuously and fully welded seam edges. Doors shall be rigid and neat in appearance, and shall be free from warpage or buckle. Corner bends shall be true and straight and shall be of not less than the minimum radius for the gage of metal used. The door top and bottom shall be internally reinforced by steel members welded in place. Tops of exterior doors shall be provided with flush, water and weather tight, top enclosures.
- B. Transom Panels: Transom panels shall be provided where shown and shall be of construction same as doors.

- C. Door and Transom Cores: Doors and transom cores shall be water-resistant honeycomb with minimum R of four (4) [fiberboard] [mineral]. Fire rated doors shall be solid or fiber mineral core doors as required to meet code and Reference Standards requirements.
- D. Louvers: Door louvers for steel doors shall be of steel of the type, which integrally frames the opening and can attach securely. Louvers shall be of the inverted "Y" blade type for exterior use and "V" blade for interior use. Exterior louvered openings shall be provided with removable type insect screens. Door louvers shall be uniformly located in doors and shall be of sizes shown. Louvers at labeled doors shall be equipped with concealed fusible links.
- E. Double Doors: Double doors shall be provided with a "T" type steel astragal unless otherwise specified in Section 08710 - Finish Hardware.
- F. Lock Box: Lock box to be provided by CITY.
- G. Manufacturers or Equal:
  1. Forderer Cornice Works;
  2. Krieger Steel Products Co.;
  3. Overly Manufacturing Co.;
  4. Or Engineer Approved Equal.

## 2.6 Knox Box

- A. Description: A small, wall mounted safe shall be provided with all necessary keys, access cards, entry items and emergency planning documents necessary in a location deemed acceptable by the local Fire Department Authority. The safe provided shall be compliant to National Fire Code (NFPA, IFC, IBC).
- B. Fabrication: Knox box shall be a surface mount type. The box shall be fabricated using a 1/4-inch plate steel housing with a 5/8-inch thick steel door. The steel door shall have an interior gasket seal. Vault shall have an anti-theft relocking mechanism with drill resistant hard-plate lock protector. Where applicable, components shall be constructed of stainless steel.
- C. Vault and Lock UL Listings:
  1. UL 1037 – Standard for Antitheft Alarms and Devices
  2. UL 1610 – Standard for Central-Station Burglar Alarm Units
  3. UL 1332 – Standard for Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment
  4. UL 437 – Standard for Key Locks
- D. Approved Manufacturers:
  1. CONTRACTOR is responsible for coordinating an acceptable knox box with the Local Fire Department Authority.
    - a. Knox Company, KnoxVault 4400 (Pending Fire Department Approval)
    - b. Or Fire Department Approved Equal

## **PART 3 – EXECUTION**

### 3.1 CONSTRUCTION

- A. General: All work shall be in accordance with manufacturer's published recommendations and specifications.
- B. All work shall be coordinated with appropriate related subcontractor's work to assure a proper installation. Field conditions and dimensions shall be verified prior to fabrication.

### 3.2 FRAME INSTALLATION

- A. Frames shall be set plumb and square in a true plane, and be securely anchored to the adjoining construction. Steel shims shall be provided and shall be set tight and rigidly attached between frame anchors and structure. All finished metal frames shall be strong and rigid; neat in appearance and square, true and free of defects, warp or buckle.
- B. Molded members, trims and stops, shall be clean cut, straight and shall be of a uniform profile throughout their lengths.
- C. Corner joints shall have all contact edges tightly closed with all trim faces mitered, welded and finished smooth. The use of gussets will not be permitted.

### 3.3 DOOR INSTALLATION

- A. Doors shall be installed plumb, square and level. Doors shall operate freely, but not loosely. They shall be free from rattling while in a closed position.
- B. The door clearances shall be plus 3/32-inch or minus 1/32-inch and shall not exceed the limits specified in the manufacturers printed recommendations.
- C. Any door that becomes warped more than 3/16-inch out-of-plane shall be replaced.
- D. Doors and door's finish hardware shall have hardware protected prior to painting as specified in Section 08710 - Finish Hardware.

### 3.4 FINISH HARDWARE

- A. Finish hardware shall be installed in accordance with hardware manufacturer's standard templates and printed instructions. Operable parts shall be adjusted for correct function and operation.

### 3.5 EXISTING CONSTRUCTION

- A. Frames that are dimpled for fasteners required for installation into previously placed (existing) concrete, masonry or steel structures shall have the fasteners and fastener frame dimples filled with auto putty or an equal filler material. The fasteners and fillers at dimple holes shall be ground smooth (non-visible) before painting. Fastener locations shall not be visible after the painting work is finished.

- END OF SECTION -

**SECTION 08710  
FINISH HARDWARE**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Furnish and install all finish hardware and appurtenant work, complete and operable, in accordance with the Contract Documents.
- B. The work hereunder shall include all fabrication and mounting templates as needed for fabricators and for control of application of metal items.
- C. In addition, provide and install all trim, attachments and fastenings specified or required for proper and complete installation. The work of this section shall include all hardware that is not specified in other sections.
- D. Protect the finish hardware from damage during construction, painting and clean-up.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Codes: All codes, as referenced herein, are specified in Section 01090 - Reference Standards.
- B. Commercial Standards:
  - Underwriters' Laboratories, Inc.      Requirements and Approvals
  - Hardware Institute (DHI)              "Recommended Procedure for Processing Hardware Schedules and Templates" and "Architectural Hardware Scheduling and Format"
  - BHMA    Builders Hardware Manufacturers Association
- C. Manufacturers Standards: In addition to the standards listed above, the finish hardware and its installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Samples: The samples of all items requested shall be furnished by the hardware supplier no later than 10 days after said request is received.

1.4 PROPRIETARY DESIGNATIONS

- A. Manufacturer's product names, numbers and models are given herein for the purpose of indicating the requirements for the type, general construction, material and operation of the specific item, not with the intention of limiting the item to the manufacturer's listed product. Substitution of another manufacturer's product that is fully equivalent in all respects may be made subject to the approval of the ENGINEER. Detailed and complete data shall be supplied as required to facilitate appropriate evaluation of all proposed substitute items.

1.5 PACKING, MARKING AND DELIVERY

- A. All locks, exit devices, door closers, overhead door holders, hinges, kick plates, pulls and push plates, thresholds, and other similar items shall be individually packed in separate, suitable, original, containers as furnished by the hardware manufacturers. Each container shall be clearly marked with item numbers, article numbers.

- B. Small miscellaneous items that would not require specific location identifications, such as door stops, coat and hat hooks and door silencers may be quantity packed if properly labeled with item numbers and other identification.
- C. Hardware shall be checked upon delivery with the aid of a representative of the hardware supplier's firm. Proper storage of all hardware will be required until ready for application.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Finish hardware shall be coordinated with all other work requiring builder's hardware or attaching to it. Copies of schedules, templates, etc., shall be furnished in ample time to avoid fabrication and construction delays. All hardware shall be made to template.
- B. All hardware furnished in connection with doors bearing Underwriters' Labels or where necessary to meet special requirements shall be in strict accordance with conditions established by the authority having jurisdiction and shall be subject to approval of that authority.
- C. Hand of lock shall be as shown. If door hand is changed during construction, necessary changes shall be made at no extra cost.
- D. Exit doors shall be operable at all times from the inside without the use of key or any special knowledge or effort.
- E. Approved shop drawings from those trades with which hardware must be coordinated shall be provided to the hardware supplier. After checking these shop drawings, necessary template information shall promptly be supplied to all concerned as may be required to facilitate the progress of the job. All procedures for template information shall be in accordance with the handbook, "Recommended Procedure for Processing Hardware Schedules and Templates."
- F. Finish of all hardware shall be 630-brush stainless steel unless otherwise specified.
- G. Approved Manufacturers:
  - 1. Locks: To be provided by CITY
  - 2. Exit Devices: Precision, Sargent, Von Dupfrin
  - 3. Closers: LCN, Sargent, Norton

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. All required items of hardware, including cylinders for locks, and all fitting, adjusting, and securing of each item neatly and firmly in place, shall be in perfect working order. Any work less than this shall form a basis for corrective measures.
- B. All finish hardware shall be provided with paint protection prior to painting work. The paint protection shall be removed after completion of the painting work and the finish hardware cleaned and polished.

### **3.2 HARDWARE GENERAL**

- A. Hardware is specified for convenience of locating hardware and does not preclude in any way the requirements that all necessary hardware shall be furnished and properly installed. Hardware not specifically called out shall be similar to that required for similar uses.

### 3.3 LATCHES AND BOLTS

- A. Latches and bolts shall be installed, to automatically engage in keepers, whether activated by closers or by manual push. In no case should additional manual pressure be required to engage latch or bolt in keepers.

### 3.4 CLOSERS AND HINGES

- A. Closers and hinges shall be carefully adjusted to operate the doors noiselessly and evenly, and hinges shall be installed so as not to bind. Closers, closer arms and hold-open arms shall be attached with sex bolts.
- B. Except at exterior doors, closers shall not be mounted on corridor or vestibule side of door.

### 3.5 WEATHERSTRIPPING AND SEALS

- A. All doors shall be provided with weather-stripping or seals unless mutes, product weather-stripping or other special seals are specified.

### 3.6 PROTECTIVE TAPE AND COATINGS

- A. Strippable coating, removable tape protection or other approved means shall be provided to prevent any damage or staining of hardware during construction. Such protective measures shall be removed prior to final cleaning and the hardware polished before the acceptance of the project.

- END OF SECTION -



**SECTION 09800  
SPECIAL COATINGS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide all labor, materials, equipment and services required for accomplishing special coatings on equipment, tanks or piping in accordance with the Contract Documents.

1.2 SPECIAL NOTICE

- A. Because there exists in this project corrosive agents in the liquids and, in certain areas, in the atmosphere, special coatings for protecting the select equipment and appurtenances are required. The service requirements of the coatings are harsh and only products with an extended history of successful application will be acceptable.
- B. Related Sections:
  - 1. Division 01 – General Requirements
  - 2. Division 05 – Metals
  - 3. Section 09900 – Painting
  - 4. Division 11 – Equipment
- C. Wherever detailed coating/painting requirements are covered under an equipment or product specification, the Specifications herein, shall govern over those coating requirements, with respect to surface preparation, coat materials, coats, thickness and coverage with the exception of manufacturer's supplied coatings and protection. Determine if the manufacturer's supplied coatings are adequate.

1.3 ACCEPTABLE PRODUCTS

- A. Unless otherwise noted, the coating products shall be manufactured by the Tnemec Company, the ICI Paints Company, the Wisconsin Protective Coatings Corporation, or as approved by Engineer. Coating products must be applied in strict accordance with the manufacturer's recommendations.

1.4 ITEMS REQUIRING SPECIAL COATING

- A. See Coating Schedule as listed in **PART 2 – PRODUCTS**.

1.5 ITEMS NOT REQUIRING SPECIAL COATING

- A. The metal surfaces of stainless steel, chromium plate, galvanized and aluminum that are not now coated will not require field coating. Do not apply coating over any code-required labels, glass items, gauges and name plates. It is also important not to coat any moving parts or operating units, valves or stems, or any mechanical and electrical parts such as valve and damper operators, linkages. It is the contactor's responsibility to protect any surface that is not to receive a coating.

1.6 QUALITY ASSURANCE

- A. Qualification of Coaters: All coating shall be done by qualified, skilled and experienced craftsmen. In the acceptance or rejection of completed coating, no allowance will be made for lack of skills on the part of the craftsmen.

- B. Coating Labels: Labels on coating containers shall include the following:
1. Manufacturer's name.
  2. Generic type of coat.
  3. Manufacturer's stock number.
  4. Color.
  5. Instructions for thinning where applicable.
- C. Field Quality Control: Coating film thickness shall be subject to measurement with electrometer, wet film gauge, low or high voltage meter and/or applicable measuring instruments acceptable to the ENGINEER. If dry film thickness is found to be less than specified, or coverage is not uniform, an additional coating to correct thickness or appearance at no additional cost shall be applied.
- D. Compatibility:
1. Compatibility of all coatings used shall be required. A compatible coating will be considered a coat, which precludes adverse effects related to bonding, drying delamination, scaling, lifting and bleeding.
  2. In cases where shop-applied primers and coatings on materials and equipment furnished by suppliers are products different from those described in the Specifications, compatibility with the specified field-applied coating system shall be verified.
  3. Where thinning is necessary, only the products of the manufacturer furnishing the coating, and products for thinning purposes only, will be allowed.
- E. Thickness and Spreading Rates:
1. Minimum dry mil thickness per coat (MDMTPC) and/or spreading rates in square feet per gallon shall be governed by the manufacturer's current data sheets or literature containing recommendations or instructions regarding these values. These recommended dry mil thickness and/or spreading rate values will be considered requirements to be met same as if set out herein these Do not exceed manufacturer's recommended coverage rates.
  2. The number of coats to be applied are specified herein and shall govern. Where the total dry film thickness is specified, this thickness shall govern over the MDMTPC.

#### 1.7 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Delivery: All materials shall be brought to the job site in the original sealed and labeled containers of the coating manufacturer. All labels shall be legible and intact at time of use.
- B. Manufacturer's Instruction: Coating manufacturer's written instructions for proper surface preparation, mixing, thinning, application and drying shall be furnished with the coating and strictly followed.
- C. Storage of Materials:
1. Store only acceptable materials on project site.
  2. Store only in a suitable and designated area restricted to the storage of coating materials and related equipment.
  3. Comply with all applicable health and fire regulations regarding the storage of coating materials.
  4. Storage of material shall comply with the manufacturer's specifications; however, storage shall be at a **minimum temperature of 50 degrees F.**

- D. Protection of Materials:
    - 1. Take all necessary precautions to ensure the safe storage and use of coating materials and the prompt and safe disposal of waste.
    - 2. Coating wastes shall be properly deposited in containers made for this purpose.
    - 3. Take all necessary precautions to protect coating materials before, during and after application and to protect the finished work.
  - E. Replacement: In the event of damage to coating materials, immediately make all replacements necessary to the approval of the ENGINEER and at no additional cost.
  - F. Product delivery, handling and storage shall be in accordance with Part 1 of this Section and the manufacturer's recommendations.
- 1.8 JOB CONDITIONS
- A. Environmental Requirements:
    - 1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
    - 2. Do not apply finish in areas where dust and/or mist is being generated.
  - B. Climatic Conditions: Coating shall not be applied if:
    - 1. The ambient temperature or temperature of the surface to be coated is below 50 degrees F or below the temperature recommended by the coating manufacturer.
    - 2. The relative humidity is above 85 percent.
    - 3. The relative humidity is such that the coating will not dry properly in accordance with the manufacturer's instructions.
  - C. Protection:
    - 1. Protect with drop cloths, masking or other acceptable means all surfaces which could be damaged in function or appearance by coating, including surfaces not being coated concurrently and surfaces not to be coated.
    - 2. Hardware, accessories, fixtures and similar items shall be removed and replaced after completion of coating.
    - 3. Spray coating will not be permitted when it will cause damage to adjacent or otherwise located surfaces.
    - 4. All coating splatters on glass shall be wiped off immediately.

## **PART 2 – PRODUCTS**

### **2.1 COATING SYSTEMS FOR STEEL - STRUCTURAL, TANKS, PIPE AND EQUIPMENT**

- A. Exterior Exposed:
  - 1. System Type: Epoxy/Polyurethane.
  - 2. Surface Preparation: SSPC-SP 6.
  - 3. Primer: Series N69 Hi-Build Epoxoline II; 3.0 to 5.0 mils DFT.
  - 4. Intermediate Coat: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  - 5. Finish Coat: Series 1075 Endura-Shield II; 2.5 to 3.5 mils DFT.
  - 6. Total DFT: 9.5 to 14.5 mils.

- B. Interior Exposed:
  - 1. System Type: Epoxy.
  - 2. Surface Preparation: SSPC-SP 6.
  - 3. Primer: Series N69 Hi-Build Epoxoline II; 3.0 to 5.0 mils DFT.
  - 4. Finish Coat: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  - 5. Total DFT: 7.0 to 11.0 mils.
- C. Immersion:
  - 1. System Type: Epoxy.
  - 2. Surface Preparation: SSPC-SP 10.
  - 3. Primer: Series N69 Hi-Build Epoxoline II; 3.0 to 5.0 mils DFT.
  - 4. Intermediate Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  - 5. Finish Coat: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  - 6. Total DFT: 11.0 to 16.0 mils.
- D. Interior/Immersion, Severe Exposure to H2S:
  - 1. System Type: Modified Epoxy.
  - 2. Surface Preparation: SSPC-SP 5 with minimum 3.0-mil profile.
  - 3. Primer/Finish (One or More Coats): Series 435 Perma-Glaze; 30.0 to 36.0 mils DFT.
  - 4. Total DFT: 30.0 to 36.0 mils.
- E. Marginally Prepared Surfaces (Maintenance, Non-Immersion, Interior):
  - 1. System Type: Epoxy.
  - 2. Surface Preparation: In accordance with manufacturer's instructions.
  - 3. Primer: Series 135 Chembuild; 4.0 to 6.0 mils DFT.
  - 4. Finish Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  - 6. Total DFT: 8.0 to 12.0 mils.
- F. Marginally Prepared Surfaces (Maintenance, Non-Immersion, Exterior):
  - 1. System Type: Epoxy/Polyurethane.
  - 2. Surface Preparation: In accordance with manufacturer's instructions.
  - 3. Primer: Series 135 Chembuild; 4.0 to 6.0 mils DFT.
  - 4. Finish Coat (Exterior): Series 1075 Endura-Shield II; 2.5 to 3.5 mils. DFT
  - 5. Total DFT: 6.5 to 9.5 mils.

## 2.2 COATING SYSTEMS FOR FACTORY PRIMED STEEL - DOORS, FRAMES, AND MISCELLANEOUS EQUIPMENT

- A. Interior Exposed:
  - 1. System Type: Epoxy
  - 2. Surface Preparation: Clean and dry.
  - 3. Primer: Factory primed.
  - 4. Field Primer: Series 135 Chembuild; 3.0 to 5.0 mils DFT.

5. Finish Coat: Series 1075 Endura-Shield II; 2.5 to 3.5 mils. DFT
  6. Total DFT: 5.5 to 8.5 mils (on top of shop primer).
- B. Exterior Exposed:
1. System Type: Epoxy/Polyurethane
  2. Surface Preparation: Clean and dry.
  3. Primer: Factory primed.
  4. Field Primer: Series 135 Chembuild; 3.0 to 5.0 mils DFT.
  5. Finish Coat: Series 1075 Endura-Shield II; 2.5 to 3.5 mils. DFT
  6. Total DFT: 5.5 to 8.5 mils (on top of shop primer).
- 2.3 COATING SYSTEMS FOR GALVANIZED STEEL AND NONFERROUS METAL - PIPE AND MISCELLANEOUS FABRICATIONS
- A. Interior Exposure:
1. System Type: Epoxy.
  2. Surface Preparation: In accordance with manufacturer's instructions.
  3. Primer: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  4. Finish Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  6. Total DFT: 8.0 to 12.0 mils.
- B. Exterior Exposure:
1. System Type: Epoxy/Polyurethane.
  2. Surface Preparation: In accordance with manufacturer's instructions.
  3. Primer: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
  4. Finish Coat: Series 1075 Endura-Shield II; 2.5 to 3.5 mils. DFT
  5. Total DFT: 6.5 to 9.5 mils
- 2.4 COATING SYSTEMS FOR DUCTILE OR CAST IRON - PIPE, PUMPS, AND VALVES
- A. Interior/Exterior Exposure:
1. System Type: Epoxy/Polyurethane
  2. Surface Preparation: In accordance with manufacturer's instructions
  3. Primer: Factory Primed
  4. Field Primer: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.L69 for Low VOC
  5. Finish Coat: Series 1075 Endura-Shield II; 2.5 to 3.5 mils. DFT 1095 for Low VOC
  6. Total DFT: 5.5 to 8.5 mils (on top of shop primer).
- C. Below Ground:
1. System Type: Coal Tar Epoxy.
  2. Surface Preparation: In accordance with manufacturer's instructions.
  3. Prime/Finish Coat:
    - a. Sherwin-Williams Targuard Coal Tar Epoxy; 16-32 mils DFT. 100 for Low VOC
    - b. Series 46H-413 Hi-Build Theme-Tar; 14.0 to 20.0 mils DFT. Series 27 WB Typoxy for Low VOC

4. Total DFT: 14.0 to 20.0 mils

D. Immersion:

1. System Type: Epoxy.
2. Surface Preparation: In accordance with manufacturer's instructions.
3. Primer: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
4. Finish Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
5. Total DFT: 8.0 to 12.0 mils

2.5 COATING SYSTEMS FOR PVC

A. Interior Exposure:

1. System Type: Epoxy.
2. Surface Preparation: Scarify
3. Primer: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
4. Finish Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
5. Total DFT: 8.0 to 12.0 mils.

B. Exterior Exposure:

1. System Type: Epoxy/Polyurethane.
2. Surface Preparation: Scarify.
3. Primer: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
4. Finish Coat: Series 1075 Endura-Shield II; 2.5 to 3.5 mils. DFT.
5. Coating provided shall contain UV inhibitor.

2.6 COATING SYSTEMS FOR PRECAST CONCRETE AND CAST-IN-PLACE CONCRETE  
(REQUIRE WHERE INDICATED IN PLANS)

A. Exterior Exposed:

1. System Type: Acrylic.
2. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
3. Primer: Series 180 W.B. Tneme-Crete; 4.0 to 8.0 mils DFT.
4. Finish Coat: Series 180 W.B. Tneme-Crete; 4.0 to 8.0 mils DFT.
5. Total DFT: 8.0 to 16.0 mils.

B. Below Grade:

1. System Type: Coal tar.
2. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
3. Primer: 46-465 H.B. Tnemecol. DFT 8.0 to 12.0 mils.
4. Finish Coat: 46-465 H.B. Tnemecol. DFT 8.0 to 12.0 mils.
5. Total DFT: 16.0 to 24.0 mils.

C. Interior Exposed:

1. System Type: Epoxy.
2. Surface Preparation: SSPC-SP 13/NACE 6. Abrasive Blast Cleaning.
3. Patching: Series 218 MortarClad (as needed)
4. Primer: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
5. Finish Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
6. Total DFT: 8.0 to 12.0 mils.

D. Severe Service – Immersion, H2S Exposure:

1. System I (H2S less than 50 ppm, Light Abrasion)
  - a. System Type: Modified Epoxy.
  - b. Surface Preparation: SSPC-SP 13/NACE 6. Abrasive blast clean to texture of 50 to 60 grit sandpaper.
  - c. Surfacing and Patching: Series 218 MortarClad; 1/16 inch DFT (nominal 62.5 mils)
  - d. Primer/Finish (One or More Coats): Series 435 Perma-Glaze; 20.0 to 30.0 mils DFT
2. System II (H2S less than 100 ppm, Moderate to Heavy Abrasion)
  - a. System Type: Modified Epoxy Mortar.
  - b. Surface Preparation: SSPC-SP 13/NACE 6. Abrasive blast clean to texture of 50 to 60 grit sandpaper.
  - c. Patching: Series 218 MortarClad; As Needed
  - d. Series 434 Perma-Shield H2S; 1/8 inch DFT (nominal 125 mils)
3. System III (H2S more than 100 ppm, Moderate to Heavy Abrasion)
  - a. System Type: Modified Epoxy Mortar.
  - b. Surface Preparation: SSPC-SP 13/NACE 6. Abrasive blast clean to texture of 50 to 60 grit sandpaper.
  - c. Patching: Series 218 MortarClad; As Needed
  - d. Series 434 Perma-Shield H2S; 1/8 inch DFT (nominal 125 mils)
  - e. Finish (One or More Coats): Series 435 Perma-Glaze; 20.0 to 30.0 mils DFT

2.7 COATING SYSTEMS FOR POROUS CONCRETE MASONRY UNITS  
(REQUIRE WHERE INDICATED IN PLANS)

A. Exterior Exposed:

1. System Type: Acrylic.
2. Surface Preparation: Porous Concrete Masonry Units: SSPC-SP 13/NACE 6. Clean and dry
3. Water Repellent: (Tnemec /Chemprobe) Series 617 Prime A Pell H2O
4. Primer: Series 180 W.B. Tneme-Crete; 4.0 to 8.0 mils DFT.
5. Finish Coat: Series 180 W.B. Tneme-Crete; 4.0 to 8.0 mils DFT.
6. Total DFT: 8.0 to 16.0 mils.

B. Interior Exposed:

1. System Type: Epoxy.
2. Primer: Series 54-660 Masonry Filler. Spreading rate 75 to 100 sq ft/gal.
3. Primer: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
4. Finish Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
5. Total DFT: 8.0 to 12.0 mils (on top of block filler).

## 2.8 COATING SYSTEMS FOR PLASTER AND GYPSUM BOARD

### A. Interior Exposed:

1. System Type: Vinyl-acrylic/Epoxy.
2. Surface Preparation: Clean and dry.
3. Primer: Series 151-1051 Elasto-Grip FC; 1.0 to 2.0 mils DFT.
4. Primer: Series N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
5. Finish Coat: N69 Hi-Build Epoxoline II; 4.0 to 6.0 mils DFT.
6. Total DFT: 8.0 to 12.0 mils

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine surfaces scheduled to receive coating for conditions that will adversely affect application, permanence or quality of work and which cannot be put into an acceptable condition through surface preparation.
- B. Do not proceed with surface preparation or coating application until conditions are suitable.

### 3.2 ACCEPTANCE OF SURFACES

- A. The commencement of coating work in any area or space will be construed as acceptance of the surface as being satisfactory.

### 3.3 PREPARATION AND APPLICATION

- A. Preparation and application shall be in accordance with coating systems (Article 2.1).

### 3.4 FINAL INSPECTION

- A. Protect all coated surfaces against damage until the date of final acceptance.
- B. Conduct a final inspection of all coating work and recoat or retouch any areas or surfaces found deficient in complying with these Specifications.

### 3.5 PIPING IDENTIFICATION

- A. All visible piping ¾-inch and greater which is accessible for maintenance and operations shall be color-coded and identified with appropriate identification markers. Direction of flow arrows are to be included with each identification mark unless otherwise specified.
- B. Each marker shall be black lettering on a yellow or white background and have a clearly printed legend to identify the contents of the pipe.
- C. Locations for pipe markers to be as follows:
  1. Adjacent to each valve (except as plumbing fixtures and equipment).
  2. At each branch and riser take-off.
  3. At each pipe passage through wall, floor and ceiling construction.
  4. At each pipe passage to underground
  5. On all horizontal pipe runs, marked every 30 feet.

3.6 PIPE COLOR CODE

<b>Process or Fluid Description</b>	<b>Color</b>	<b>Tnemec Color #</b>
Potable Water	Dark Blue	11SF
Raw Sewage	Dark Gray	33GR
Secondary/ Centrate	Light Grey	31GR
Tertiary/Reclaimed	Purple (Pantone)	14SF
Sludge	Dark Brown	84BR
Backwash Waste	Light Brown	68BR
Compressed Air	Dark Green	91GN
Fire Protection	Red	06SF
Foul Air	White	11WH
Chlorine (Gas or Solution)	Yellow	02SF
Polymer or Coagulant Aid	Orange	04SF

- END OF SECTION -

**SECTION 09900  
PAINTING**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide all labor, materials, equipment and services required to do all painting (excluding items listed in Section 09800 - Special Coatings), including preparation, priming and protection of finished surfaces. An extensive and comprehensive painting job will be required and shall include all surfaces which normally are painted.
- B. The intent of these Specifications is to obtain the material and workmanship necessary to produce an adequate and acceptable job, and is intended to describe the requirements for both shop and field painting.
- C. The intent of this Specification Section is to include all items which are to receive painting and have not been included in Section 09800 – Special Coatings.
- D. The intent of this Specification Section and Section 09800 – Special Coatings shall be to paint all exposed structural steel, miscellaneous ferrous metal, lintels, equipment, piping, all exterior masonry walls and all other work obviously required or noted to be painted unless otherwise specified (see also Article 2.01). The omission of minor items in the schedule of work shall not relieve the obligation to include such items where they come within the general intent of the Specifications as stated herein. All interior surfaces and equipment which have been previously painted shall be repainted or recoated following the proper surface preparation as shown on the Drawings.
- E. Review and examine all Divisions and Sections of these Specifications for any additional painting requirements and/or additional surfaces or items to be painted.
- F. Apply specified finish coats of paint to all pre-primed work and complete finishing system for unprimed work required to be painted.
- G. Backprime, with specified interior first coat material all surfaces of finish trim which will be concealed after installation.
- H. Apply specified finish coats of paint to all pre-painted surfaces which require only a finish coat. Otherwise, the complete system (as given in Article 2.01) shall be administered.

1.2 RELATED WORK

- A. Related Sections:
  - 1. Division 01 – General Requirements
  - 2. Division 05 – Metals
  - 3. Section 07920 – Caulking and Sealants
- B. Wherever detailed painting requirements are covered under an equipment or product specification, the Specifications herein and Section 09800 – Special Coatings govern with respect to surface preparation, paint materials, coats, thicknesses and coverage.

1.3 ITEMS NOT REQUIRING FIELD PAINTING

- A. All new galvanized and stainless steel surfaces (except where noted on Drawings).
- B. Exposed PVC plastic piping (except as required for color coding).

- C. Valves, fittings and appurtenances in small diameter plastic piping (less than 3 inches).
- D. Prefinished items.
- E. Plain copper (except as required for color coding) and stainless steel.
- F. Aluminum except where otherwise designated and required to prevent corrosion at contact with dissimilar materials.
- G. Concrete floors except where noted.
- H. Exterior concrete surfaces except where noted.
- I. Finish hardware.
- J. Concealed from view items (except where required for color coding) and surfaces, except as specified herein or where previously painted.
- K. Packing glands and other adjustable parts and nameplates of mechanical equipment.
- L. Mechanical equipment (i.e. pumps, blowers, actuators, etc.)

#### 1.4 DEFINITIONS

- A. The term "paint" as used herein includes enamels, epoxy, paints, sealers, fillers, emulsions and other coatings.
- B. MDMTPC = Minimum dry mil thickness per coat.
- C. MDFT = Minimum dry film thickness.
- D. SSPC = Steel Structures Painting Council.

#### 1.5 QUALITY ASSURANCE

- A. Qualification of Painters: All painting shall be done by qualified, skilled, experienced craftsmen. In the acceptance or rejection of completed painting, no allowance will be made for lack of skills on the part of the craftsmen.
- B. Paint Labels: Labels on paint containers shall include the following:
  - 1. Manufacturer's name
  - 2. Generic type of paint
  - 3. Manufacturer's stock number
  - 4. Color
  - 5. Instructions for thinning where applicable
- C. Field Quality Control: Paint film thickness shall be subject to measurement by electrometer, wet film gauge, low or high voltage meter, and/or ENGINEER approved measuring instruments. If dry film thickness is found to be less than specified, or coverage is not uniform, apply additional paint to correct the thickness or appearance at no additional.
- D. Compatibility:
  - 1. Compatibility of all paints used is required. A compatible paint will be considered a paint which precludes adverse effects related to bonding, drying delamination, scaling, lifting and bleeding.

2. In cases where shop-applied primers and coatings on materials and equipment furnished by suppliers are products different from those described in the Specifications, compatibility shall be verified with the specified field-applied coating system.
3. Where thinning is necessary, only the products of the manufacturer furnishing the paint, and products for thinning purposes only, will be allowed.

E. Thickness and Spreading Rates:

1. Minimum dry mil thicknesses per coat (MDMTPC) and/or spreading rates in square feet per gallon shall be governed by the manufacturer's current data sheets or literature containing recommendations or instructions regarding these values. These recommended dry mil thickness and/or spreading rate values will be considered requirements to be met same as if set out herein these Specifications and Contract Documents. Do not exceed manufacturer's recommended coverage rates.
2. The number of coats to be applied are specified herein and shall govern. Where the total dry film thickness is specified, this thickness shall govern over the MDMTPC.

## 1.6 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Delivery: All materials shall be brought to the project site in the original sealed and labeled containers of the paint manufacturer. All labels shall be legible and intact at time of use.
- B. Manufacturer's Instructions: Paint manufacturer's written instructions for proper surface preparation, mixing, thinning, application and drying shall be furnished with the paint, and strictly followed.
- C. Storage of Materials:
  1. Store only acceptable materials on project site.
  2. Store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
  3. Comply with all applicable health and fire regulations regarding the storage of paint materials.
  4. Storage of material shall comply with the manufacturer's specifications; however, storage shall be at a minimum temperature of 50 degrees F.
- D. Protection of Materials:
  1. Take all necessary precautions to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.
  2. Painting wastes shall be properly deposited in containers made for this purpose. Do not use plumbing fixtures for disposing of paints wastes.
  3. Take all necessary precautions to protect paint materials before, during and after application and to protect the finished work.
- E. Replacement: In the event of damage to paint materials, immediately make all replacements necessary at no additional cost.
- F. Product delivery, handling and storage shall be in accordance with Part 1 of this Specification.

## 1.7 JOB CONDITIONS

- A. Environmental Requirements:
  1. Comply with manufacturer's recommendations as to the environmental conditions under which painting systems can be applied.
  2. Do not apply finish in areas where dust and/or mist is being generated.

- B. Climatic Conditions: Paint shall not be applied if:
  - 1. The ambient temperature or temperature of the surface to be painted is below 50 degrees F or below the temperature recommended by the paint manufacturer.
  - 2. The relative humidity is above 85 percent.
  - 3. The relative humidity is such that the paint will not dry properly in accordance with the manufacturer's instructions.
- C. Projection:
  - 1. Protect with drop cloths, masking or other acceptable means all surfaces which could be damaged in function or appearance by paint, including surfaces not being painted concurrently and surfaces not to be painted.
  - 2. Hardware, accessories, fixtures and similar items shall be removed and replaced after completion of painting.
  - 3. Spray painting will not be permitted when it will cause damage to adjacent of otherwise located surfaces.
  - 4. All paint splatters on glass shall be wiped off immediately.

## **PART 2 – PRODUCTS**

### **2.1 PAINT SYSTEMS**

- A. General:
  - 1. All paints of a system shall be by one (1) manufacturer.
  - 2. "Lift" tests may be requested on various surfaces to be painted to assure bonding compatibility.
  - 3. Paints containing lead, or other "dangerous" materials, that surpass federal maximum levels shall not be allowed. Oil shall be pure boiled linseed oil.

### **2.2 COLORS**

- A. The manufacturer shall be able to furnish all paints for exposed surfaces in a wide range of colors including lighter and darker shades of these colors which may be selected on various surfaces, if not included in the following codes (also note, the below listed may be included in the requirements of Section 09800 – Special Coatings):
  - 1. Safety Color Codes: Comply with Occupational Safety and Health Administration Standards, as applicable, regarding safety color codes.
  - 2. Piping Color Codes: Colors for process pipe coding shall be as specified in Section 09800 – Special Coatings.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Examine surfaces scheduled to receive paint and/or coating finishes for conditions that will adversely affect application, permanence or quality of work and which cannot be put into an acceptable condition through surface preparation.
- B. Do not proceed with surface preparation or painting application until conditions are suitable.

- C. If surfaces are not thoroughly dry or if they cannot be put in proper conditions to receive paint by customary cleaning methods, the painting applicators shall notify the ENGINEER in writing, requesting necessary corrections.
- D. Review the specified or approved painting systems and bring any questions or doubts as to the proper performance to the ENGINEER. Otherwise, assume the responsibility for providing the desired results.

### 3.2 ACCEPTANCE OF SURFACES

- A. The commencement of painting work in any area or space will be construed as acceptance of the surface as being satisfactory.

### 3.3 SURFACE PREPARATION

#### A. General:

1. All surfaces shall be thoroughly cleaned and free of dust, rust, mill scale, loose paint or oily materials.
2. References to SSPC refer to Steel Structures Painting Council specifications.
3. Surfaces shall be primed and/or treated, as specified, as soon after completion of surface preparation as practical, but in any event before any visible or detrimental corrosion or contamination can occur. A prepared surface, which becomes corroded or contaminated, shall be re-prepared before treating and/or priming.

B. Non-submerged Non-Galvanized Structural Steel: All new non-galvanized structural steel for non-submerged service shall have their surfaces prepared according to SSPC-SP6-63, Commercial Blast Cleaning.

C. Submerged Non-Galvanized Structural Steel: All new non-galvanized structural steel and fabricated metals for submerged service of high temperature service shall have their surfaces prepared according to SSPC-SP10-63T Near White Metal Blast Cleaning.

D. Unprimed Metal Surfaces: All unprimed metal surfaces and miscellaneous fabricated metals (exclusive of structural steel and galvanized metal) to be painted shall be thoroughly cleaned according to SSPC-SP2-63 Hand Tool Cleaning or SSPC-SP3-63 Power Tool Cleaning, unless specifically required elsewhere in these Specifications.

E. Non-Ferrous Metals: Non-ferrous metals surface preparation shall be not less than that required by the paint manufacturer.

#### F. Concrete and Masonry:

1. All concrete and masonry surfaces shall be cleaned and free from loose particles.
2. Concrete floors to be painted shall be etched with a 10 percent solution of muriatic acid. If the concrete surface is exceedingly dense, a greater strength acid or a second etching will be required. After etching for a minimum of 30 minutes, wash thoroughly with water to remove all traces of acid. Allow to thoroughly dry at least 72 hours.
3. Submerged concrete to be coated shall have their surfaces prepared by a light sandblast (Brush Blast), to remove loose coating and provide a textured surface to enhance adherence of the new coating. No sandblasting shall be done on the job in areas containing pumps, motors or other equipment that could be damaged by infiltration of sand particles.

G. Wood Surfaces: Wood surfaces shall be thoroughly cleaned of all extraneous matter and all cracks, nail holes, and other defects properly filled and smoothed. Wood trim shall be sanded to fine finish and wiped clean of dust.

### 3.4 SHOP PRIMING

- A. The requirements Specification Section 09800 will govern over this Specification Section requirements.
- B. Shop priming shall be done with primers that are guaranteed by the equipment manufacturer to be compatible with the finish paints to be used.
- C. The CONTRACTOR shall coordinate all paint materials supplied in the shop and field.

### 3.5 APPLICATION

- A. On metal surfaces apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mill thickness required. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spry gun than when applied unthinned by brush. Deficiencies of film thickness shall be corrected.
- B. On masonry, the application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded.
- C. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate of by applying additional coats of paint.
- D. Evenly brush out each finish coat and permit to dry per manufacturer's recommendation before applying any subsequent coats.
- E. All paints and catalogs shall be maintained at a minimum manufacturer's application temperature before applying.
- F. Successive coats of paint shall be tinted so as to make each coat easily distinguishable from each other with the final undercoat tinted to a darker shade than the finish coat.
- G. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal to remove defects and provide a smooth even surface.
- H. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weathering shall be prime coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.
- I. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be maintained at the conditions recommended by manufacturer by heating and ventilating, if necessary, until each coat of paint has hardened. Any defective paint shall be removed and the surface repainted.
- J. Perform all required back priming work before items are installed.

### 3.6 REINSTALLATION OF REMOVED ITEMS

- A. Following completion of painting in each space, promptly reinstall all items removed for painting, using only workmen skilled in the particular trade.

### 3.7 CLEANING

- A. During the progress of Work, do not allow the accumulation of empty containers or other excess items except in areas specifically reserved for that purpose.
- B. Take all precautions to prevent accidental spillage of paint materials. In the event of spilling, immediately remove all spilled materials and the waste and other equipment used to clean up the spill, and wash surfaces to their original undamaged condition.

- C. Touch-up and restore finish where damaged.
- D. Remove all trash and accumulated materials of a painting nature from premises at the completion of the Work.
- E. Paint spots, oil or stains upon adjacent surfaces shall be removed. Any damage to Work of other trades or equipment caused from painting shall be made good at no additional expense.
- F. Do not mar surface finish of items being cleaned.
- G. Leave entire job clean (including paint storage space).

### 3.8 FINAL INSPECTION

- A. Protect all painted surfaces against damage until the date of final acceptance of the Work.
- B. Conduct a final inspection of all painting work and repaint or retouch any areas or surfaces found deficient in complying with these Specifications.

- END OF SECTION -



**SECTION 10200**  
**LOUVERS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The work of this section consists of furnishing and installing wall louvers as shown on the drawings and as specified herein.
- B. Related Sections:
  - 1. Section 05120 – Miscellaneous Metals, Fasteners, and Special Finishes
  - 2. Section 07920 – Caulking and Sealants
  - 3. Division 09 – Finishes
  - 4. Section 15500 – Ventilating, Heating, and Air Conditioning

1.2 SUBMITTALS

- A. In accordance with Section 01300 - Submittals.
- B. Indicate all dimension, including rough-in dimensions, and type, gauge or thickness, and shape of all components.
- C. Describe type and method of all finishes.
- D. Indicate type, size, location and spacing of all fasteners and anchorage.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. All Work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these Specifications.
- B. Comply with the applicable editions of the following codes, regulations and standards.
  - 1. Industry Standards:
    - ASTM B 85 - Standard Specification for Aluminum-Alloy Die Castings
    - ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
    - ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
    - ASTM B 241 - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
    - ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- C. Comply with the applicable reference Specifications as directed in the General Requirements.

**PART 2 – PRODUCTS**

2.1 FIXED WALL LOUVERS

- A. 6-inch drainable fixed blade high performance louver with a front lip gutter and a recessed second gutter designed to catch both airborne droplets and cascading water.

- B. Heads, sills, jambs and mullions to be one-piece structural members of 6063-T52 alloy 0.125-inch thick, with integral caulking slot and retaining beads.
- C. Mullions shall be sliding interlock type with integral internal drains.
- D. Drainable blade to be minimum 0.125-inch thick.
- E. Closed cell PVC compression gaskets to be provided between bottom of mullion or jab and top of sill to insure leak tight connections.
- F. Structure supports to be designed by louver manufacturer to carry a wind load of not less than 20 pounds per square foot.
- G. All fasteners to be stainless steel or aluminum.
- H. All exterior louvers shall be furnished with insect screens. Insect screens shall be removable 18 x 14 aluminum mesh, 0.0123-inch diameter, 5056 clad, rolled or extruded aluminum with mitered corners and secured with clips to provide a strong neat frame.
- I. All louvers to be free of scratches and shall be finished in two-coast fluorocarbon polymeric system, Kynar 500, or equal, color as selected by CITY.
- J. All louvers shall be installed with disposable or reusable filter panels/ material per 3M, Permatron, or equal. Filter materials shall allow for ease in removal and replacement and be placed on the interior side of a building.
- K. The static pressure drop, in inches water gage, across the louver as a function of face velocity, in feet per minute, shall not exceed the values tabulated below:
  - 1. Static Pressure Drop-Inches Water Gage
    - a. Not to Exceed 0.20
  - 2. Face Velocity-Feet per Minute
    - a. Not to Exceed 525
- L. Louvers shall be Ruskin, Greenheck, or approved equal.

## 2.2 ADJUSTABLE OR STATIONARY LOUVER

- A. Fabrication: Sightproof/Mullion style.
  - 1. Manufacturer: Ruskin Company or approved equal.
  - 2. Frame:
    - a. Frame Depth: 6 inches (152 mm).
    - b. Material: Aluminum
    - c. Wall Thickness: 16 gage (1.6 mm), nominal.
  - 3. Blades:
    - a. Style: Horizontal drainable.
    - b. Material: Galvanized steel, ASTM A 653, HDG G60 CS.
    - c. Wall Thickness: 18 gage (1.3 mm), nominal.
    - d. Angle: 37-1/2 degrees.
    - e. Centers: 4-5/16 inches (110 mm), nominal.
    - f. Linkage: Concealed in frame.
    - g. Bearings: Stainless steel sleeve pressed into frame.
    - h. Axles: 1/2 inch (13 mm) plated steel hex.

4. Actuator (where applicable):
    - a. Manual, locking louver quadrant.
    - b. Electric, 120 V, 60 Hz, two-position, spring-return.
  5. Gutters: Drain gutter in head frame and each blade.
  6. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.
  7. Assembly:
    - a. Factory assembled louver components. Mechanically fastened construction.
- B. Performance Data:
1. Performance Ratings: AMCA licensed.
    - a. Based on testing 48 inch by 48 inch (1219 mm by 1219 mm) size unit in accordance with AMCA 500.
  2. Free Area: 52 percent, nominal.
  3. Maximum Recommended Air Flow through Free Area: 1026 feet per minute (313 m/min).
  4. Air Flow: Per Plans
  5. Maximum Pressure Drop: .10 inches w.g. (24.89 Pa).
  6. Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/sm) of free area at an air flow of 1026 feet per minute (313 m/min) free area velocity when tested for 15 minutes.

### 2.3 STATIONARY ACOUSTICAL LOUVER

- A. Acoustic louvers shall be used on the East and South buildings. Acoustic Louvers shall be per Ruskin, Greenheck, or equal.
- B. Design: Louver blades shall be non-drainable type and contained within 6 inches frame. Acoustical blades shall be solid on exterior and perforated material on interior for noise absorption. Blades shall have acoustical insulation fill.
- C. Extruded Aluminum Fabrication:
  1. Frame:
    - a. Frame Depth: 6 inches.
    - b. Wall Thickness: 0.125 inch, nominal.
    - c. Material: Extruded aluminum Alloy 6063 T6.
  2. Blades:
    - a. Style: Insulated.
    - b. Interior Wall Thickness: 0.040 inch, nominal.
    - c. Interior Material: Perforated aluminum, covers insulation.
    - d. Exterior Wall Thickness: 0.081 inch, nominal.
    - e. Exterior Material: Extruded aluminum Alloy 6063 T6.
    - f. Blades positioned at 45° angle and spaced approximately 4 5/8 center to center.
    - g. Linkage: Concealed in frame.
    - h. Bearings: Stainless steel sleeve pressed into frame.
    - i. Axles: ½ inch plated steel hex.
  3. Mullion Style – Design incorporates visible mullions or frames at the perimeter of the louver and also at certain intervals within the louver perimeter to support the louver blades. Louver blade sightlines are interrupted at the mullion locations. No rear-mounted blade supports are utilized.

- D. Performance Data:
1. Based on testing 48 inch x 48 inch size unit in accordance with AMCA 500.
  2. Free Area: 35-42 percent, nominal.
  3. Maximum Recommended Air Flow through Free Area: 1019 feet per minute
  4. Maximum Pressure Drop (Intake): 0.10 inches w.g.
  5. Water Penetration: Maximum of 0.01 ounces per square foot of free area at an air flow of 1019 feet per minute free area velocity when tested for 15 minutes.
- E. Sound Data: Tested in accordance with ASTM E 90.

Octave Band Frequency (Hz)	Free Field Noise Reduction (db) 1" Fiberglass Insulation
1/63	9
2/125	7
3/250	8
4/500	9
5/1000	10
6/2000	16
7/4000	16
8/8000	19

- F. Design Windload: Incorporate structural supports required to withstand wind load as noted on the structural GSN sheets.
- G. Louvers shall be factory engineered to withstand the specified seismic loads.
- H. Minimum design loads shall be calculated to comply with ASCE – 7, or local requirements of Authority Having Jurisdiction (AHJ).

#### 2.4 ACCESSORIES

- A. Aluminum Filter Racks: Formed channel racks to accept standard thick filters (rigid and reusable polyester filter material – PermaFlo per Permatron). Unused bottom portion blanked off with 0.040 inch aluminum sheet.
- B. Filter: 1 inch thick.
- C. Bird Screen: Aluminum, 1/2 inches by 0.063 inch, intercrimp. Frame: Removable. Rewireable.
- D. Extended Sills:
1. Extruded aluminum, Alloy 6063-T6. Minimum nominal thickness 0.060 inch.
  2. Visible Mullions: Manufacturer's standard horizontal or vertical visible mullions for architectural accent as indicated on drawings.

#### 2.5 FINISHES

- A. Finish: Epoxy-Based Painted Finish.
- B. Color: Color for PVDF Coating: Custom. Refer to Drawings.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. Delivered materials shall be in manufacturer's original unopened and undamaged packages with labels legible and intact. Store materials in unopened packages in a manner to prevent damage from environment and construction operations. Handle in accordance with manufacturer's instructions.
- B. Louvers shall be installed in accordance with manufacturer's approved shop drawings and as detailed on the drawings. All necessary fastenings shall be provided to make a complete installation.
- C. Louvers shall be fastened to the supporting member of materials on all four sides, non-removable from outside, with stainless steel fasteners.
- D. Observe all necessary precautions to prevent damage to finish. Use stainless steel washers under all fasteners.
- E. Upon completion of the louver installation, all louvers shall be cleaned of all dirt and other foreign material. Louvers shall be touched up as required using the manufacturer's recommended materials and instructions.
- F. Louvers shall be protected from damage from subsequent building operations.

- END OF SECTION -

**SECTION 10440**  
**SIGNAGE**

**PART 1 - GENERAL**

1.1 WORK INCLUDED

- A. Includes all labor, materials, and equipment required to install room signage as noted on drawings and specified herein. It is the intention of the signage requirement to have one sign at each interior door or room.

1.2 SUBMITTALS

- A. Submit shop drawings and samples in accordance with Section 01300 for all work under this Section. CONTRACTOR shall submit layouts and schedules of each type of signage.
- B. Submit color samples for CITY approval.

**PART 2 - PRODUCTS**

2.1 INTERIOR SIGNAGE

- A. Wall Mounted Room Names and Numbers
  - 1. Signage shall be one piece photo etched raised letter borderless glass plaques with radius corners, 4" x 8", laminated to an opaque acrylic 1/8" thick backing.
  - 2. All signs shall have characters on contrasting background (color selected by CITY) and shall meet ADA and ANSI A117.1 Standards for raised letter and braille characters and pictorial symbol signs.
  - 3. Braille to comply with specification #800 National Library Service, National Library of Congress specifications for standard literary braille.
  - 4. Signage shall utilize upper case Palatino style of lettering, black in color.
  - 5. Finish materials shall be durable and stain resistant.
- B. Mounting system shall utilize a silastic adhesive mounting system with vinyl foam adhesive tape supplied to hold the sign in place until silastic is fully cured.
- C. Room name signage shall be mounted at the exterior side of each door.
  - 1. Refer to Room finish schedule, door schedule, and floor plan for complete listing of rooms.
  - 2. Prior to fabrication, verify room name schedule with CITY.
- D. Toilet Room signage shall include pictorial symbol sign for men and women handicap use and be door mounted to comply with ADA requirements.

**PART 3 - EXECUTION**

3.1 INSTALLATION AND WORKMANSHIP

- A. Install room sign units 4" from the latch side of the door, 5'-0" above finish floor to bottom of sign. Securely mount with adhesive. Attach signs to substrates in accordance with the manufacturer's instructions.
- B. Install all signage level, plumb, and at proper heights. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by the CITY.

- END OF SECTION -



**SECTION 11000**  
**EQUIPMENT GENERAL PROVISIONS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. All equipment and appurtenant work, complete and operable, in accordance with the Contract Documents shall be provided.
- B. The provisions of this Section shall apply to all equipment except where otherwise indicated.
- C. Equipment Arrangement: Unless specifically indicated otherwise, the arrangement of equipment shown on the Drawings is based upon information available at the time of design and is not intended to show exact dimensions particular to a specific manufacturer in all cases. Some aspects of the Drawings are diagrammatic and some features of the illustrated equipment arrangement may require revision to meet the actual equipment requirements. Structural supports, foundations, piping and valve connections, and electrical and instrumentation connections indicated may have to be altered to accommodate the equipment provided.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Equipment shall be in accordance with the following standards, as applicable and as indicated in each equipment specification:

- 1. American Society for Testing and Materials (ASTM).
- 2. American National Standards Institute (ANSI)
- 3. American Society of Mechanical Owners (ASME).
- 4. American Water Works Association (AWWA).
- 5. American Society of Heating, Refrigerating and Air Conditioning Owners (ASHRAE).
- 6. American Welding Society (AWS).
- 7. National Fire Protection Association (NFPA).
- 8. Federal Specifications (FS).
- 9. National Electrical Manufacturers Association (NEMA).
- 10. Manufacturer's published recommendations and specifications.
- 11. General Industry Safety Orders (OSHA).

- B. The following standards are referenced in this Section:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy and other Special Alloys
ANSI B46.1	Surface Texture
ANSI S12.6	Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors
ASME B1.20.1	General Purpose Pipe Threads (Inch)
ASME B31.1	Power Piping
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 in. through 144 in. (100 mm through 3,600 mm)

ASTM A 48	Gray Iron Castings
ASTM A 108	Steel Bars, Carbon, Cold-Finished, Standard Quality

### 1.3 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 - Submittals.
- B. Shop Drawings: Furnish complete drawings and technical information for equipment, piping, valves and controls. Where indicated or required by the ENGINEER, Shop Drawings shall include clear, concise calculations showing equipment anchorage forces and the capacities of the anchorage elements.
- C. Spare Parts List: A list of spare parts for each piece of equipment shall be obtained from the manufacturer and submitted at the same time as Shop Drawings. The name, address and telephone number of the nearest distributor for each piece of equipment shall be furnished. This list shall contain all data necessary to allow the CITY to purchase spare parts as necessary.

### 1.4 QUALITY ASSURANCE

- A. Inspection: The local authorities shall be informed to witness all required tests for piping, plumbing, fire protection systems, pressure vessels, safety systems, and related items.
- B. Quality and Tolerances: Tolerances and clearances shall be as shown on the Shop Drawings and shall be closely adhered to.
  - 1. Machine work shall in all cases be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts. Members without milled ends and which are to be framed to other steel parts of the structure may have a variation in the detailed length of not greater than 1/16-inch for members 30-feet or less in length, and not greater than 1/8-inch for members over 30-feet in length.
  - 2. Castings shall be homogeneous and free from non-metallic inclusions and defects. Surfaces of castings which are not machined shall be cleaned to remove foundry irregularities. Casting defects not exceeding 12.5 percent of the total thickness and where defects will not affect the strength and serviceability of the casting may be repaired by approved welding procedures. If the removal of metal for repair reduces the stress-resisting cross-section of the casting by more than 25 percent or to such an extent that the computed stress in the remaining metal exceeds the allowable stress by more than 25 percent, then the casting may be rejected.
  - 3. All materials shall meet the physical and mechanical properties in accordance with the reference standards.
- C. Machine Finish: The type of finish shall be the most suitable for the application and shall be shown in micro-inches in accordance with ANSI B46.1. The following finishes shall be used:
  - 1. Surface roughness not greater than 63 micro-inches shall be required for all surfaces in sliding contact.
  - 2. Surface roughness not greater than 250 micro-inches shall be required for surfaces in contact where a tight joint is not required.
  - 3. Rough finish not greater than 500 micro-inches shall be required for other machined surfaces.
  - 4. Contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall be finished to not greater than 32 micro-inches.

### 1.5 SPARE PARTS AND TOOLS

- A. Spare parts shall be furnished as indicated in the individual equipment sections. All spare parts shall be suitably packaged in the original manufacturer's box and labeled clearly with equipment numbers and name tags attached to the box.
- B. Special tools shall be suitably packaged and clearly labeled and directions shall be provided for intended use.

## PART 2 – PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. **Noise Level:** When in operation, no single piece of equipment shall exceed the OSHA noise level requirement of 105 dBA for one-hour exposure per day without sound enclosure or sound dampening devices.
- B. **High Noise Level Location:** One personal hearing protection station at each high noise level location shall be provided. Locations are defined as follows:
1. **Outdoor Location:** Any single equipment item or any group of equipment items that produce noise exceeding OSHA noise level requirements for a 2-hour exposure. Where such equipment is separated by a distance of more than 20 feet, measured between edges of footings, each group of equipment shall be provided with a separate hearing protection station.
  2. **Indoor Location**
    - a. Any single equipment item or any group of equipment items located within a single room not normally occupied, that produces noise exceeding OSHA noise level requirements for a 2-hour exposure.
    - b. Any single equipment item or any group of equipment items located within a single room normally occupied by workers, that produces noise exceeding OSHA noise level requirements for an 8-hour exposure.
- C. **Personal Hearing Protection:** Three pairs of high attenuation hearing protectors in the original unopened packaging shall be provided. The ear protectors shall be capable of meeting the requirements of ANSI S12.6 and shall produce a noise level reduction of 25 dBA at a frequency of 500 Hz. The hearing protectors shall have ear cushions and a variable, padded headband.
- D. **Drive Trains and Service Factors:** Service factors shall be applied in the selection or design of mechanical power transmission components. All components of drive train assemblies between the prime mover and the driven equipment shall be designed and rated to deliver the maximum peak or starting torque, speed, and horsepower. All of the applicable service factors shall be considered, such as mechanical (type of prime mover), load class, start frequency, ventilation, ambient temperature and fan factors. Drive train components include couplings, shafts, gears and gear drives, drive chains, sprockets and V-belt drives. Unless otherwise indicated, the following load classifications shall apply in determining service factors:

Type of Equipment	Service Factor	Load Classification
Reciprocating Air Compressors: Multi-Cylinder	2.0	Heavy Shock
Single-Cylinder	2.0	Heavy Shock
Pumps: Centrifugal or Rotary	1.0	Uniform
Reciprocating	1.8	Moderate Shock
Cranes or Hoists	1.25	Moderate Shock

- E. **Mechanical Service Factors:**

	Electric Motor	Internal Combustion Engine
Uniform	1.25	1.50
Moderate Shock	1.50	1.75
Heavy Shock	2.00	2.25

- F. For thermal rating adjustments such as start frequency, ambient temperature, and hourly duty cycle factor, ventilation factor, and fan factor, refer to gear manufacturer sizing information.
- G. For service factors of electric motors, see Section 16150 – Induction Motors.
- H. Where load classifications are not indicated, service factors based on AGMA 514.02 shall be used for standard load classifications and service factors for flexible couplings,
- I. Welding: Unless otherwise indicated, welding shall conform to the following:
  - 1. Latest revision of AWWA D100.
  - 2. Latest revision of AWWA C206.
  - 3. Composite fabricated steel assemblies that are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipment, shall have continuous seal welds to prevent entrance of air or moisture.
  - 4. Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.
  - 5. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS code. Upon completion of welding, weld splatter, flux, slag and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.
- J. Protective Coating: Equipment shall be painted or coated in accordance with Section 09800 - Special Coatings and Section 09900 - Painting, unless otherwise indicated.
- K. Identification of Equipment Items: Each item of equipment shipped shall have a legible identifying mark corresponding to the equipment number for the particular item.
- L. Vibration Isolators: Air compressors, blowers, engines, inline fans shall be provided with restrained spring-type vibration isolators or pads per manufacturer's written recommendations.
- M. Shop Fabrication: Shop fabrication shall be performed in accordance with the Contract Documents and the Shop Drawings.
- N. Controls: Equipment and system controls shall be in accordance with Division 17 - Instrumentation.

## 2.2 EQUIPMENT SUPPORTS AND FOUNDATIONS

- A. Equipment Supports: Unless otherwise indicated, equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, wind, and seismic loads. The design horizontal seismic force shall be the greater of: that noted in the general structural notes or as required by the governing building code, or 10 percent of gravity. Submitted design calculations for equipment supports shall bear the signature and seal of an engineer registered in the State wherein the project is to be built, unless otherwise indicated.
- B. Equipment Foundations: Mechanical equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on minimum 3.5-inch high concrete bases, where indicated. Equipment foundations are indicated on Drawings. The size and weight of equipment foundation to insure compatibility with equipment shall be verified through the equipment manufacturer.

## 2.3 COUPLINGS

- A. Mechanical couplings shall be provided between the driver and the driven equipment. Flexible couplings shall be provided between the driver and the driven equipment to accommodate slight angular misalignment, parallel misalignment, end float, and to cushion shock loads. Unless otherwise indicated or recommended by the equipment manufacturer, coupling type shall be furnished with the respective equipment as follows:

Equipment Type	Coupling Type
Air Compressors / Air Blowers	Belt, gear or flexible disc pack

- B. Each coupling size shall be determined based on the rated horsepower of the motor, speed of the shaft, and the load classification service factor. The equipment manufacturer shall select or recommend the size and type of coupling required to suit each specific application.
- C. Differential Settlement: Where differential settlement between the driver and the driven equipment may occur, 2 sets of universal type couplings shall be provided.
- D. Taper-Lock or equal bushings may be used to provide for easy installation and removal of shafts of various diameters.

## 2.4 SHAFTING

- A. General: Shafting shall be continuous between bearings and shall be sized to transmit the power required. Keyways shall be accurately cut in line. Shafting shall not be turned down at the ends to accommodate bearings or sprockets whose bore is less than the diameter of the shaft. Shafts shall rotate in the end bearings and shall be turned and polished, straight, and true.
- B. Design Criteria: All shafts shall be designed to carry the steady state and transient loads suitable for unlimited number of load applications, in accordance with ASME B106.1M, - Design of Transmission Shafting. Where shafts are subjected to fatigue stresses, such as frequent start and stop cycles, the mean stress shall be determined by using the modified Goodman Diagram. The maximum torsional stress shall not exceed the endurance limit of the shaft after application of the factor of safety of 2 in the endurance limit and the stress concentration factor of the fillets in the shaft and keyway. Stress concentration factor shall be in accordance with ASME Standard B17.1 - Keys and Keyseats.
- C. Materials: Shafting materials shall be appropriate for the type of service and torque transmitted. Environmental elements such as corrosive gases, moisture and fluids shall be taken into consideration. Materials shall be as indicated unless furnished as part of an equipment assembly.
1. Low carbon cold-rolled steel shafting shall conform to ASTM A 108, Grade 1018.
  2. Medium carbon cold-rolled shafting shall conform to ASTM A 108, Grade 1045.
  3. Other grades of carbon steel alloys shall be suitable for service and load.
  4. Corrosion-resistant shafting shall be stainless steel or Monel, whichever is most suitable for the intended service.
- D. Differential Settlement: Where differential settlement between the driver and the driven equipment may occur, a shaft of sufficient length with 2 sets of universal type couplings shall be provided.

## 2.5 V-BELT DRIVES

- A. V-belts and sheaves shall be of the best commercial grade and shall conform to ANSI, MPTA, and RMA Standards.
- B. Unless otherwise indicated, sheaves shall be machined from the finest quality gray cast iron.

- C. Sheaves shall be statically balanced. In some applications where vibration is a problem, sheaves shall be dynamically balanced. Sheaves operating at belt speeds exceeding 6,500 fpm may be required to be of special materials and construction.
- D. Finish bored sheaves shall be complete with keyseat and setscrews.
- E. Sliding motor bases or auto-tension, spring suspension shall be provided to adjust the tension of V-belts.

2.6 DRIVE GUARDS

- A. Power transmission trains, prime movers, machines, shaft extensions, and moving machine parts shall be guarded to conform with the Division of Industrial Safety General Industrial Safety Orders latest edition. The guards shall be constructed of minimum 10 gage expanded, flattened steel with smooth edges and corners, galvanized after fabrication, and securely fastened. Where required for lubrication or maintenance, guards shall have hinged and latched access doors.

2.7 BEARINGS

- A. General: Bearings shall conform to the standards of the Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA).
- B. To assure satisfactory bearing application, fitting practice, mounting, lubrication, sealing, static rating, housing strength, and lubrication shall be considered in bearing selection.
- C. Re-lubricatable type bearings shall be equipped with a hydraulic grease fitting in an accessible location and shall have sufficient grease capacity in the bearing chamber.
- D. Lubricated-for-life bearings shall be factory-lubricated with the manufacturer's recommended grease to insure maximum bearing life and best performance.
- E. Anti-Friction Type Bearing Life: Except where otherwise indicated, bearings shall have a minimum L-10 life expectancy of 5 years or 20,000 hours, whichever occurs first. Where so indicated, bearings shall have a minimum rated L-10 life expectancy corresponding to the type of service, as follows:

Type of Service	Design Life (years)	L-10 Design Life (hours)
<b>(whichever comes first)</b>		
8-hour shift	10	20,000
16-hour shift	10	40,000
Continuous	10	60,000

- F. Bearing housings shall be of cast iron or steel and bearing mounting arrangement shall be as indicated or as recommended in the published standards of the manufacturer. Split-type housings may be used to facilitate installation, inspection, and disassembly.
- G. Sleeve Type Bearings: Sleeve-type bearings shall have a cast iron or ductile iron housing and Babbitt or bronze liner. Bearing housing shall be bolted and doweled to the lower casing half. These housings shall be provided with cast iron caps bolted in place and the bearing end caps shall be bored to receive the bearing shells. Sleeve bearings shall be designed on the basis of the maximum allowable load permitted by the bearing manufacturer. If the sleeve bearing is connected to an equipment shaft with a coupling, the coupling transmitted thrust will be assumed to be the maximum motor or equipment thrust. Lubricant, lubrication system, and cooling system shall be as recommended by the bearing manufacturer.

- H. Plate Thrust Bearings: Thrust bearings shall be the Kingsbury Type, designed and manufactured to maintain the shaft in the fixed axial position without undue heating or the necessity of adjustment or attention. Bearings shall be oil lubricated to suit the manufacturer's standard method of lubrication for the specific bearing. If bearing cooling is required, manufacturer shall provide necessary piping, filters, and valves.

## 2.8 PIPING CONNECTIONS

- A. Pipe Hangers, Supports, and Guides: Pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment. Supports and hangers shall be in accordance with Section 15006 - Pipe Supports.
- B. Flanges and Pipe Threads: Flanges on equipment and appurtenances shall conform to ANSI B16.1, Class 125, or B16.5, Class 150, unless otherwise indicated. Pipe threads shall be in accordance with ANSI/ASME B1.20.1 and Section 15000 - Piping, General.
- C. Flexible Connectors: Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment and in piping systems in accordance with the requirements of Section 15000 – Piping, General. Flexible connectors shall be harnessed or otherwise anchored to prevent separation of the pipe where required by the installation.
- D. Insulating Connections: Insulating bushings, unions, couplings, or flanges, as appropriate, shall be used in accordance with the requirements of the Section 15000.

## 2.9 GASKETS AND PACKINGS

- A. Gaskets shall be in accordance with Section 15000 – Piping, General.
- B. Packing around valve stems and reciprocating shafts shall be of compressible material, compatible with the fluid being used. Chevron-type "V" packing shall be **Garlock No. 432, John Crane "Everseal,"** or equal.
- C. Packing around rotating shafts (other than valve stems) shall be "O"-rings, stuffing boxes, or mechanical seals, as recommended by the manufacturer, in accordance with Section 11100 - Pumps, General.

## 2.10 NAMEPLATES

- A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

## 2.11 EQUIPMENT LUBRICANTS

- A. Lubricants for all equipment during storage and prior to initial testing of the equipment shall be installed.

# PART 3 – EXECUTION

## 3.1 SERVICES OF MANUFACTURER

- A. Inspection, Startup, and Field Adjustment: Where required by individual sections, an authorized, experienced, and competent service representative of the manufacturer shall visit the Site to witness or perform the following in accordance with Section 01450 – Services of Manufacturer's Representative and to certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation.
  1. Inspection, checking, and adjusting the equipment and approving its installation.
  2. Startup and field testing for proper operation, efficiency, and capacity.

3. Performing field adjustments during the test period to ensure that the equipment installation and operation comply with requirements.
4. Instruct plant operating personnel on proper operations, maintenance and care.

### 3.2 INSTALLATION

- A. General: Equipment shall be installed in accordance with the manufacturer's written recommendations.
- B. Alignment: Equipment shall be field tested to verify proper alignment.

### 3.3 PRE-PACKAGED EQUIPMENT

- A. Coordination of all necessary space and structural requirements, clearances, utility connections, signals, and outputs shall be required to avoid later change orders, when any system is furnished as pre-packaged equipment.

### 3.4 WELDING

- A. Welds shall be cleaned of weld-slag, splatter, etc. to provide a smooth surface. Metal brushes shall be the same material as the metal welded. Stainless steel brushes shall be used for cleaning stainless steel welds.

### 3.5 FIELD TESTS

- A. Where indicated by the individual equipment sections, equipment shall be field tested after installation to demonstrate satisfactory operation without excessive noise, vibration, or overheating of bearings or motor.
- B. The following field testing shall be conducted:
  1. Start equipment, check, and operate the equipment over its entire operating range. Vibration level shall be within the amplitude limits as indicated or as recommended by the reference applicable Standards.
  2. Obtain concurrent readings of motor voltage, amperage, capacity, vibration and bearing temperatures.
- C. In the event that any equipment fails to meet the test requirements, the equipment shall be modified and retested until it satisfies the requirement.

- END OF SECTION -

**SECTION 11100  
PUMPS, GENERAL**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. All pumps and pumping appurtenances, complete and operable, in accordance with the Contract Documents shall be provided.
- B. The provisions of this Section shall apply to all pumps and pumping equipment except where otherwise indicated in the Contract Documents.
- C. The requirements of Section 11000 – Equipment General Provisions apply to this Section.
- D. Unit Responsibility: The pump manufacturer shall be made responsible for furnishing the equipment and for coordination of design, assembly, testing, and installation of each pump system.
- E. Single Manufacturer: Where two or more pump systems of the same type or size are required, the pumps shall all be produced by the same manufacturer.

1.2 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Shop Drawings: Shop Drawings shall contain the following information:
  - 1. Pump name, identification number, and specification Section number.
  - 2. Performance data curves showing head, capacity, horsepower demand, NPSH required, and pump efficiency over the entire operating range of the pump. The equipment manufacturer shall indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the design flow conditions and the maximum and minimum flow conditions. Performance curves at intervals of 5 Hz from minimum speed to maximum speed shall be furnished for each centrifugal pump equipped with a variable speed drive.
  - 3. The manufacturer shall be required to indicate the limits on the performance curves recommended for stable operation without surge, cavitation or excessive vibration. The stable operating range shall be as wide as possible based on actual hydraulic and mechanical tests.
  - 4. Assembly and installation drawings including shaft size, seal, coupling, bearings, anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights.
  - 5. Data, in accordance with Section 16150 - Induction Motors, for the electric motor proposed for each pump.
  - 6. Wiring diagram of field connections with identification of terminations between Local Control Panels, junction terminal boxes, and equipment items.
  - 7. Complete electrical schematic diagram.
  - 8. Factory certification indicating the pump make and model has been tested satisfactorily to meet the specified performance criteria.
- C. Spare Parts List: A list of spare parts for each piece of equipment shall be obtained from the manufacturer and submitted at the same time as Shop Drawings. The name, address and telephone number of the nearest distributor for each piece of equipment shall be furnished. This list shall contain all data necessary to allow the CITY to purchase spare parts as necessary.

- D. Factory Test Data: Signed, dated, and certified factory test data for each pump system which requires factory testing.
- E. Certifications:
  - 1. Manufacturer's certification of proper installation.
  - 2. ENGINEER'S certification of satisfactory field testing.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. Compliance with the requirements of the individual pump Sections may necessitate modifications to the Manufacturer's standard equipment.
- B. Performance Curves: All centrifugal pumps shall have a continuously rising curve or the system operating range shall not cross the pump curve at two different capacities or “dip region.” Unless indicated otherwise, the required pump shaft horsepower at any intended operational point on the performance curve shall not exceed the rated horsepower of the motor or engine or encroach on the service factor.
- C. All components of each pump system provided under the pump Sections shall be entirely compatible. Each unit of pumping equipment shall incorporate all basic mechanisms, couplings, electric motors or engine drives, variable speed controls, necessary mountings, and appurtenances.

### **2.2 MATERIALS**

- A. All materials shall be suitable for the intended application; materials not indicated shall be high-grade, standard commercial quality, free from all defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended, and shall conform to the following requirements:
  - 1. Cast iron pump casings and bowls shall be of close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30 or equal.
  - 2. Bronze pump impellers shall conform to ASTM B 62 - Composition Bronze or Ounce Metal Castings, or B 584 - Copper Alloy Sand Castings for General Applications, where dezincification does not exist.
  - 3. Stainless steel pump shafts shall be Type 416 or 316. Miscellaneous stainless steel parts shall be of Type 304 or 316, except in a septic environment.
  - 4. Anchor bolts, washers, and nuts in Standard Service (Non-Corrosive Application) shall be galvanized steel in accordance with the requirements of Section 05500 – Misc. Metals, Fasteners and Special Finishes. Anchor bolts, washers and nuts in Corrosive Service as defined in Section 05500 – Misc. Metals, Fasteners and Special Finishes shall be stainless steel in accordance with that Section.

### **2.3 PUMP COMPONENTS – GENERAL**

- A. Flanges and Bolts: Suction and discharge flanges shall conform to ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800 or B16.5 - Pipe Flanges and Flanged Fittings dimensions. Bolts shall be in accordance with Section 05500 – Misc. Metals, Fasteners and Special Finishes.
- B. Lubrication: Vertical pump shafts of clean water pumps shall be product water-lubricated, unless otherwise indicated. Deep-well pumps and pumps with dry barrels shall have water- or oil-lubricated bearings and seals and enclosed line shafts.
- C. Handholes: Handholes on pump casings shall be shaped to follow the contours of the casing to avoid any obstructions in the water passage.

- D. Drains: All gland seals, air valves, cooling water drains, and drains from variable speed drive equipment shall be piped to the nearest floor sink, or drain, with galvanized steel pipe or copper tube, properly supported with brackets.

## 2.4 PUMP APPURTENANCES

- A. Nameplates: Each pump shall be equipped with a stainless steel nameplate indicating serial numbers, rated head and flow, impeller size, pump speed, induction motor Full Load Current (FLA), Voltage, Frequency and manufacturer's name and model number.
- B. Gauges:
  - 1. Gauges shall be located in a representative location, where not subject to shock or vibrations, in order to achieve true and accurate readings.
  - 2. Where subject to shock or vibrations, the gauges shall be wall-mounted or attached to galvanized channel floor stands and connected by means of flexible connectors.
  - 3. Pressure and compound gauges shall be provided in accordance with Division 17 - Instrumentation.

## 2.5 FACTORY TESTING

- A. If specified in individual specification sections, the following tests shall be conducted on each indicated pump system:
  - 1. Motors: Electric motors shall be tested in accordance with Section 16150 – Induction Motors.
  - 2. Pump Systems: All centrifugal pump systems with drives 10 hp up to and including 125 hp shall have a prototype tested at the pump factory in accordance with the American National Standard for Centrifugal Pump Tests (ANSI/HI 1.6) acceptance Level "A" or the American National Standard for Vertical Pump Tests (ANSI/HI 2.6) as approved by ANSI and published by the Hydraulic Institute. The following minimum test results shall be submitted:
    - a. Hydrostatic test results
    - b. At maximum speed, a minimum of five hydraulic test readings between shutoff head and 25 percent beyond the maximum indicated capacity, recorded on data sheets as defined by the Hydraulic Institute. For variable speed driven pumps, each pump shall be tested between maximum and minimum speed at 5 Hz increments.
    - c. Pump curves showing head, flow, bhp/ electrical current, and efficiency requirements.
    - d. NPSH required test curve if required by the pump specification. Otherwise, a calculated NPSH required curve may be submitted.
  - 3. Acceptance: In the event of failure of any pump to meet any of the requirements, all necessary modifications, repairs, or replacements shall be made to conform to the requirements of the Contract Documents and the pump shall be re-tested until found satisfactory.

## PART 3 – EXECUTION

### 3.1 SERVICES OF MANUFACTURER

- A. Inspection, Startup, and Field Adjustment: Where required by the individual pump Sections, an authorized service representative of the manufacturer shall visit the Site to witness the following and to certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation.
  - 1. Inspection, checking, and adjusting the equipment.
  - 2. Startup and field testing for proper operation.
  - 3. Performing field adjustments to ensure that the equipment installation and operation comply with requirements.
  - 4. Instruct plant operating personnel on proper operation, maintenance and care.

### 3.2 INSTALLATION

- A. General: Pumping equipment shall be installed in accordance with the manufacturer's written recommendations.
- B. Alignment: All equipment shall be field tested to verify proper alignment and freedom from binding, scraping, shaft runout, or other defects. Pump drive shafts shall be measured just prior to assembly to ensure correct alignment without forcing. Equipment shall be secure in position and neat in appearance.
- C. Lubricants: The necessary oil and grease for initial operation shall be provided.

### 3.3 PROTECTIVE COATING

- A. Materials and equipment shall be coated as required in Section 09800 - Special Coatings and Section 09900 - Painting.

### 3.4 FIELD TESTS

- A. Where indicated by the individual pump sections, each pump system shall be field tested after installation to demonstrate:
  - 1. Satisfactory operation without excessive noise and vibration.
  - 2. No material loss caused by cavitation.
  - 3. No overheating of bearings.
  - 4. Indicated head, flow, and efficiency at design point.

**The following field testing shall be conducted:**

- 5. Startup, check, and operate the pump system over its entire speed range. If the pump is driven by a variable speed drive, the pump and motor shall be tested at 5 Hz increments. If the pump is driven at constant speed, the pump and motor shall be tested at max RPM. Unless otherwise indicated, vibration shall be within the amplitude limits recommended by the Hydraulic Institute Standards at a minimum of four pumping conditions.
  - 6. Obtain concurrent readings of motor voltage, amperage, pump suction head, and pump discharge head for at least three pumping conditions at each pump rotational speed if variable speed at 5 Hz increment or at max RPM if constant speed. Check each power lead to the motor for proper current balance.
  - 7. Determine bearing temperatures by contact type thermometer. A run time until bearing temperatures have stabilized shall precede this test, unless insufficient liquid volume is available.
  - 8. Electrical and instrumentation tests shall conform to the requirements of the sections under which that equipment is specified.
- B. In the event any pumping system fails to meet the indicated requirements, the pump shall be modified or replaced and retested as above until it satisfies the requirements.
  - C. After each pumping system has satisfied the requirements, the ENGINEER shall certify in writing that it has been satisfactorily tested and that all final adjustments have been made. Certification shall include the date of the field tests, a listing of all persons present during the tests, and the test data.
  - D. This work shall include all costs of field tests, including related services of the manufacturer's representative, except for power and water.

- END OF SECTION -

**SECTION 11108  
CHEMICAL FEED SYSTEM**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Furnish and install the chemical feed system with associated skid, anchoring, piping and appurtenances, complete and operable in accordance with the Contract Documents.
- B. The requirements of Section 11000 – Equipment General Provisions apply to this Section

1.2 SUBMITTALS

- A. Submittals shall be furnished in accordance with Sections 01300 – Submittals.

1.3 OPERATING AND MAINTENANCE MANUAL

- A. Provide hard copies plus electronic version in PDF format.
- B. Operation and Maintenance Manual shall be furnished in accordance with Section 01730 – Operating and Maintenance Data.

1.4 QUALITY ASSURANCE

- A. Equipment manufacturer shall meet the description requirements indicated on the Drawings.
- B. The manufacturer shall provide a minimum of a 1 year equipment warranty.
- C. Manufacturer shall have a minimum of ten years' experience in manufacturing Chemical Feed Systems.
- D. All equipment provided under this section shall be obtained from a single supplier or manufacturer who shall assume full responsibility for the completeness and proper installation of the Chemical Feed System.
- E. To insure quality and unit responsibility, the Chemical Feed System must be assembled and tested by the manufacturer at its facility and be a standard regularly marketed product of that manufacturer. The manufacturer must have physical plant, technical and design staff and fabricating personnel to complete the work specified. Skids assembled by a second party fabricator, integrator or contractor shall not be acceptable.
- F. Prior to shipment the Chemical Feed System shall be inspected for quality of construction verifying all fasteners and fittings are tight, all wires are secure and connection whisker-free. The Chemical Feed System shall be tested under pressure for a minimum of one hour at 100 psi. If leaks are found they shall be fixed and a new test shall be conducted for an additional hour at 100 psi until the Chemical Feed System is verified to be leak free.

1.5 SPARE PARTS AND TOOLS

- A. Provide all spare parts anticipated to be required for the first 2 years of operation. Manufacturer shall clearly define quantity, description of part and associated part numbers as part of manufacturer's scope of supply.
- B. Spare parts shall be placed in separate container clearly marked as "Spare Parts." All parts shall be identified and clearly labeled with applicable part numbers.
- C. In addition to spare parts required for the first 2 years of operation, supply 2 rebuild kits with all parts necessary to completely rebuild the pump's wet end.

## 1.6 MANUFACTURER'S WARRANTY

- A. The manufacturer shall warrant all pumps and controllers of its manufacture to be free of defects in material or workmanship for a minimum of 24 months from date of shipment from the factory.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. The Chemical Feed System shall be the standard equipment of the supplier involved in the manufacture of similar type equipment and shall be as manufactured by PulsaFeeder, or Engineer approved equal.
- B. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- C. The feed system shall be specially designed, constructed and installed for the service intended and shall comply with the conditions listed in the schedule below. The VENDOR shall submit compatibility data from the manufacturer being supplied to confirm the materials of construction.
- D. Chemical Metering Pumps shall be positive displacement pumps of the electronic solenoid or motor driven mechanical diaphragm type. This specification addresses skid mounted chemical metering pump systems complete with the skid assembly containing chemical metering pumps, all necessary piping, valves, fittings, supports, electrical controls, and accessories as specified herein.
  - 1. The metering pump skid shall contain the following items:
    - a. Skid mount and associated appurtenances
    - b. Metering pumps with adjustable stroke length adjustment
    - c. Calibration column
    - d. Pressure gauges with diaphragm seals
    - e. Ball valves
    - f. Pressure relief valves
    - g. Backpressure valves
    - h. All piping, valves, gaskets, supports, hardware, wiring, and accessories necessary for a fully functioning skid.
  - 2. All wetted surfaces of feed pumps and all sealing gaskets shall be suitable for continuous exposure to chemical service shown on the pump schedule.
  - 3. All wetted surfaces shall be of materials suitable for contact with potable water and shall not leach out any organic or inorganic constituent that is not permitted by local or federal regulations.
  - 4. The chlorine pump shall have the option to choose between manual control and 4-20mA external pace inputs for automatic control based on well pump flow rate, with an Auto-Off-Manual switch.

Sodium Hypochlorite Pump Min. Design Parameters	
Service (Chemical)	Sodium Hypochlorite
Chemical Conc.	12.5%
Specific Gravity	1.2 at 60 deg F
Ambient Temperature	40-105°F
Feed Rate	4-42 GPD
Pressure, MAX, PSI/BAR at GPD/GPH/LPD	300/20 3/13/11
Capacity, MAX, GPD/GPH/LPD At PSI/BAR	500/20.8/1890 20/1.4
Reproducibility, % MAX Capacity	2
Controls	6-Station Membrane Switch
Stroke Frequency, MAX, SPM	125
External Stroke Frequency Control (Automatic)	4-20 mA DC
Stroke Frequency Turn Down Ration	100:1
Stroke Length Turn Down Ration	10:1
Pressure at Injection Point	100 psig Max, 65 psig Normal
Drive Type	Motor
Connections – Tubing (Suction and Discharge)	.25” ID x 0.38” OD
Electrical Requirement	120VAC/1Ø/60Hz

E. The skid mounting of the metering pumps shall conform the following requirements.

1. Each chemical feed system shall be completely assembled, mounted, calibrated, tested, and delivered to the site on a single skid. Components to be mounted on the skid are as indicated on the drawings and shall include the metering pumps, calibration column, piping, valves, piping accessories (pulsation dampeners, strainers, etc.), and wiring integral to the skid. The chemical feed system supplier shall be responsible for providing all equipment, valves and piping within the skid boundary.
2. The skid shall be constructed of polypropylene and designed to hold all equipment and be wall or base mounted.
3. All components of the skid-mounted system (pumps, piping and controls) shall be tested prior to shipment as described in Part 1.4.

F. Calibration Chamber

1. Provide one, clear plastic calibration chamber with vent for use in calibrating the metering pumps.
2. The chamber shall be sized to give adequate capacity for a minimum 60 second draw down test.
3. The scale shall give direct readings in GPH without the need for calculations.
4. The calibration chamber shall be piped and valved so that each pump shall be able to utilize the calibration chamber without interfering with the operation of the other pumps.
5. The top of the chamber shall have a fitting to allow for piping to a common vent.

G. Piping, Valves and Appurtenances

1. All pipe, molded fittings, valve end connectors and fabricated piping components shall be made of CPVC.
2. The skid mounted piping network(s) shall be solvent weld type, or as recommended by the equipment manufacturer.
3. Accessories shall be CPVC bodied components.

4. Isolation valves shall be Asahi Type 21 ball valves, or Engineer approved equal.
  5. The piping system shall be SDR rated to 150 psig at 68°F for chemical service.
- H. Back Pressure and Pressure Relief Valves
1. Provide one type of each valve for each metering pump.
  2. Valves shall be spring-loaded, diaphragm-type, with materials of construction compatible with chemical service.
- I. Metering Pumps
1. General
    - a. Pump construction and features vary as a function of the pump flow output range. See the design parameters table above for pump flow range requirements, and see paragraphs below for pump specific design features.
    - b. The pump shall be designed for leak-proof operation and trouble-free performance.
    - c. Metering Pump Capacity up to 10 gph (5 gph, normal):
      - 1) The chemical metering pump(s) shall be microprocessor-controlled, simplex, solenoid or motor-driven, reciprocating, mechanically-actuated diaphragm type. All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD, which is readable at an offset angle of 45 degrees. Keypad will allow for simple scrolling and display of programmed parameters. The housing shall be rated IP65.
      - 2) The power supply shall be 120VAC, 60 Hz, single-phase. The microprocessor is to automatically compensate for supply voltage variations within 15% of the rated voltage such that the frequency of the pump remains constant.
      - 3) The liquid end shall be physically separated from the drive unit by a backplate with weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the solenoid if the primary diaphragm fails. The diaphragm shall be constructed of a steel core, vulcanized into nylon reinforced EPDM, with PTFE-faced fluid contact surface.
      - 4) Liquid End Materials of Construction: Acrylic / PVC with PTFE seals and auto degas function.

### **PART 3 - EXECUTION**

#### **3.1 SERVICE OF MANUFACTURER**

- A. Inspection, Startup, and Field Adjustment: The service representative of the Manufacturer shall be present at the Site to furnish the field services required by Section 11100 – Pumps, General.
- B. Services of manufacturer shall be in accordance with Section 01450 – Services of Manufacturer’s Representative.
- C. Manufacturer shall define quantity of trips and days on site necessary to perform the specified services as a part of the manufacturer’s scope of supply. Scope of supply shall be inclusive of travel and living expenses.
- D. Site Tests: The skid shall be tested at startup. Chemical Pump Skid design parameters shall be measured and recorded. The manufacturer shall provide a formal test procedure and forms for recording data.
- E. Upon completion of field services, representative of manufacturer shall prepare and submit a report in accordance with the requirements of Section 01450 – Services of Manufacturer’s Representative.

#### **3.2 INSTALLATION**

- A. CONTRACTOR shall install the equipment in accordance with installation requirements of Section 11100 – Pumps, General.

- END OF SECTION -

**SECTION 11150  
VERTICAL TURBINE WELL PUMP**

**PART 1 – GENERAL**

1.1. SUMMARY

- A. This section includes specifications for a water flush line shaft, vertical turbine deep well pumps. The vertical turbine deep well pump shall be provided complete with multistage bowl, column, impeller, discharge head, motor and all required accessories. The pump installer shall be responsible for the complete engineered pump product and warranty for a period of 24 months. The pump supplier's facility must be located within a 100-mile radius of the Vernon Well 22 jobsite. Product examples are to be available for inspection, and at the Engineer's request, the supplier will utilize a CNC to machine a water flush bearing to be evaluated.

1.2. MANDATORY BID SUBMITTAL

- A. Bidders are to submit five (5) references of similar water flush pumps, which have been supplied and installed in the past five years in Southern California. Failure to include these references with your bid will cause the bid to be considered non-responsive.

1.3. QUALITY ASSURANCE

A. Reference Standards:

1. American Iron and Steel Institute (AISI):
2. American National Standard Institute (ANSI):
  - a. B16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
3. American Society for Testing and Materials (ASTM):
  - a. A48, Gray Iron Castings (Class 35 Minimum).
  - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - c. A108, Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
  - d. A120, Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless for Ordinary Uses.
  - e. A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
  - f. B505, Standard Specification for Copper-Base Alloy Continuous Castings.
  - g. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
4. American Water Works Association (AWWA):
  - a. El 01, Vertical Turbine Pumps -Line Shaft and Submersible Types,
5. Hydraulic Institute Standards (HI).
6. Society of Automotive Engineers (SAE).

1.4. SUBMITTALS

- B. Submittals shall be furnished in accordance with Sections 01300 – Submittals.

- C. Product technical data including:
1. Acknowledgement that products submitted meets requirements of standards referenced.
  2. Manufacturer's installation instructions.
  3. Maintenance instructions.
  4. CAD drawing showing dimensions of discharge head, column, shaft, bowl assembly, cone strainer, and motor.
- D. After the above equipment submittals have been approved, the additional submittals shall include, but shall not be limited to, the following:
1. Certified pump performance curves for the supplied pumps as determined in the specified shop test
  2. Operation and Maintenance Manuals.
  3. Equipment shall not be shipped until these shop test submittals have been submitted and approved

Name	Well 22		
DHS Status (active/stand-by/inactive)	Active	Company Status (on/off-line)	On-line
Rated Capacity (gpm)	2100	Year Drilled	2020
Diameter (in)	18	Depth (ft)	1,140
Perforations	625' – 730', 780' – 830', 900' – 970', 1,000' – 1,100'		
Sanitary seal (ft)	500'	Column setting (ft, bgs)	400'
Gravel Port (yes/no)	Yes	Air Line Depth (ft)	400'
Pump (make)	Flowserve	Motor (make)	US
Pump Lubrication	Water Flush	Motor HP	350

#### 1.5. PERFORMANCE AND DESIGN REQUIREMENTS

##### A. General

1. Pump shall be designed and constructed to satisfactorily meet the conditions and requirements specified below and for the installations as shown on the Drawings. The pump shall have a head-capacity characteristic that is constantly rising to shutoff head without any sags. The pumping unit shall have a non-overloading horsepower characteristic.

Pump Design Point	1	2	3
Flow (gpm)	2100	2400	2010
TDH (feet)	500	400	520
Minimum Efficiency per Stage	81.0%	77.0%	82.0%
Maximum Stages (No.)	11		
Maximum Speed (RPM)	1780		
Motor Horsepower (HP)	325		
Specific Speed (Ns)	2578		

Anticipated Pump Bowl Setting: 400' Below the Top of the Base

## PART 2 – PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. The pump installer shall be fully responsible for the entire pump and motor assembly. In addition, the CONTRACTOR shall modify the bowl assembly for water flush and shall be responsible for the design of the line shaft bearings. Subject to compliance with the Contract Documents, the bowl assembly shall be manufactured by Flowserve Corporation or Engineer Approved Equal.
- B. The pump and motor shall be rated for continuous duty and shall be capable of pumping the specified flow range without surging, cavitation, or vibration. The pump shall not overload the motor for any point on the speed pump performance characteristic curve within the limits of stable pump operation as recommended by the manufacturer to prevent surging, cavitation, and vibration, as well as throughout the entire pump operating range. The service factor for the motor shall not be applied when sizing the motor. To ensure vibration-free operation, all rotating components of the pumping unit shall be statically and dynamically balanced. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the amplitude of vibration as measured at any point on the pumping unit shall not exceed the limits set forth in the latest edition of the Hydraulic Institute Standards. All parts of the pump shall be designed to withstand the stresses that will be imposed upon them during their handling, shipping, erection, and operation. The completed unit, when assembled and operating, shall be free of cavitation, vibration, noise, and oil or water leaks over the range of operation. The unit shall be so constructed that dismantling and repairing can be accomplished without difficulty.

### 2.2 LINE SHAFT PUMP COMPONENTS

- A. General:
  - 1. Furnish unit consisting of a vertical shaft turbine pump connected to a vertical hollow shaft motor. Design unit with non-reversing ratchets.
  - 2. Weight of revolving parts of pump including unbalanced hydraulic thrust of impeller is carried by thrust bearing in driver.
  - 3. Hollow shaft motor construction shall provide for adjusting impeller clearance in relation to the bowl assembly.
- B. Column Assembly: Construct discharge column pipe of Schedule 40 ASTM A53 Grade B steel with threaded ends and threaded steel sleeve type couplings. The column pipe shall be furnished in interchangeable sections not exceeding a nominal length of 20 ft.
- C. Tube and Shaft Assembly:
  - 1. Enclosing tubes shall be schedule 80 ASTM A120 tube in interchangeable sections not exceeding a nominal length of 5 ft. The faces of the tubes shall be machined parallel and concentric and shall butt to ensure accurate alignment. Enclosing tubes shall be lined (ID) with NSF Scotchkote 6233 fusion bonded epoxy applied per the manufacturer's specifications. The tubes shall be stabilized in the column pipe by rubber centering spiders spaced 20 feet from the top and bottom, and at 40 ft intervals throughout the balance of the column length. The line shaft screw bearings shall be spaced to maintain proper alignment of the pump shafting and prevent excessive vibration, not to exceed 5 feet. The bearings shall be of bronze material and machined, threaded and grooved with sufficient radial grooves to allow adequate flow at 60 PSI for proper lubrication within a water flush

system. A complete line shaft lubrication system shall be provided to allow for a minimum flow of 5 gpm.

2. Line shaft shall be turned, ground, and polished AISI 416 stainless steel, of ample size (1.6875" minimum) to operate the pump without distortion or vibration and shall be tested for straightness. Shaft shall be straight in accordance with ANSI 858.1. The shafts shall be furnished in interchangeable sections not over 20 feet in length that shall be field replaceable. Shaft couplings shall be extra strong threaded stainless steel couplings and shall be designed to transmit the full load torque and thrust and maintain alignment between adjacent shaft sections.

D. Airline and PVC Access:

3. A 1/4" rubber jacketed stainless steel tubing shall be installed to the top of the bowl assembly and connected to a direct reading gauge to be subsequently utilized for water level measurements. The tubing shall be banded to the column pipe with stainless steel banding.
4. A minimum 2" schedule 80 flush thread PVC access line shall be installed to the bottom of the bowl assembly and shall pass through the discharge head base plate for continuous access. The PVC shall be banded to the column pipe with stainless steel banding.

E. Pump Bowl Assembly: The pump bowls shall be of ASTM-A48 Class 30 cast iron, free of blow holes, sand holes, and other detrimental defects. They shall be accurately machined with register fit circles. All bowls shall be flanged type construction. The bowl wetted passage shall be coated with an abrasion-resistant baked enamel, phenolic or epoxy. The coating shall be NSF approved for potable water service. The bowl assembly shall be designed to ensure easy removal of bearings and impellers. The impellers shall be enclosed-type C903 bronze. All impellers shall be dynamically balanced and shall be securely fastened to the bowl shaft with stainless steel taper lock collets or double keys. The impellers shall be adjustable vertically by external means at the driver location. The pump shaft shall be 17-4 pH condition H-1150 stainless steel PSQ turned and ground. The shaft shall be sized to handle the worst case down thrust condition and maximum loads of the motor and bowl assembly. It shall be supported by bronze bearings above and below each impeller. The suction case bearing shall be extra long and grease packed and sealed with a bronze sand collar. The discharge case shall also contain an extra-long support bearing. The suction case shall be equipped with a minimum 5 ft suction pipe of same diameter and material as the pump column with a welded, heavy duty 316 stainless steel cone strainer. The strainer shall have a minimum inlet open area of not less than four times the suction pipe size. The bowl assembly shall be modified for water flush operation by the CONTRACTOR. All hardware shall be stainless steel.

F. Discharge Head Assembly: CONTRACTOR shall furnish need fabricated steel discharge head complete with a 150# ANSI flange to adapt to the discharge pipeline. The discharge head shall be of sufficient strength, weight and thickness to provide accurate alignment, prevent excessive deflection and support the drive motor. The discharge head shall be offset for adequate, unhindered PVC access. The discharge head shall be equipped with hinged safety screens. The discharge head shall be sandblasted and wetted passages shall be coated with Scotchkote 134 NSF fusion bonded epoxy per the manufacturer's specifications. CONTRACTOR shall furnish and install a complete water flush head assembly machined from solid bronze with a tube tension plate. The water flush head assembly shall accept a minimum six (6) rings of packing and have dual injection ports and shall be supplied by the CONTRACTOR. The assembly shall include a drain connection and lubricating product water connection and piping. A chlorinated 3/4" water line with valves and meter will be supplied by others to connect to the water flush injection port. The water flush assembly shall be designed to allow for sufficient lubrication at 60 PSI.

- G. Motor: The motor shall be a 350 HP Nidec US Motor VHS, WPI premium efficient, inverter duty rated 4-pole hollow shaft motor equipped with a non-reverse ratchet and 115 volt space heaters. The motor thrust bearing shall be designed to handle the worst case down thrust condition and maximum loads of the motor and bowl assembly and shall meet, at a minimum, the published standard rules and regulations of NEMA, ANSI, and IEEE with respect to application, manufacture and test.
- H. Testing: Provide a factory non-witness pump performance test and submit test curve to the Engineer for approval prior to shipping.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION AND STARTUP**

- A. Install products in accordance with manufacturer's instructions and in full compliance with Section 11100. Arrange for the pump manufacturer or supplier of the equipment furnished to provide the services of a degreed engineer with a minimum of ten (10) years of experience working with water flush pumps to supervise the installation and initial operation. Include this cost in the price of the equipment.

#### **3.2 FIELD QUALITY CONTROL**

- A. Following completion of the installation and satisfactory start-up of the equipment, the experienced pump engineer shall conduct field testing for the operation, over the entire specified range. The pump shall be free of vibration, noise, or cavitation. The injection system shall be inspected and approved by the engineer to include all of the necessary components and protective devices.
- B. Vibration shall be checked and recorded. Full speed vibration of pumps shall be equal to or less than the amplitude limits recommended in the Hydraulic Institute Standards.
- C. Each pump performance shall be documented by obtaining concurrent readings showing motor voltage and amperage, pump discharge head, water surface elevation in the well, and pump capacity. Readings shall be documented for at least five pumping conditions to define the actual pumping curve. One test shall be at shutoff head. Each power lead to the motor shall be checked for proper current balance at the motor terminals and the MCC.
- D. In the event any of the pumping equipment fails to meet the above test requirements, modify and retest.

#### **3.3 INSTRUCTION OF CITY PERSONNEL**

- A. After the equipment been installed, tested, adjusted, and placed in satisfactory operating condition, provide a minimum of two (2) hours of training by an experience engineer to instruct the CITY's operating personnel in the use and maintenance of the equipment. Schedule the dates, duration, and content of instruction in consultation with the CITY. Include the cost of this service in the price of the equipment.

- END OF SECTION -





**SECTION 13000**  
**FIBER REINFORCED POLYMER (FRP) BUILDINGS**

**PART 1 GENERAL**

1.0 DESCRIPTION

- A. The CONTRACTOR shall furnish and install all FRP buildings, equipment, components and accessories as specified herein. All said buildings, equipment, components and accessories shall be provided by a single supplier or manufacturer to assure compatibility and proper performance.

1.1 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. All buildings, equipment, components and accessories shall be designed, manufactured, inspected and delivered in accordance with the latest edition of the following specifications, codes and standards:

ASTM D 790                      Standard Test Methods for Flexural Properties of Unreinforced and Reinforced  
Plastics and Electrical Insulating Materials

ASTM D2563                     Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic  
Laminate Parts

ASTM D 2583                    Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a  
Barcol Impressor

- B. Related Sections:

1. Division 16: Electrical

1.2 WARRANTY

- A. The FRP building shall be provided with a minimum ten (10) year manufacturer's warranty against defects in material and workmanship. All equipment, components and accessories shall be provided with a minimum two (2) year CONTRACTOR warranty against defects in material and workmanship unless otherwise stated in the project bid documents.

1.3 SUBMITTALS

- A. The supplier or manufacturer shall submit the following documents for acceptance prior to manufacturing, assembling and/or shipping the specified buildings, equipment, components or accessories:

1. Complete fabrication drawings showing all materials and dimensions of the FRP building and associated appurtenances.
2. Complete assembly drawings showing the locations of all equipment, components and accessories to be provided by the manufacturer or supplier in accordance with this specification.
3. Original Equipment Manufacturer (OEM) product data sheets for all equipment, components and accessories being provided by the manufacturer or supplier in accordance with this specification.
4. If required per section 2.02, submit complete design calculations for all design loads including: dead loads, live loads, wind loads, and seismic loads prepared and signed by Registered Civil Engineer licensed in the State of which the project will be completed.
5. Detailed information and/or drawings showing standard options for building anchorage. All material, equipment, labor and provisions associated with the FRP building foundation and anchorage design and construction shall not be made part of this specification section and shall not be provided by the FRP building supplier or manufacturer.
6. Instructions and recommendations for unloading, handling, storage, and installation.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. The manufacturer or supplier shall take reasonable precautions to protect all products covered within this specification section from damage during shipment.
- B. The CONTRACTOR shall take the proper precautions to protect all products covered within this specification section from damage following receipt of shipment. Damage incurred while loading, unloading, moving, storing, assembling or installing the products covered within this specification section shall be the sole liability of the CONTRACTOR.

### **PART 2 - PRODUCTS**

#### 2.1 APPROVED MANUFACTURERS AND SUPPLIERS

- A. Orenco Composites, a Division of Orenco Systems, Inc. – Roseburg, OR – (541) 459-6970
- B. Or Engineer Approved Equal

#### 2.2 FRP BUILDING DESIGN AND MANUFACTURING REQUIREMENTS

- A. Provide a FRP building (s) meeting the following requirements:
  - 1. Structure Name: City of Vernon Well No. 22
    - a. Chemical Room (Building):
      - 1) Exterior Width: 10'
      - 2) Side Wall Height: 10'
    - b. Electrical Room (Building)
      - 1) Exterior Width: 12'
      - 2) Side Wall Height: 10'
  - 2. The total exterior length of the two buildings side by side shall NOT exceed 27'.
  - 3. FRP Floor Required: No
  - 4. PE Stamped Structural/Seismic Calculations Required: Yes
  - 5. Exposure: C
  - 6. Category: III
  - 7. Design Velocity (Wind): 115 mph
  - 8. Minimum Design Thermal Resistance: R-24
  - 9. Exterior Color: Per City Standard
  - 10. Interior Color: White
- B. The FRP building shall be a seamless, molded, one-piece building manufactured using a closed-molded RTM or vacuum-infusion process. Open-molded and/or panel assembled buildings shall not be acceptable. To ensure a seamless, strong and weather-proof design, a building shall be determined panel assembled (and therefore not allowed) if any portion of the walls and/or roof are molded or manufactured individually.
- C. To reduce the risk of delamination due to rotting, swelling and/or rusting, the FRP building shall be manufactured of 100% composite materials. Embedded wood and or ferrous metals shall not be allowed.
- D. The ability to move existing equipment and/or install new equipment within the structure is critical for future use. To ensure full and unimpeded equipment mounting access to all interior and exterior wall locations all structural laminates shall be of sufficient strength to handle direct mounting of heavy equipment using standard, readily available mounting hardware. Specifically, each piece of mounting hardware shall be rated to an ultimate pull-out strength of 1,750lbs (minimum) when properly anchored within the structural laminate.

Equipment mounting boards of any type or material shall not be allowed as they restrict mounting access for future equipment and introduce degradable materials into the structure.

- E. The FRP building shall be manufactured from fiberglass reinforced polyester resin, using grades of resin and fiberglass considered acceptable for use in water and wastewater environments. All FRP laminate shall obtain a minimum glass reinforcement content of 50%. Insulation foam with a minimum density of 2 lb/ft<sup>3</sup> shall be polyurethane or polyisocyanurate and shall be integrally molded within the structure walls, roof and floor. The FRP building walls, roof and floor shall be manufactured to include integrally molded FRP columns, spaced at a minimum of 8" on-center, to increase structural integrity and prevent delamination.
- F. All interior surfaces shall be protected with a polyester gelcoat. All exterior surfaces shall be protected with a high performance, UV resistant, polyaspartic urethane coating rated for continuous outdoor exposure.
- G. The FRP building shall be manufactured with in-wall, embedded anchor pockets. To ensure equipment may be located directly against all interior walls, internally protruding mounting flanges shall not be acceptable. Exterior mounting flanges shall not be acceptable for security reasons. A manufacturer provided gasket or butyl sealant shall be installed between the FRP building and concrete foundation at the time of installation.
- H. The FRP building shall include a roof and/or floor of identical construction to that of the walls. The roof shall be sloped to allow drainage.
- I. The FRP building shall be equipped with lifting brackets or eyebolts installed on the roof exterior to facilitate lifting and installation of the structure.

### 2.3 DOORS, FRAMES AND HARDWARE

- A. The FRP structure shall be supplied with the type, size and quantity of doors and hardware as specified below or as shown on the project drawings.
- B. All single/double doors shall be of FRP construction with a 2" minimum polyurethane or polyisocyanurate foam core (minimum density of 2 lb/ft<sup>3</sup>).
- C. Each single/double door shall be hung on 4-inch × 4-inch stainless steel ball bearing hinges with non-removable pins. The hinges shall be bolted through the door jamb with 304 stainless steel fasteners. Single/double doors are supplied with commercial-grade 1, outdoor lever- type handles with interior panic bar.
- D. Door frames shall be composed entirely of FRP material and shall be mounted separately to the structure after the molding process is complete. To permit use of standard, industrial doors and hardware, submarine style door systems (or similar systems in which the frame is molded into the wall of the unit) shall not be allowed.
- E. To eliminate tripping hazards and facilitate entry and exit from the building, the area below the door shall be free of any and all building material, framing and/or extensions of the structure. Raised or integral door sills shall not be acceptable.
- F. The FRP structure shall be provided with an FRP drip cover above the entire length of the door.

### 2.4 HEATING, VENTILATION AND AIR CONDITIONING

- A. Provide (1) exhaust fan rated to a minimum of 200 CFM. Exhaust fan shall be Greenheck or approved equal. Exhaust fan shall be provided with all necessary controls equipment to provide a complete and operable system as required by the manufacturer and as shown in the Contract Documents.
- B. Provide (1) air conditioning unit rated to 48,000 BtuH with integrated thermostat. Air conditioning unit shall be Daikin or approved equal.
- C. Provide (1) door mounted intake louver with adjustable damper and insect screen. The intake louver shall be capable of passing the specified amount of air required in the Contract Documents. Intake louver shall be Dayton or approved equal.

## 2.5 ELECTRICAL

- A. All components, equipment, wiring and ancillary items shall be provided and installed in conformance with the National Electric Code as well as all applicable state and local codes.
- B. The CONTRACTOR and FRP building manufacturer shall coordinate conduit runs to the load center. This item includes all breakers and components required to provide power to the equipment that is to be provided by the building manufacturer.
- C. Provide 20 amp, duplex, feed-through, outdoor rated GFCI receptacles housed within weatherproof enclosures as shown in the Contract Documents. Receptacles shall be Leviton 1221-2W or approved equal.
- D. All components shall be wired to the load center using standard 12 AWG THHN wiring within rigid, UL listed, schedule 40, PVC electrical conduit.
- E. Provide an adequate quantity of 20 amp toggle switch(s) to control all equipment. Toggle switches shall be housed within weatherproof enclosures and shall be Leviton 1221-2W or approved equal.
- F. Provide an adequate quantity of 4-foot, damp location rated, vapor-proof, florescent, dual light fixtures such to provide a minimum output of 35 lumens per square foot of interior structure space. Interior light fixtures shall be RAB, Lithonia or approved equal.
- G. Provide (1) compact florescent exterior light fixture above or adjacent to each door. Exterior light fixtures shall include an integrated photocell and shall be Lithonia TWS LED 1 50K 120PE or approved equal.

## PART 3 EXECUTION

### 3.1 GENERAL

- A. All buildings, equipment, components and accessories shall be stored, fabricated, assembled, erected, moved and tested in accordance with the bid documents and the manufacturers, suppliers and original equipment manufacturers (OEM's) written recommendations and instructions.

### 3.2 INSTALLATION

- A. All buildings, equipment, components and accessories shall be installed in strict accordance with manufacturer's printed recommendations. Appropriately sized lifting equipment shall be used to off-load the building using the manufacturer supplied lifting lugs.
- B. All buildings shall be installed on level and flat concrete slabs or foundations free of cracks and vertical projections. The CONTRACTOR shall install a manufacturer supplied neoprene gasket in between the FRP building and concrete foundation at the time of placement.
- C. All pipe and conduit penetrations through concrete foundation, FRP roof, and FRP walls shall be completely sealed to provide an air and weather tight structure.
- D. All building equipment and accessories shall be mounted directly to the FRP wall using either walldog screws (60 lb design pull-out strength, 406 lb ultimate) and/or rivet nuts (200lb design pull-out strength, 1,781 lb ultimate) depending on the equipment loading requirements. The CONTRACTOR shall consult with the manufacturer or supplier should equipment loadings exceed the aforementioned mounting hardware capabilities.

- END OF SECTION-

**SECTION 13200**  
**DOUBLE WALL TANKS**  
**HIGH DENSITY CROSSLINKED POLYETHYLENE STORAGE TANKS**

**PART 1 - GENERAL**

1.1 REQUIREMENTS

- A. The CONTRACTOR shall provide a double wall, high density crosslinked polyethylene tank and accessories, complete and in place, in accordance with the Contract Documents.
- B. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the double wall tank(s) and its accessories as indicated.

1.2 REFERENCES, CODES AND STANDARDS

- A. American Society of Testing Materials (ASTM).
  - 1. D638 Tensile Properties of Plastics
  - 2. D883 Standard Definitions of Terms Relating to Plastics
  - 3. D1505 Density of Plastics by the Density-Gradient Technique
  - 4. D1525 Test Method for Vicat Softening Temperature of Plastics
  - 5. D1693 ESCR Specification Thickness 0.125" F50-10% Igepal
  - 6. F412 Standard Terminology Relating to Plastic Piping Systems
- B. ANSI Standards: B-16.5, Pipe Flanges and Flanged Fittings
- C. Building Code: California Building Code, [Latest Edition]
- D. ARM: Low Temperature Impact Resistance (Falling Dart Test Procedure).
- E. Section 01610 – Seismic Design Criteria

1.3 SUBMITTALS

- A. Shop Drawings: Shop drawings shall be approved by the engineer or CONTRACTOR prior to the manufacturing of the double wall tank(s). Submit the following as a single complete initial submittal. Sufficient data shall be included to show that the product conforms to Specification requirements. Where indicated or required by the ENGINEER, Shop Drawings shall include clear, concise calculations showing equipment anchorage forces and the capacities of the anchorage elements (including seismic and structural anchoring calculations and support devices). Provide the following additional information:
  - 1. Double wall tank and Fitting Material
    - a. Resin Manufacturer Data Sheet
    - b. Fitting Material
    - c. Gasket style and material
    - d. Bolt material
  - 2. Dimensioned Tank Drawings
    - a. Location and orientation of openings, fittings, accessories, restraints and supports.
    - b. Details of manways, flexible connections, and vents.
  - 3. Calculations shall be stamped and signed by a registered, third party engineer where required.
    - a. Wall thickness. Hoop stress shall be calculated using 600 psi @ 100 degrees F.
    - b. Tank restraint system. Show seismic and wind criteria (where exposed - for wind).

4. Insulation data if required.
- B. Manufacturer's warranty
- C. Manufacturer's unloading procedure
- D. Manufacturer's installation instructions
- E. Supporting information of Quality Management System.
- F. Manufacturer's Qualifications: Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.
- G. Factory Test Report
  1. Material, specific gravity rating at 600 psi @ 100 degrees F. design hoop stress.
  2. Wall thickness verification.
  3. Fitting placement verification.
  4. Visual inspection
  5. Impact test
  6. Gel test
  7. Hydrostatic test

#### 1.4 QUALITY ASSURANCE

- A. The double wall tanks of the same material furnished under this Section shall be supplied by Poly Processing Company, or approved equal who has been regularly engaged in the design and manufacture of chemical storage tanks for over 10 years.
- B. Tanks shall be manufactured from virgin materials.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For equipment and accessories to include in emergency, operation, and maintenance manuals.

#### 1.6 WARRANTY

- A. The warranty shall be provided upon request for the specific service application. For most chemical applications, a 5 year full replacement warranty shall be provided.

### **PART 2 – PRODUCTS**

#### 2.1 GENERAL

- A. Tanks shall be rotationally-molded, high density crosslinked polyethylene, double wall, flat bottom tanks. The assembly consists of one cylindrical, closed top inner primary tank and one cylindrical, open top containment outer tank. Each tank is a rotationally molded one-piece seamless constructed tank. The tanks are designed for above-ground, vertical installation and are designed to store approved chemicals at atmospheric pressures. The assembly shall be designed to prevent rainwater and debris from entering the containment tank. Tanks shall be adequately vented. Venting-Design for ACFM (air cubic feet per minute). Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer; date of manufacture and serial numbers must be permanently embossed into the tank.

2.3 MANUFACTURER

- A. Tanks shall be manufactured by Poly Processing Company, or approved equal.

2.4 POLYETHYLENE STORAGE TANKS

- A. Conical 30° sloped bottom, 1000 gallons, with seismic stand from Poly Processing, Core-Rosion Products, or Engineer Approved Equal.
- B. Service: Chemical storage tanks shall be suited for the following operating conditions:
- C. High Density Crosslinked Polyethylene resin used in the tank manufacture shall be by Exxon Mobil Chemicals or equal and shall contain ultraviolet stabilizer as recommended by resin manufacturer. Where black tanks are indicated, the resin shall have a carbon black compounded into it. The tank material shall be rotationally molded and meet or exceed the following properties:

Property	Type I XLPE	ASTM Test
Environmental Stress Cracking Resistance, F50, hours, 10% Igepal	>1,000	D1693
Tensile Strength, Ultimate psi, 2-inch/minimum	2,830	D638 Type IV Specimen
Elongation at Break, % ,2-inch minimum	700	D638 Type IV Specimen
Flexural Modulus, psi	86,780	D790

- D. Wall thickness for a given hoop stress is to be calculated in accordance with ASTM D 1998. Tanks shall be designed using a hoop stress no greater than 600 psi. In NO case shall the tank thickness be less than design requirements per ASTM D 1998.

- 1. The wall thickness of any cylindrical portion at any fluid level shall be determined by the following equation:

$$T = P \times OD / 2SD \text{ or } 0.433 \times SG \times H \times OD / 2SD$$

- Where:
- T = wall thickness, in
  - P = pressure, psi
  - SG = specific gravity, gm/cc
  - H = fluid head, ft
  - OD = outside diameter, ft
  - SD = hydrostatic design stress, 600 psi

- a. The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187" thick.
- 2. On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.
- 3. The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be:

Tank Diameter, ft	Min Knuckle Radius, in
less than or equal to 6	1
greater than 6	1-1/2

4. Tanks with 3000 gal capacity or larger shall have at least 3 lifting lugs. Lugs shall be designed for lifting the tank when empty.
  - a. Unless otherwise indicated, manways shall be 19-in diameter or greater and equipped with an emergency pressure relief device or Manway.
  - b. Unless otherwise indicated, bolted sealed top manway shall be 19- inches or greater and be in locations easily accessible from the nearest worker access position. The sealed manway shall be constructed of polyethylene material. The bolts shall be chemically compatible with the chemical being stored. Gaskets shall be closed cell, crosslinked polyethylene foam, Viton, or EPDM materials. NOTE: If pneumatically filling, venting must be in accordance with the following:

Venting Requirements For Polyethylene Tanks										
Mechanical Pump Fill		Pneumatic Fill								
IF ≤ 1000 gallons		IF - Vent length ≤ 3 feet			IF - Vent length > 3' and ≤ 30'			IF - Scrubber Application		
Vent size should equal size of largest fill or discharge fitting		AND - Vent screen mesh size ≥ 1/4" or no screen used			AND - 3 or less 90° elbows with no other restrictions or reduction in pipe size			Vent pipe size throughout scrubber system <b>CANNOT</b> be reduced! Centerline of dispersion pipe not to be submersed > 6 inches		
IF > 1000 gallons		Emergency Pressure Relief Cover Required			Emergency Pressure Relief Cover Required			Perforated dispersion pipe must be same diameter or larger, as vent. Sum of perforations ≥ cross sectional area of pipe		
Vent size should exceed the largest fill or discharge fitting by 1 inch		Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size
		2"	2"	4"	2"	2"	6"	2"	2"	6"
		3"	2"	6"	3"	2"	6"	3"	2"	8"
		3"	3"	6"	3"	3"	8"	3"	3"	10"

(2) 2 inch vents DO NOT EQUAL 4 inch venting capacity

For detailed venting guidelines, please visit our Technical Resources at [www.polyprocessing.com](http://www.polyprocessing.com)

rev. Nov 2006

- E. Tank colors shall be natural (unpigmented, or as specified by the CITY with written agreement by the tank manufacturer.

## 2.5 TANK ACCESSORIES

### A. Mixer

1. Each tank shall include a chemical mixer, mounted to the tank. Mixers shall provide recirculation mixing for flocculent polymer in the bulk storage tanks for chemicals with viscosities of 300-3,000 cPs. Viscosity shall also be confirmed within this range by selected polymer supplier prior to furnishing and installing the mixer.
2. Mixers shall be manufactured by Neptune, Series JG, or equal.
3. Motor will be 3/4 HP, 120-volt, 1 phase, 60 hz, TEFC. All motors will be UL rated and have a NEMA B temperature rise performance rating.
4. A supplier's written warranty shall be provided for the equipment specified in this section. The warranty shall be for a minimum period of one (1) year for start-up or 18 months from time of equipment shipment, whichever comes first.

### 1. Ladder:

1. Fiberglass access ladders shall be provided with the polyethylene chemical storage tanks at locations as shown. Use proper chemical resistant materials when anchoring to tank dome or sidewall. Safety cages shall be added to ladders as required. Ladders must be designed to OSHA standard 2206; 1910.27.
2. Ladders must be secured to the tank and secured to the concrete to allow for tank expansion / contraction due to temperature and loading changes. See Manufacturer's Installation Manual.
3. All ladders shall be designed to meet applicable OSHA standards. Reference: OSHA 2206; 1910.27; fixed ladders.

- B. Restraint System:
  - 1. Metal components to be stainless steel, edge softeners, and tension ring with stainless steel or galvanized cables and clamps.
  - 2. Seismic system to be designed to meet the proper seismic zone and specified wind load. PE stamped calculations and or drawings will be required based on individual project requirements. Reference Section 01610.
- C. Hazard Identification Signage:
  - 1. Visible hazard identification signs as specified in NFPA 704 for the specific material contained shall be placed on stationary containers and above-ground tanks and at entrances to locations where hazardous materials are stored, dispensed, used or handles in quantities requiring a permit and at specific entrances and locations designated by the local governing fire code official.

## 2.6 TANKS

- A. Tank Schedule per the following specifications

Note 1: Approximate overall height is measured along the straight cylindrical portion of the tank and includes the dome top.

- B. Fittings

- 1. Tank fittings shall be according to the fitting schedule below. Fitting, gasket and bolt material shall be per requirements in section A, or a material that is compatible with the product being stored and shall be a minimum of 1/4-in thick. Threaded fittings shall use American Standard Pipe Threads. If tanks are insulated, fittings shall be installed at the factory prior to application of the insulation. All bottom discharge connection must maintain and meet the requirements to support 110% secondary containment requirements.
- 2. Double flange fittings shall be constructed of virgin polyethylene. Bolts will be welded to a common backing ring and encapsulated with polyethylene preventing fluid contact with the metal material. Flange will have one full face gasket to provide a sealing surface against the flange and tank surface. Bolt holes shall straddle the principal centerline of the tank
- 3. Bolted flange bulkhead fittings shall be constructed with one 150-lb flange installed inside the tank and one flange ring installed outside the tank. The flange will be socket or threaded according to specific connection requirements. The head of the bolts shall be encapsulated with polyethylene preventing fluid contact with the metal material. Encapsulated heads shall have a gasket to provide a sealing surface against the flange. Bolt holes shall straddle the principal centerline of the tank.
- 4. Down Pipes and Fill Pipes: Down pipes and fill pipes shall be supported at 6-ft max intervals. Down pipes and fill pipes shall be PVC or material compatible with the chemical stored.
- 5. U-Vents: Each tank must be vented for the material and flow and withdrawal rates expected. Vents should comply with OSHA 1910.106(F)(iii)(2)(IV)(9). U-vents shall be sized by the tank manufacturer and be furnished complete with insect screen if required (Insect screen lessens the tank capacity by 1/3) in accordance with the venting schedule listed above.
- 6. Flange Adapters: Adapters may be used to adapt threaded or socket fitting components to 150-lb flange connections. Adapters shall be of material compatible with the chemical stored.

## 2.7 LEVEL INDICATION

- A. Float Indication: The level indicator shall be assembled to the tank and shall consist of PVC float, indicator, polypropylene rope, perforated interior pipe, PVC roller guides, clear PVC sight tube and necessary pipe supports. The level indicator shall act inversely to the tank contents and shall not allow entrance of tank contents into the sight tube at any time.

- B. Ultrasonic Level Indicator (where indicated): The ultrasonic level indicator shall be per Specification Section 17510, and suitable for service in a non-hazardous/hazardous environment, as required for the measuring medium.

## 2.8 FACTORY TESTING

### A. Material Testing

1. Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.
2. Degree of Crosslinking. Use Method C of ASTM D 1998- Section 11.4 to determine the ortho-xylene insoluble fraction of crosslinked polyethylene gel test. Samples shall test at no less than 60 percent.

### B. Tank Testing

1. Dimensions: Take exterior dimensions with the tank empty, in the vertical position. Outside diameter tolerance, including out-of-roundness, shall be per ASTM D 1998. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.
2. Visual: Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking, and delamination.
3. Hydrostatic test: Following fabrication, the bottom tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1/2 an hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

## PART 3 - EXECUTION

### 3.1 DELIVERY, STORAGE, AND HANDLING

- A. The tank shall be shipped upright or lying down on their sides with blocks and slings to keep them from moving. AVOID sharp objects on trailers.
- B. All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the CONTRACTOR.
- C. Upon arrival at the destination, inspect the tank(s) and accessories for damage in transit. If damage has occurred, the manufacturer/supplier shall be notified immediately.

### 3.2 INSTALLATION

- A. Install the tanks in strict accordance with Manufacturer's Installation Manual and shop drawings.

### 3.3 FIELD TESTING

- A. All tanks be hydro-tested for 24 hours prior to commissioning.

- END OF SECTION -





**SECTION 15000  
PIPING, GENERAL**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Provide all piping systems indicated, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section shall apply to all piping sections in Divisions 2 – Sitework and 15 - Mechanical.
- C. The mechanical drawings define the general layout, configuration, routing, method of support, pipe size and pipe type. The mechanical drawings are not pipe construction or fabrication drawings. Details for construction shall be developed as necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide all spools, spacers, adapters, and connectors for a complete and functional system.
- D. ALL PIPING AND FITTINGS INSTALLED ON POTABLE WATER LINES SHALL BE NSF 61 CERTIFIED AND RATED FOR POTABLE WATER INSTALLATIONS.

1.2 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 – Submittals.
- B. Shop Drawings shall contain the following information:
  - 1. Drawings: Layout drawings including all necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate all spool pieces, spacers, adapters, connectors, fittings and supports to accommodate the equipment and valves in a complete and functional system.
- C. Certifications: All necessary certificates, test reports and affidavits of compliance shall be obtained.

**PART 2 - PRODUCTS**

2.1 GENERAL

- A. Extent of Work: Pipes, fittings and appurtenances shall be provided in accordance with the requirements of the applicable Sections of Divisions 2 and 15 and as indicated.
- B. Pipe Supports: Pipes shall be adequately supported, restrained and anchored in accordance with Section 15006 - Pipe Supports, and as indicated.
- C. Lining: Application, thickness and curing of pipe lining shall be in accordance with the applicable Sections of Division 2, unless otherwise indicated.
- D. Coating: Application, thickness and curing of pipe coating shall be in accordance with the applicable Sections of Division 2, unless otherwise indicated. Pipes above ground or in structures shall be field-coated in accordance with Section 09800 - Protective Coating.
- E. Pressure Rating: Piping systems shall be designed for the maximum expected pressure as defined in Section 02643 - Pipeline Testing, or as indicated on the Piping Schedule.
- F. Inspection: Pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with requirements.

- G. Tests: Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. Welds shall be tested as indicated.
- H. Welding Requirements: Welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1 - Structural Welding Code. Welding procedures shall be reviewed for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- I. Welder Qualifications: Welding shall be done by skilled welders and welding operators who have had adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. Qualification testing of welders and materials used during testing are part of the WORK.

## 2.2 PIPE FLANGES

- A. General: Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small pipes shall be in accordance with the standards indicated for these pipes.
- B. Pressure Ratings:
  - 1. 150 psi or less: Flanges shall conform to either ANSI/AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4-inch. Through 144-inch, Class D, or ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings, 150-lb class.
  - 2. 150 psi to 275 psi: Flanges shall conform to either ANSI/AWWA C207 Class E or Class F, or ANSI/ASME B16.5 150-lb class.
  - 3. 275 psi to 700 psi: Flanges shall conform to ANSI/ASME B16.5, 300-lb class.
  - 4. Selection based on test pressure: AWWA flanges shall not be exposed to test pressures greater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.
- C. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207, or as indicated for miscellaneous small pipes.
- D. Flange Coating: Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.
- E. Flange Bolts: Bolts and nuts shall conform to Section 05500 – Misc. Metals, Fasteners and Special Finishes. Studs and bolts shall extend through the nuts a minimum of ¼-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.
- F. Insulating Flanges: Insulated flanges shall have bolt holes ¼-inch diameter greater than the bolt diameter.
- G. Insulating Flange Sets: Insulating flange sets shall be provided where indicated or as needed. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1½-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1½-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic material. Steel washers shall be in accordance with ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength. Insulating gaskets shall be full-face.

#### H. Flange Gaskets:

1. Gaskets for flanged joints used in general water and wastewater service shall be full-faced type, with material and thickness in accordance with ANSI/AWWA C207. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted, unless otherwise indicated.
2. Gaskets for flanged joints used in chemicals, air, solvents, hydrocarbons, steam, chlorine and other fluids shall be made of materials compatible with the service, pressure and temperature.

### 2.3 THREADED INSULATING CONNECTIONS

- A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.
- B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

### 2.4 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

- A. General: Cast mechanical-type couplings shall be provided where indicated. The couplings shall conform to the requirements of ANSI/AWWA C606 - Grooved and Shouldered Joints. Bolts and nuts shall conform to the requirements of Section 05500 – Misc. Metals, Fasteners and Special Finishes. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of grooved piping shall conform with the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid stress on equipment, equipment connections with mechanical-type couplings shall have rigid-grooved couplings or flexible type coupling with harness in sizes where rigid couplings are not available, unless thrust restraint is provided by other means. Mechanical-type couplings shall be bonded. The Contractor shall have the coupling manufacturer's service representative verify the correct choice and application of couplings and gaskets, and the workmanship, to assure a correct installation. To assure uniform and compatible piping components, all grooved fittings, couplings and valves shall be from the same manufacturer.

### 2.5 SLEEVE-TYPE COUPLINGS

- A. Construction: Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with steel bolts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than ¼-inch thick or at least the same wall thickness as the pipe to which the coupling is connected. If the strength of the middle ring material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe. The coupling shall be either 5 or 7 inches long for sizes up to and including 30 inches and 10 inches long for sizes greater than 30 inches, for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to the requirements of Section 05500 – Misc. Metals, Fasteners and Special Finishes. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.
- B. Pipe Preparation: Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:
  - a. Color - Jet Black
  - b. Surface - Non-blooming
  - c. Durometer Hardness - 74 plus and minus 5
  - d. Tensile Strength - 1000 psi Minimum
  - e. Elongation - 175 percent Minimum
2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Where sleeve couplings are used in water containing chloramine or other fluids, which attack rubber materials, gasket material shall be compatible with the piping service and fluid utilized.

D. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. Restrained Joints: Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be designed by the pipe manufacturer in accordance with Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed. Where harness sets are installed near the suction and discharge of the pump, harness bolts shall have zero elongation to prevent misalignment of the pump imparted by the thrust within the piping system.

2.6 DISMANTLING JOINTS

A. General: Dismantling joints shall be provided where indicated, and provide up to 5" of longitudinal adjustment and up to 2 degrees of misalignment in flanged piping systems. The flange spool shall meet the requirements of AWWA Class D Ring Flange, compatible with ANSI Class 125 and 150 bolt circles. The end and body ring shall meet the requirements of ASTM A536 ductile iron meeting or exceeding Grade 65-45-12 for 3" to 12" sizes and ASTM A36 Carbon Steel with AWWA C207 Class D flanges for 14" to 72" sizes. Dismantling joints shall be provided with gaskets compounded for water and sewer service in accordance with ASTM D 2000. Dismantling joints shall have a fusion bonded epoxy coating. Bolts and nuts (including tie-rods) shall conform to the requirements of Section 05500 – Misc. Metals, Fasteners and Special Finishes. Dismantling joints shall be per Romac Industries, or approved equal.

2.7 EXPANSION JOINTS

A. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.

B. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 2 inch and 30 inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 3 inch through 12 inch sizes is required.

C. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20°, 2" - 12"; 15°, 14" - 36"; 12°, 42"-48" and 4-inches minimum expansion. Additional expansion sleeves shall be available and easily added or removed at the factory or in the field. Both standardized mechanical joint and flange end connections shall be available.

- D. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating shall meet ANSI/NSF-61.
- E. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.
- F. Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.
- G. Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The purchaser (or owner) shall reserve the right to inspect the manufacturer's facility for compliance. All flexible expansion joints shall be FLEX-TEND as manufactured by EBAA Iron, INC. Eastland, TX., U.S.A.

## 2.8 PIPE THREADS

- A. Pipe threads shall be in accordance with ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (inch), and be made up with Teflon tape unless otherwise indicated

## 2.9 GENERAL

- A. Pipes, fittings and appurtenances shall be installed in accordance with the requirements of the applicable Sections of Divisions 2 - Sitework and 15 - Mechanical.
- B. Lined Piping Systems: The lining manufacturer shall take full responsibility for the complete, final product and its application. Pipe ends and joints of lined pipes at screwed flanges shall be epoxy-coated to assure continuous protection.
- C. Core Drilling: Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and reinforcing bars.
- D. Cleanup: After completion of the WORK, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site. The entire piping system shall be handed over in a clean and functional condition.

## 2.10 RESTRAINED FLANGE COUPLING ADAPTER

- A. Restrained flanged coupling adapter (RFCA) shall be used where indicated on the project drawings and to connect plain end IPS sizes steel pipe or ductile iron pipe to a flanged pipe or fitting. Coupling shall be supplied with pipe restrained for the plain end pipe rated for the application.
- B. If installed on potable water lines, all RFCAs shall be NSF 61 certified and rated to be installed on potable water systems.
- C. Flange shall be compatible with ANSI class 125 and 150 bolt circles.
- D. Each RFCA must have a minimum joint deflection of 3 degrees.
- E. Manufacturer
  1. Romac or Engineer Approved Equal.

2.11 STAINLESS STEEL RESTRAINED FLEXIBLE/REPAIR COUPLING

- A. Stainless steel restrained flexible repair couplings shall be compatible with the specified pipe material indicated on the plans.
- B. All SS restrained flexible repair couplings shall be constructed of 304 SS and be equipped with an internal EPDM gasket.
- C. If installed on potable water lines, all couplings shall be NSF 61 certified and rated to be installed on potable water systems.

**PART 3 – EXECUTION**

3.1 SERVICES OF SUPPLIER

- A. Piping shall be installed in accordance with the respective piping material Sections within Division 02 and 15.

- END OF SECTION -

**SECTION 15003**  
**DUCTILE IRON PIPE, FITTINGS, AND VALVES**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Ductile iron pipe for water and other liquids shall be furnished in the sizes, classes, grades, or nominal thickness and joint types as specified herein or indicated on the Contract drawings.
- B. It shall be the responsibility of the CONTRACTOR to furnish and install all ductile iron piping systems specified herein and as shown on the Contract drawings. Each system shall be installed complete with all applicable fittings, flanges, hangers, supports, anchors, expansion joints, flexible connections, valves, wall castings, sleeves, and accessories to provide a functional system as specified.
- C. The CONTRACTOR shall be responsible for all insulation, lining and coating, piping identification, testing, cleaning, disinfecting, excavation, backfill and/or encasement specified herein or as shown on the Contract drawings.
- D. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor necessary to complete installation of ductile iron piping systems as shown on the Contract drawings and specified herein.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

B. Commercial Standards:

ANSI/ASME B16.1	Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
ANSI/ASME B18.22.1	Plain Washers
ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings for Water
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast, for Water.
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings for Water Service
ANSI/AWWA C500	Metal-Seated Gate Valves for Water Supply Service
ANSI/AWWA C504	Rubber-Seated Butterfly Valves
ANSI/AWWA C507	Ball Valves, 6 In. Through 48 In
ANSI/AWWA C508	Swing-Check Valves for Waterworks Service, 2-in. Through 24 In
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water Supply Service
ANSI/AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
ANSI/AWWA C606	Grooved and Shouldered Joints.
ASTM A126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A193	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose

Ductile Iron Pipe, Fittings, and Valves

## Applications

ASTM A194	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A276	Specification for Stainless Steel Bars and Shapes
ASTM A395	Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
ASTM A536	Specification for Ductile Iron Castings
ASTM B62	Specification for Composition Bronze or Ounce Metal Castings
ASTM D698	Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1557	Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

### 1.3 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall submit complete shop drawings for approval in accordance with SUBMITTALS of the GENERAL REQUIREMENTS and as specified herein.
- B. Shop drawings shall include all ductile iron pipes, fittings, flanges, gaskets, couplers, hangers, supports, wall castings, sleeves, valves, and all required appurtenances indicated on the Contract drawings or as specified herein necessary to provide a complete, operable piping system as specified.
- C. The CONTRACTOR shall submit for review and approval complete piping lay-out drawings showing piping, fittings, couplers, hangers, supports, wall castings, sleeves, and all required appurtenances indicated on the Contract drawings or as specified herein necessary to provide a complete, operable piping system as specified. Layout drawings shall indicate all interfaces with other systems being installed which may cause interference with the piping system being installed.
- D. It is the responsibility of the CONTRACTOR to coordinate all work being performed and review all shop drawings to insure that no unnecessary interferences exist.
- E. The CONTRACTOR shall submit as part of the shop drawings for ductile iron piping a statement from the pipe manufacturer certifying that all pipes is being fabricated per the requirements of these specifications.

### 1.4 QUALITY ASSURANCE

- A. Inspection of ductile iron pipe manufacturing, grooving, lining and coating shall be at the discretion of the INSPECTOR.
- B. All wall castings shall be shop inspected.
- C. The CONTRACTOR shall be responsible for providing access to manufacturing and/or fabricating facilities at all times when so requested by the INSPECTOR.
- D. Manufacturer shall perform Notched Charpy impact tests on at least one sample machined from the pipe wall during each hour to assure the desired toughness of the pipe.
- E. Manufacturer shall perform Hydrostatic testing on pipe in conformance with AWWA C151.
- F. Each pipe shall have clearly marked on each piece the words "DUCTILE IRON", the weight, class (nominal thickness) and the casting date.
- G. Each piece of grooved end pipe shall have the groove type (flexible or rigid) clearly marked on each end of the

pipe.

- H. All valves shall be tested in accordance with manufacturer's recommendation and applicable AWWA/ANSI specifications.

**PART 2 – PRODUCTS**

**2.1 GENERAL REQUIREMENTS**

- A. All pipes, fittings, flanges, and valves shall be carefully examined for cracks and other defects prior to shipment. All defective pipes, fittings, flanges, and valves shall be rejected and replaced.
- B. Lining: All pipes and fittings shall be cement lined per ANSI/AWWA C104/A21.4.
- C. Coating: All pipes, fittings, flanges, and valves shall be provided with coating in accordance with Division 09 – Finishes.
- D. Ductile iron piping systems shall have design temperature limit of 200 degree F, unless otherwise noted.
- E. Fasteners: All bolts, nuts, and washers shall be made of Type 316 stainless steel, unless otherwise noted.
- F. Insulating connections: Protection shall be provided at all dissimilar metal connections.
  - 1. General: Insulating gaskets, sleeves, washers, bushings, unions, couplings, or flanges, as appropriate, shall be used for joining pipes of dissimilar metals, and for piping systems where corrosion control and cathodic protection are required regardless of whether or not shown on Contract drawings.
  - 2. Material: Insulating connections shall be in accordance with the requirements of Section 15000 – Piping, General.

**2.2 DUCTILE IRON PIPE**

- A. General: Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51 and Cement Lined per ANSI/AWWA C104/A21.4.
- B. Thickness: Ductile iron pipe shall be provided in accordance with the thickness class listed below:

<u>PIPE SIZE</u>	<u>MINIMUM THICKNESS CLASS</u>
4" to 16"	53
18"	54
20"	55
24" and LARGER	56

- 1. Thickness complies with ANSI/AWWA C150/A21.50 for minimum pipe wall thickness for threaded flanges.

**2.3 FITTINGS**

- A. Fasteners: All bolts, nuts, and washers shall be made of Type 316 stainless steel, unless otherwise noted. Grooved and Shouldered Fittings.
  - 1. Sizes 4" - 36": Grooved Ductile Iron per ANSI/AWWA C606-06, Wall Thickness per ANSI/AWWA C110/A21.10 or C153/A21.53, Center-to-End dimensions per ANSI/AWWA C110/A21.10, Cement Lined per ANSI/AWWA C104/A21.4.

<u>PIPE SIZE</u>	<u>MAX WORKING PRESSURE PSI</u>
4"	500
6" - 8"	400
10" - 12"	350

14" - 18"	250
20" and LARGER	150

2. Couplings: Per ANSI/AWWA C606-06 with Buna-N Rubber Gasket.

B. Mechanical or Push-on Joint Fittings

1. Only when specified or shown on Contract drawings, all ductile iron rubber gasket, push-on, or mechanical joint fittings shall be manufactured in accordance with ANSI/AWWA C110/A21.10.

2. Joints: Per ANSI/AWWA C111/A21.11 with Buna-N Rubber Gasket.

2.4 PIPE FLANGES

A. Flanges

1. Sizes 4" - 48": Class 125 Flat Face, drilled per ANSI B16.1, Ductile Iron, Threaded, ANSI/AWWA C115/A21.15.

B. Blind Flanges

1. Sizes 4" - 48": Class 125 Flat Face, drilled per ANSI B16.1, Ductile Iron.

C. Gaskets

1. Sizes 4" - 48": Buna-N Rubber, 1/8" Thick, Full Face.

D. Bolts

1. Studs: 316 Stainless Steel ASTM 193 Grade B8M.

2. Nuts: 316 Stainless steel ASTM 194 Grade 8M.

3. Washers: 316 Stainless Steel ANSI B18.22.1

4. Assemble with anti-seize compound.

2.5 VALVES

A. General:

1. Valves with pneumatic, hydraulic, and electric motor operators and controls shall be in accordance with Division 17 – Instrumentation and Control of these specifications.

2. Valves with manual operators shall be as specified herein.

B. Fasteners: All bolts, nuts, and washers shall be made of Type 316 stainless steel, unless otherwise noted.

**PART 3 – EXECUTION**

3.1 HANDLING

A. Pipe, fittings, and accessories shall be handled in a manner that will insure installation in sound, undamaged condition.

B. Pipe and fittings with cement mortar or glass lining shall be handled with rubber covered hooks or other type of equipment to prevent damage to the cement lining.

C. Bare fork lift arms, hooks, or chains shall not be inserted into open ends.

D. Pipe and fittings in which the lining has been damaged shall be immediately removed from the job site and replaced.

3.2 STORAGE

- A. All pipe and fittings shall be stored off the ground.
- B. Pipe ends shall be covered to prevent foreign matter from entering the pipe during storage.
- C. Pipe shall be stacked using suitable lumber between rows to prevent damage to pipe.
- D. Any pipe that becomes damaged or unidentifiable due to improper storage shall be rejected and immediately removed from the job site.

### 3.3 REPAIR OF CEMENT MORTAR LINING

- A. When approved and witnessed by the INSPECTOR, small and readily accessible damaged areas of cement mortar lining may be repaired in conformance with ANSI/AWWA C104/A21.4 and the following:
  - 1. Cut out the damaged lining to the metal, with square edges.
  - 2. Thoroughly wet the cut out area and adjoining lining.
  - 3. With the damaged area cleaned and the adjoining lining wet, spread the mortar evenly over the area to be patched.
  - 4. After the lining patch has become firm and adheres well to the surface, finish it with a wet 3" or 4" paint brush or similar soft bristle brush.
  - 5. The repaired lining shall be kept moist by tying canvas wet burlap over the ends of the pipe or fitting for 24 hours.
  - 6. After the lining patch is dry and hard, the asphaltic coating shall be replaced using approved coating material.
- B. Repair mortar shall be in conformance with ANSI/AWWA C104/A21.4 and the following formula:
  - 1. Cement Mortar mix by volume:
    - 3 parts Portland Cement
    - 2 parts clean sand
    - Necessary clean water for 5" to 8" slump
  - 2. Sand shall be clean, free of clay, and screened through a No. 20 screen.

### 3.4 CUTTING PIPE

- A. Cutting of pipe shall be done in a neat manner, without damage to the pipe or the lining.
- B. Cuts shall be smooth, straight, and at right angles to the pipe axis.
- C. Pipe shall be cut using a portable guillotine saw, abrasive wheel "cut-off" saw, or milling cutter only. Use of gas torches for cutting pipe will not be permitted.
- D. Field cut holes for saddles shall be with mechanical cutters. Gas torch cutting will not be permitted.
- E. After cutting, the end of the pipe shall be dressed with a file or power grinder to remove all roughness and sharp edges.
- F. All damaged or removed cement mortar lining shall be repaired in accordance with Section 03300 – Cast-In-Place Concrete of these specifications.

### 3.5 CLEANING

- A. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation, and shall be kept clean until the work has been accepted.

- B. Before jointing, all joint contact surfaces shall be wire brushed, wiped clean, and kept clean until jointing is completed.
- C. Flange faces shall be wire brushed and cleaned to remove all oil, grease, loose primer, mill scale or any other foreign matter which could affect the proper seating of the gasket.
- D. When pipe installation is stopped, precautions shall be taken to prevent foreign material from entering the pipe.
- E. Prior to testing, the entire pipeline shall be flushed until the flushing water runs clear and clean.
- F. Cleaning for final acceptance shall be in conformance with Section 02515 – Pipeline Testing and Disinfection.

### 3.6 ALIGNMENT

- A. Piping shall be installed to the lines and grades indicated on the Contract drawings.
- B. Pipelines intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the values stipulated in Table 5 of ANSI/AWWA C600, unless specially designed approved bells and spigots are provided.
- C. Batter boards, laser beam equipment, or survey shall be used in all pipe installations to maintain alignment and grade.
- D. Batter boards, if used, shall be erected at intervals not to exceed 25 feet.
- E. All pipe subgrades shall be determined and checked by survey.
- F. If laser equipment is used, periodic elevation measurements shall be made with survey equipment to verify accuracy of grade or elevation. If such measurements indicate thermal deflection of the laser due to differences between ground temperature and the air temperature within the pipe, steps shall be taken to prevent further thermal deflections.

### 3.7 AS-BUILT DRAWINGS

- A. The CONTRACTOR shall provide surveyed "as-built" drawings for all piping installed.
- B. "As-built" drawings shall be provided for buried pipe installations as well as pipe installed in tunnels, galleries, inside buildings, or above ground outside.
- C. For buried pipe installations, surveyed "as-built" shall include the elevation and location of pipe, valves, and all other pertinent information on the installation, as well as all existing piping or structures in the immediate area.
- D. For buried pipe installations, survey shall be taken of location and elevations of all piping installed prior to any encasement or backfill.
- E. For buried, encased piping, survey shall be taken both prior to encasement and after the encasement is in place.
- F. Drawings shall be forwarded to the ENGINEER for review and approval within five days after installation is completed.
- G. Progress payment will be withheld for all pipe installations for which "as-built" drawings are not received as specified.

### 3.8 LAYING PIPE

- A. Buried pipe shall be protected from lateral displacement by use of the specified pipe embedment and/or encasement.
- B. Under no circumstance shall pipe be laid in water.
- C. All pipes will be laid on native material unless otherwise indicated on the Contract drawings.
- D. All pipe subgrade shall be compacted to 95% of maximum density per ASTM D698, unless otherwise indicated on the Contract drawings.
- E. All subgrade shall have compaction tests taken and be approved by the INSPECTOR prior to pipe installation.
- F. When pipe laying is interrupted, or stopped at the end of the work shift, the open ends of pipe shall be sealed with a watertight plug, or other means acceptable to the INSPECTOR, to prevent water from entering the pipe.
- G. All fresh potable/Industrial water piping shall be completely encased in blue concrete. No pipe will be encased prior to testing and without approval of the INSPECTOR.

### 3.9 FIELD JOINTS

- A. All joints in buried locations shall be grooved-end type "flexible" joints unless otherwise indicated in these specifications or on the Contract drawings.
- B. All joints of piping above ground outside, in tunnels, galleries, or inside buildings shall be grooved-end type "rigid" joints unless otherwise indicated in these specifications or on the Contract drawings.
- C. All buried ductile iron pipe joints shall be field coated with a minimum 12 mils of an approved thixotropic coal tar coating. The coating shall cover the entire joint, including fasteners.
- D. When specified or indicated on the Contract drawings, bells on flush mounted wall castings and wall sleeves shall be mechanical joint type with tapped holes for tie rods or stud bolts.
- E. When specified or indicated on the Contract drawings, all wall castings other than flush mounted castings and wall sleeves shall be standard mechanical joint flanged joints as indicated.
- F. Insulating Connections: All insulating connections shall be installed in accordance with manufacturer's printed instructions. Care shall be exercised to prevent damage to insulating fittings, while making up the joints.

### 3.10 GROOVED END JOINTS

- A. When specified or indicated on the Contract drawings, grooved end couplings shall be installed in accordance with AWWA C606 and the manufacturer's recommendations and instructions.
- B. Completed joints in piping above grade or within tunnels, galleries or buildings shall be rigid and shall not allow angular deflection or longitudinal movement.
- C. Completed joints in buried piping shall be flexible and shall allow limited angular deflection and longitudinal movement, in accordance with the coupling manufacturer's recommended tolerances.
- D. Except for closure pieces approved by the INSPECTOR, field grooving of pipe will not be permitted.
  - 1. All field grooving allowed will be in strict accordance with AWWA C606.

2. Only grooving tools designed for cut-grooving of ductile iron pipe will be allowed for field grooving. Roll-grooving of field grooved pipe will not be allowed.
  3. Cut-grooving tools shall be designed to be driven around a stationary pipe, shall have integral pipe stop to provide proper groove depth, and stops in the tool to provide proper dimension from the pipe end to the groove ("A" dimension).
  4. Prior to beginning field grooving operations, the CONTRACTOR shall submit for approval the grooving tools intended for use.
  5. All field grooving will be done in the presence of and approved by the INSPECTOR.
- E. The outside surface of the pipe between the groove and the pipe end shall be smooth and free from deep pits or swells.
- F. All rust, loose scale, oil, grease, and dirt shall be removed prior to installation of the coupler.
- G. Following installation and before backfill or encasement, all joints in buried piping shall be thoroughly coated with a minimum of 12 mils of approved coal tar coating.
1. Joints may be wrapped with a minimum of 40 mils of approved pipe tape wrap.

### 3.11 MECHANICAL JOINTS

- A. When specified or indicated on the Contract drawings, mechanical joints shall be carefully assembled in accordance with ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11 and the manufacturer's recommendations.
- B. If effective seating is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled.
- C. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11.
- D. Over tightening of bolts to compensate for poor installation will not be permitted.
- E. Holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods.
- F. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top (or side for vertical piping) centerline. The top centerline shall be marked on each flange and mechanical joint piece at the foundry.

G. Minimum Number of Tie Rods:

<u>PIPE SIZE</u>	<u>OPERATING PRESSURE (PSI)</u>					
	<u>50</u>	<u>75</u>	<u>100</u>	<u>125</u>	<u>150</u>	<u>200</u>
3", 4", 6"	2	2	2	2	2	2
8"	2	2	2	2	4	4
10"	2	4	4	4	4	6
12"	2	4	4	6	6	6
14"	4	6	6	8	8	10
16"	6	6	6	8	8	12
18"	6	6	8	10	10	
20"	8	10	10	10	12	
24"	10	10	12	16		
30"	6	8	10	12	14	18
36"	8	10	14	16	20	
42"	6	8	12	14	16	22
48"	8	10	14	18	20	28

### 3.12 PUSH-ON JOINTS

- A. When specified or indicated on the Contract drawings, joints shall be installed in conformance with ANSI/AWWA C111/A21.11 and the pipe manufacturer's instructions and recommendations for proper jointing operations.
- B. All joint surfaces shall be properly lubricated with approved heavy vegetable soap solution immediately before the joint is completed.
- C. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean at all times.
- D. Each spigot end of the pipe shall be suitably beveled to facilitate assembly.

### 3.13 FLANGED JOINTS

- A. When specified or indicated on the Contract drawings, flanges shall conform to ANSI B16.1, B16.2, and B21.10.
- B. Bolts shall be tightened gradually and at a uniform rate to facilitate uniform gasket compression.
- C. Care shall be taken when connecting to pumping equipment to insure that pipe stresses are not transmitted to the pump flanges.
- D. All flanged piping connecting to pumping equipment shall be permanently supported so that accurate matching of bolt holes and uniform contact over the entire surface of abutting pump and piping flanges are obtained before the installation of any bolts in these flanges.
- E. Pump connection piping shall be free to move parallel to its longitudinal centerline while the bolts are being tightened.
- F. Each pump shall be leveled, aligned, and placed into position, but shall not be grouted until the initial fit-up and alignment of the pipe is completed.
- G. Each pump shall be grouted before final bolting of the connecting piping.

### 3.14 FLANGED COUPLING ADAPTERS

- A. When specified or indicated on the Contract drawings, flanged coupling adapters shall be installed in strict accordance with manufacturer's recommendations and instructions.

### 3.15 MECHANICAL COUPLINGS

- A. When specified or indicated on the Contract drawings, mechanical couplings shall be installed in accordance with the manufacturer's recommendations and instructions.
- B. A space of at least 1/4", and not more than 1", shall be left between the pipe ends.
- C. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks and all parts of the coupling are square and symmetrical with the pipe.
- D. Following installation of the coupling, damaged areas of shop coatings of the pipe and coupling shall be repaired to the satisfaction of the INSPECTOR.

### 3.16 WALL CASTINGS

- A. Unless otherwise specified or indicated on the Contract drawings, wall castings shall be provided where ductile iron pipe passes through concrete walls.
- B. Where a flange and mechanical joint piece is to connect to a mechanical joint wall casting, the bolt holes in the bell of the wall casting shall straddle the top (or side for vertical piping) center line of the casting and shall align with the bolt holes in the flange and mechanical joint piece. The top center line shall be marked on the wall casting at the foundry.

### 3.17 WALL SLEEVES

- A. Wall sleeves are to be provided where ductile iron pipe passes through concrete floors and where otherwise specified or indicated on the Contract drawings.
- B. Wall sleeves are to be sealed using modular casing seals ("link seals") and approved caulking on both sides of the floor penetration.

### 3.18 REDUCERS

- A. Reducers, adjacent to flow meters and pumps or in other locations as specified or indicated on the Contract drawings, shall be eccentric pattern, installed with the straight side on top so that air traps are not formed. All other reducers shall be concentric pattern.

### 3.19 OUTLETS

- A. Where a 12" or smaller branch outlet is specified or indicated on the Contract drawings, and the diameter of the line pipe is at least twice the diameter of the branch, either a tee or factory welded-on boss shall be used.
- B. Connections of gauges to 6" and smaller pipe shall be made using a tee complete with blind flange drilled and tapped to accept the gauge piping specified.
- C. Connections of gauges to 8" and larger piping shall be made by means of a factory welded-on boss.
- D. Tapping saddles shall be used for "hot taps" in specified instances or as shown on the Contract drawings.
  - 1. Use of tapping saddles must be approved in writing by the ENGINEER prior to use in every instance.

### 3.20 CONNECTIONS TO EXISTING PIPING

- A. Connections between new work and existing piping shall be made using fittings submitted and approved by the ENGINEER for each separate condition encountered.
- B. Each connection to existing pipe shall be made at a time and under conditions which will least impact normal plant operations, and as authorized in writing by the ENGINEER.
- C. The CONTRACTOR is responsible for making provisions for cutting of existing pipe when necessary, using approved mechanical means. Flame cutting of pipe will not be allowed.
- D. The CONTRACTOR is responsible for making provisions for dewatering existing lines and for disposal of water from the dewatering operation.
- E. Prior to construction, the CONTRACTOR shall submit for review and approval detailed procedures for pressure testing and the making of final connections to existing lines.
- F. When connecting to existing fresh (Potable/Industrial) water lines, all new piping and fittings shall be cleaned and disinfected prior to making the connection.
  - 1. Provisions shall be made to prevent any cross-connection and contamination of existing lines.
  - 2. Trench water, mud, or other contaminants shall not be allowed to enter the lines.
- G. The CONTRACTOR is responsible for disinfection and chlorination of all fresh (Potable/Industrial) water lines after connections are made in conformance with these specifications.

### 3.21 CONCRETE ENCASEMENT

- A. All fresh (Potable/Industrial) water piping shall be encased in blue concrete, per the detail in the Contract drawings.
- B. All other pipe encasement shall be installed where indicated on the Contract drawings, per the detail in the Contract drawings.
- C. Concrete and reinforcement for encasement shall be as specified in the Section 03300 – Cast-in-Place Concrete.
- D. All pipes to be encased shall be suitably supported and blocked in proper position.

- E. All pipes to be encased shall be anchored to prevent floating.
- F. All pipes to be encased shall be tested as specified and the INSPECTOR will approve the pipe installation prior to encasement.

### 3.22 REACTION ANCHORAGE

- A. All buried piping shall have thrust blocks placed at all changes of direction, tees, y-branches, valves, and at ends of pipe runs.
- B. All piping with mechanical couplings or mechanical joints subject to internal pressure shall be anchored to prevent separation of joints.
- C. All mechanical joint tees, y-branches, bends deflecting 22-1/2 degrees or more, and plugs which are installed in piping shall be provided with approved retainer glands.
- D. When placing thrust blocks, the concrete shall extend from the pipe to solid, undisturbed earth, and all joints shall remain accessible for repair.
- E. The dimensions of all concrete blocking shall be as indicated on the Contract drawings, or as directed by the INSPECTOR to accommodate field conditions.
- F. If adequate support against undisturbed earth cannot be obtained, metal harness anchorages shall be provided.
  - 1. Metal harness anchorages shall consist of steel rods extending across the joint and securely anchored to the pipe.
- G. All reaction anchorage and/or seismic anchorage shall be installed prior to pressure testing of any pipe.
- H. Seismic anchorage for piping installed above ground outside, inside tunnels, galleries, or buildings shall be in conformance with the California Building Code.

### 3.23 PRESSURE AND LEAKAGE TESTING

- A. All pipe installations shall be hydrostatically tested for a period of two hours at pressure specified.
- B. All pressure testing shall be done in the presence of, and approved by, the INSPECTOR.
- C. All pipe supports and reaction anchorage/seismic anchorage must be installed prior to pressure testing.
  - 1. Buried pipe may be center-loaded to preclude movement prior to testing.
- D. The high point of all pipe installed shall be vented.
- E. All leaking piping must be completely retested following repairs of leaks.
- F. Acceptable leakage is zero.
- G. If changes are made to piping installation after initial testing, such as addition of valves, routing changes, branches, etc., the entire line must be retested.
- H. Testing against valves will not be permitted. All sections of pipe to be tested must be blind-flanged.
- I. All pipelines tested shall be approved by the INSPECTOR, and a Pipeline Test Report completed for each test.

### 3.24 DISINFECTION

- A. Disinfection of ductile iron pipe shall be performed in conformance with Section 02515 – Pipeline Testing and Disinfection.

### 3.25 VALVE INSTALLATION AND TESTING

- A. Installation and field testing of valves shall be performed in accordance with manufacturer's recommendations, AWWA Standards, and the applicable provisions of Section 15200 – Valves, General.

B. All field testing shall be witnessed and approved by the INSPECTOR.

- END OF SECTION -

**SECTION 15005**  
**PIPING IDENTIFICATION AND SIGNAGE SYSTEMS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide safety signs and identification devices for all exposed piping and valves using color bands, lettering, flow direction arrows, and related permanent identification devices, and all appurtenant works, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards: ANSI A13.1 Scheme for the Identification of Piping Systems

1.3 SUBMITTALS

- A. Submit samples of all types of identification devices and signs to be used in the work.
- B. All submittals shall be in strict accordance with the requirements of Section 01300 –Submittals.

1.4 QUALITY ASSURANCE

- A. Manufacturer and model shall be described on the Drawings or Engineer approved equal.
- B. The manufacturer shall provide a 2-year equipment warranty.

**PART 2 – PRODUCTS**

2.1 IDENTIFICATION OF PIPING

- A. Identification of all exposed pipe shall be accomplished by color-coding with bands or painting of the pipe and by lettering as specified in Part 3, herein. Color bands shall either be painted directly upon the pipe or shall be pressure-sensitive adhesive-backed vinyl cloth or plastic tape.
- B. Each pipe identification shall consist of two color-coded bands, a printed label identifying the name of the pipe, and a flow arrow to indicate direction of flow in the pipe. All labels shall be preprinted on pressure-sensitive adhesive-backed vinyl cloth or plastic tape. Arrows shall be die-cut of the same type of material as the labels. Arrows and labels may be stenciled on the pipes at the discretion of the Engineer.
- C. Letter sizes and colors for lettering, arrows and background shall conform to ANSI A13.1.

2.2 IDENTIFICATION OF VALVES AND SHORT PIPE LENGTHS

- A. Identifying devices for valves and the sections of pipe that are too short to be identified with color bands, lettered labels, and arrows shall be identified with metal or plastic tags as specified herein.
- B. Metal tags shall be supplied with embossed lettering. Plastic tags shall be of solid black phenolic with white letters. All tags shall be designed to be attached, by chain, to the valves or short pipes.

2.3 SAFETY SIGNS

- A. Color, legend and layout shall conform to OSHA 1910.145 requirements.
- B. “DANGER” Signs: Two-inch high white letters “Danger” in red oval surrounded by a rectangular black field. Text wording 1½-inch high black capital letters on white field.

- C. “CAUTION” Signs: Two-inch high yellow letters on black field. Text wording 1½-inch high black capital letters on yellow field.
- D. Chemical precaution signs:
  - 1. In accordance with ANSI Z129.1
  - 2. 12-inch x 14-inch
  - 3. Made to withstand most chemicals. Special ink for printing to be absorbed into sign surface. Ultraviolet inhibitors and clear face coating for resisting fading and scratching. Semi-rigid linear polyethylene.

### **PART 3–EXECUTION**

#### **3.1 GENERAL**

- A. All labels and identification tags shall be installed in accordance with the manufacturer's printed instructions, and shall be neat and uniform in appearance. All such tags or labels shall be readily visible from all normal working locations.

#### **3.2 VALVE TAGS**

- A. Valve tags shall be attached to the valve or structure by means of a chain.

#### **3.3 PIPE IDENTIFICATION**

- A. Each pipe shall be identified at intervals of 30-feet, and at least one time in each room. Piping shall also be identified at a point approximately within 2-feet of all turns, elbows, valves and on the upstream side of all distribution fittings or branches.
- B. Pipe identification shall consist of 2 elements, i.e., a lettered label, and a directional label.

#### **3.4 IDENTIFICATION SCHEDULE**

- A. Application of identifying devices shall conform to the following color codes in Table in Section 09800 – Special Coatings, Part 3.6 of these specifications.

- END OF SECTION -

**SECTION 15006  
PIPE SUPPORTS**

**PART 1 – GENERAL**

2.1 THE REQUIREMENT

- A. Provide pipe supports, hangers, guides, and anchors, complete, in accordance with the Contract Documents.

2.2 SUBMITTALS

- A. Submittals shall be in accordance with Section 01300 – Submittals.
- B. Shop Drawings shall include the following information:
  - 1. Drawings of pipe supports, hangers, anchors and guides
  - 2. Calculations for special supports and anchors.

**PART 2 – PRODUCTS**

2.1 GENERAL REQUIREMENTS

- A. Code Compliance: All piping systems and pipe connections to equipment shall be properly anchored and supported to prevent undue deflection, vibration, dislocation due to line pressures, and stresses on piping, equipment and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1 - Power Piping, except as supplemented or modified below. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code or local administration requirements.
- B. Structural Members: Wherever possible, pipes shall be supported from structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction.
- C. Pipe Hangers: Pipe hangers shall be capable of supporting the pipe in all conditions of operation, allowing free expansion and contraction of the piping, and preventing excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed to prevent becoming disengaged by any movement of the supported pipe. Hangers subject to shock or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading only.
- D. Hangers Subject to Horizontal Movements: At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than 1/2-inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.
- E. Spring-Type Hangers: Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. Supports shall be capable of accommodating at least 4 times the maximum travel due to thermal expansion.

- F. Thermal Expansion: Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints permitting the piping to expand and contract freely in directions away from the anchored points. All components shall be structurally suitable to withstand all loads imposed.
- G. Heat Transmission: Supports, hangers, anchors, and guides shall be so designed and insulated, that excessive heat will not be transmitted to the structure or to other equipment.
- H. Riser Supports: Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.
- I. Freestanding Piping: Free-standing pipe connections to equipment such as chemical feeders and pumps shall be firmly attached to steel frames fabricated from angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps securing the pipes.
- J. Materials of Construction:
  - 1. General: All pipe support assemblies, including framing, hardware, and anchors, shall be steel construction, galvanized after fabrication, unless otherwise indicated.
  - 2. Submerged Supports: All submerged piping, as well as piping, conduits, and equipment in hydraulic structures within 24 inches of the water level, shall be supported with support, assemblies, including framing, hardware, constructed of Type 304 stainless steel, unless otherwise indicated. All bolts and nuts shall be 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.
- K. Point Loads: Any meters, valves, heavy equipment, and other point loads on PVC, FRP, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on PVC, FRP, and other plastic piping shall be equipped with extra wide pipe saddles or galvanized steel shields.
- L. Noise Reduction: To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material at each pipe support, bracket, clip, or hanger.

## 2.2 SUPPORT SPACING

- A. Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending, and shear stresses in the piping, with special consideration given where components such as flanges and valves impose concentrated loads. Pipe support spacing shall not exceed the maximum spans in the tables below. For temperatures other than ambient temperatures, or those listed, and for other piping materials or wall thicknesses, the pipe support spacing shall be modified in accordance with the pipe manufacturer's recommendations. Vertical supports shall be provided to prevent the pipe from being overstressed from the combination of all loading effects.

1. Support Spacing for Schedule 40 and Schedule 80 Steel Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
½	6
¾ and 1	8
1¼ to 2	10
3	12
4	14
6	17
8 and 10	19
12 and 14	23
16 and 18	25
20 and greater	30

2. Support Spacing for Welded Fabricated Steel Pipe:

The support spacing shall be designed so that the stress on the pipe does not exceed 5,000 psi. Maximum deflection of pipe shall be limited to 1/360th of the span and shall be calculated by using the formula:

$$L = (7500tD / (32t + D))^{1/2}$$

Where:      t      =      Thickness (inches)  
                   D      =      Diameter (inches)  
                   L      =      Maximum span (feet)

3. Support Spacing for Ductile-Iron Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
All Diameters	Two supports per pipe length or 10 feet (one of the 2 supports located at joint)

4. Support Spacing for Copper Tubing:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
½ to 1½	6
2 to 4	10
6 and greater	12

5. Support Spacing for Schedule 40 or 80 PVC Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (at 100 degrees F) (feet)
½	4
¾	4
1	5
1¼	5

<b>Nominal Pipe Diameter (inches)</b>	<b>Maximum Span (at 100 degrees F) (feet)</b>
1½	5
2	6
3	7
4	8
6	10
8	11
10	12
12	13

### 2.3 MANUFACTURED SUPPORTS

- A. Stock Parts: Where not specifically indicated, designs which are generally accepted as exemplifying good engineering practice and use stock or production parts, shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.
- B. Manufacturers or Equal:
  - 1. TOLCO Inc.
  - 2. Bergen-Paterson Pipe Support Corp., Woburn, MA;
  - 3. Grinnell Corp. (Supply Sales Company), Cranston, RI;
  - 4. NPS Products, Inc., Westborough, MA;
  - 5. Power Piping Company, Pittsburgh, PA.
  - 6. ZSI
  - 7. Engineer approved equal.

### 2.4 COATING

- A. Galvanizing: Unless otherwise indicated, all fabricated pipe supports other than stainless steel or non-ferrous supports shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123 - Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. Other Coatings: Other than stainless steel or non-ferrous supports, all supports shall receive protective coatings in accordance with the requirements of Section 09800 - Protective Coating.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. General: All pipe supports, hangers, brackets, anchors, guides and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1 - Power Piping. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.
- B. Appearance: Pipe supports and hangers shall be positioned to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets, unless noted otherwise. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

## 3.2 FABRICATION

- A. Quality Control: Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

- END OF SECTION -

**SECTION 15026**  
**STEEL PIPE, MORTAR LINED AND COATED**

**PART 1 - GENERAL**

1.1 WORKED INCLUDED IN THIS SECTION

- A. The work of this Section includes providing mortar-lined and mortar-coated steel pipe, including fittings and specials, complete in place.

1.2 REFERENCE SPECIFICATIONS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section.

AWWA	C200	Steel Water Pipe 6 Inch and Larger
AWWA	C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe-4 Inch and Larger-Shop Applied
AWWA	C206	Field Welding for Steel Water Pipe Fittings
AWWA	C207	Steel Pipe Flanges
AWWA	C208	Dimensions for Fabricated Steel Water Pipe Fittings
AWWA	C602	Cement-Mortar Lining of Water Pipelines 4-inch and Larger-In Place
AWWA	M11	Steel Water Pipe - A Guide for Design and Installation

1.3 SUBMITTALS

- A. The following shall be submitted in compliance with Section 01300.

- 1. Shop Drawings

- a. Shop drawings showing dimensions and details of pipe, joint fittings, fitting specials, valves and appurtenances.
- b. Joint and fitting wall construction details which indicate the type and thickness of cylinder; the position, type, size, and area of reinforcement; manufacturing tolerances; and all other pertinent information required for the manufacture of the product.
- c. Joint details shall be submitted where deep bell or butt strap joints are required for control of temperature stresses.
- d. Fittings and specials details such as elbows, reducers, wyes, tees, crosses, outlets, connections and test bulkheads, and nozzles or other specials where shown which indicate amount and position of all reinforcement. All fittings and specials shall be properly reinforced to withstand the internal pressure, both circumferential and longitudinal, and the external loading conditions as indicated in the Contract Documents.
- e. Material lists and steel reinforcement schedules which include and describe all materials to be utilized.
- f. Full and complete information regarding location, type, size, and extent of all welds shall be shown on the shop drawings. The shop drawings shall distinguish between shop and field welds.
- g. Shop drawings shall indicate by welding symbols or sketches the details of the welded joints, and the preparation of parent metal required to make them.

- 2. Design Calculations

- a. Calculations supporting selected wall thickness.
- b. Calculations supporting welded joint design.

B. Certificates

1. The CONTRACTOR shall furnish a certification stating that all pipe, special fittings, and other products or materials furnished under this Section of the Specifications comply with AWWA C200 and C205.

C. Test Reports

2. The CONTRACTOR shall furnish certified reports of the following tests:
  - a. Physical and chemical properties of all steel.
  - b. Hydrostatic test reports.
  - c. Results of production weld tests.
  - d. Upon request by the CITY, mill test reports on each sheet from which steel is rolled will be submitted.

1.4 INSPECTION

A. Factory Inspection

- B. All pipes shall be subject to inspection at the place of manufacturer in accordance with the provisions of AWWA C200 and C205, respectively, as supplemented by the requirements herein.
- C. The CONTRACTOR shall notify the CITY in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.

1.5 WELDING

- A. All welding procedures used to fabricate pipe shall be prequalified under the provisions of AWS D1.1.
- B. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- C. All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used.
- D. Welders shall be qualified under the provisions of AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests.
- E. The CONTRACTOR shall furnish all material and bear the expense of qualifying welders.

1.6 TESTING

- A. Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of AWWA C200 and C205, as applicable.
  1. Shop Testing of Steel Pipe
    - a. After the joint configuration is completed and prior to lining with cement mortar, each length of pipe of each diameter and pressure class shall be shop tested and certified to a pressure of at least 80 percent of the yield strength of the pipe steel.
    - b. Production weld tests shall be conducted in compliance with AWWA C200. In addition to the frequency of tests required in AWWA C200, weld tests shall be conducted on each 2,000 feet of production welds and at any other times there is a change in the welding procedure or welding equipment.

2. Shop Testing of Steel Plate Special
  - a. Upon completion of welding, but before lining and coating, each special shall be bulkheaded and tested under a hydro-static pressure of not less than 1-1/2 times the design pressure; provided, that if straight pipe used in fabricating the specials has been previously tested and meets the requirements of the applicable piping Section, no further hydrostatic testing will be required; or provided, that all other welded seams are tested by the liquid penetrant inspection procedure conforming to ASTM E165, under Method "B" and "Leakage Testing" or where applicable by the soap and compressed air method at an air pressure of 25 psi. Any pin holes or porous welds which may be revealed by the test shall be chipped out and rewelded and the special retested.
  - b. No outside coating shall be applied over a seam prior to testing; however, mortar lining may be applied over a seam prior to hydrostatic testing, but under such conditions said pressure test shall be held on the pipe or fitting for a period of not less than 30 minutes.
- B. The CONTRACTOR shall perform said material tests at no additional cost to the CITY. The CITY shall have the right to witness all testing conducted by the CONTRACTOR; provided, that the CONTRACTOR's schedule is not delayed for the convenience of the CITY.
- C. In addition to those tests specifically required, the CITY may request additional samples of any material including mixed concrete and lining and coating samples for testing by the CITY. The additional samples shall be furnished at no additional cost to the CITY.
- D. All expenses incurred in making samples for certification of tests shall be borne by the CONTRACTOR.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Mortar lined and coated steel pipe shall conform to AWWA C200 and C205, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets or welded joints, as indicated in the Contract Documents, and all specials and bends shall be provided as required for a complete piping system.
- B. Specials are defined as fittings, closure pieces, bends, reducers, wyes, tees, crosses, outlets, manifolds, and other steel plate specials, wherever located, and all piping above ground or in structures.
- C. Dimensions of fabricated steel pipe fittings shall comply with AWWA C208.
- D. Pipe 14 inches in diameter and larger, the inside diameter after lining shall not be less than the nominal diameter specified or shown.
- E. Pipe smaller than 14 inches in diameter may be furnished in standard outside diameters.
- F. The pipe lining shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness.
- G. Closures and correction pieces shall be provided as required so that closures may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing shown on the Drawings.
- H. The CONTRACTOR shall be fully liable for the cost of replacement or repair of pipe and specials which are damaged.



2. Unless otherwise indicated, Pw shall be assumed to equal the indicated pipe pressure class and Pt shall be assumed to equal 1.33 Pw. In no case shall the design stress (Y/Sw) exceed 16,500 psi at design working pressure, Pw, nor shall the design stress (Y/St) exceed 22,000 psi at design transient pressure, Pt, nor shall the steel shell thickness be less than No. 10 gauge (0.135 in.) or the nominal pipe diameter divided by 240, whichever is greater, as shown in the following table:

Nominal Pipe Diameter (in.)	Minimum Cylinder Thickness (in.)
6–30	0.135
36	0.150
42	0.175
48	0.200
54	0.225

- C. Upon determination of cylinder thickness, for internal pressure, deflection of the pipe shall be checked by the following formula:

$$\text{Defl}_x = \frac{DKWr^3}{EI + 0.0614E'r^3}$$

- Where:
- Defl x = Vertical deflection of pipe in inches, not to exceed 0.015 times the nominal diameter.
  - D = Deflection lag factor (1.0-1.5)
  - K = Bedding constant (0.1)
  - W = Vertical load on pipe, lb/in (see Notes 1 and 2)
  - R = Mean radius of pipe shell, inches
  - EI = Pipe wall stiffness, lb-in (see Note 3)
  - E' = Modulus of soil reaction, lb/in<sup>2</sup> (1100 for 90 percent Standard Proctor; 1500 for 95 percent Standard Proctor; 2500 for 100 percent Standard Proctor; i.e., cement crushed rock)

Note 1 In the determination of the vertical load on the pipe, W, the trench condition shall normally apply unless an actual embankment condition exists or the trench width exceeds the transition width, in which case the embankment condition shall apply. Yard piping shall always be designed for an embankment condition. The CONTRACTOR is cautioned that depth of covers less than 3 feet, if permitted, shall be investigated for concentrated wheel loads.

Note 2 For depths of cover of 10 feet or greater, the earth load shall be computed assuming the trench/embankment condition as applicable. For depths of cover of less than 10 feet, HS-20 live load shall be included. For depths of cover of 3 feet or less, HS-20 live load plus impact shall be included. The determination of live load and impact factors shall be as recommended by AASHTO in "Standard Specifications for Highway Bridges."

Note 3 Value of IE is based on the sum of the pipe wall stiffness, mortar lining and coating, and steel cylinder, assuming that it acts as a three-part laminar ring which considers no bond between the steel cylinder and the applied lining and coating. The term "pipe wall stiffness" as used herein is defined as EI, where "E" is the modulus of elasticity (E=30,000,000 psi for steel and E=4,000,000 psi for mortar) and "I" is the transverse moment of inertia per unit length of pipe wall, the factors in the following expression to be dimensionally compatible.



## 2.5 MATERIALS

- A. Pipe manufactured under AWWA C200 shall be fabricated from sheet conforming to the requirements of Table 1 in Section 2. All longitudinal and girth seams, whether straight or spiral, shall be butt welded using an approved electric-fusion-weld process.
- B. All steel used for the fabrication of pipe shall have a maximum carbon content of 0.25 percent, a maximum sulfur content of 0.015 percent, and shall have a minimum elongation of 22 percent in a 2-inch gauge length.
- C. All steel used in fabricating pipe which exceeds 1/2-inch in thickness shall be tested for notch toughness using the Charpy V-Notch test in accordance with ASTM A370. The steel shall withstand a minimum impact of 25 ft. lb. at a temperature of 30 degrees F.
- D. Steel shall be fine-grained, fully kilned and manufactured by the continuous casting process.
- E. Cement for mortar shall conform to the requirements of AWWA C205; provided that cement for mortar lining shall be Type II and mortar lining shall be Type II. Fly ash or pozzolan shall not be used as a cement replacement.
- F. Joint Design
  - 1. The standard field joint for steel pipe shall be either a single-welded lap joint or a rubber-gasketed joint for all pipe sizes up to and including 54-inch diameter and shall be single-welded lap joint for pipe sizes above 60-inch diameter. Double welded joints with air taps for air pressure testing shall be provided where shown.
  - 2. Mechanically coupled or flanged joints shall be required where shown.
  - 3. Butt-strap joints shall be used only where required for closures or where shown, or approved by the CITY.
  - 4. The joints furnished shall have the same or higher pressure rating as the abutting pipe.
  - 5. Shop-applied interior linings and exterior coatings shall be held back from the ends of the pipe as indicated or as otherwise acceptable to the CITY.
  - 6. Where indicated, restrained joints shall be field-welded joints. Designs shall include considerations of stresses induced in the steel cylinder, the joint rings, and any field welds, caused by thrust at bulkheads, bends, reducers, and line valves resulting from the design working pressure. All joints to be field welded for thrust restraint shall have the joint rings attached to the cylinder with double fillet welds. Calculations for the number of joints that need to be welded on each side of all vertical and horizontal angle points shall be furnished to the CITY at no additional cost to the CITY.
  - 7. For field welded joints, design stresses shall not exceed 50 percent of the indicated minimum yield strength of the grade of steel utilized, or 16,500 psi, whichever is less, for the part being examined when longitudinal thrust is assumed to be uniformly distributed around the circumference of the joint. At the CONTRACTOR's option, the steel cylinder area may be progressively reduced from the point of maximum thrust to the end of the restrained length.
- G. Lap Joints
  - 1. Preparation for field welding shall be in accordance with AWWA C200.
  - 2. The method used to form, shape and size bell ends shall be such that the physical properties of the steel are not substantially altered. Unless otherwise approved by the CITY, bell ends shall be formed by an expanding press or by being moved axially over a die in such a manner as to stretch the steel plate beyond its elastic limit to form a truly round bell of suitable diameter and shape. No process will be permitted in which the bell is formed by rolling. Faying surfaces of the bell shall be essentially parallel, but in no case shall the bell slope vary more than 2 degrees from the longitudinal axis of the pipe.

## H. Bell and Spigot Ends

1. The CONTRACTOR shall require the pipe manufacturer to submit details complete with significant dimensions and tolerances and also to submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted.
2. The method used to form, shape and size bell ends shall be such that the physical properties of the steel are not substantially altered.
3. Unless otherwise approved by the CITY, bell ends shall be formed by an expanding press or by being moved axially over a die in such a manner as to stretch the steel plate beyond its elastic limit to form a truly round bell of suitable diameter and shape. No process will be permitted in which the bell is formed by rolling.
4. Unless otherwise approved by the CITY, spigot ends with rolled gasket grooves shall be non-destructively tested by the dye penetrant or magnetic particle method for the full circumference, especially at the weld seam area.
5. Faying surfaces of the bell and spigot shall be essentially parallel, but in no case shall the bell slope vary more than 2 degrees from the longitudinal axis of the pipe.
6. Actual yield strength of the steel used in the spigot rolling operation (i.e. yield strength values in mill certifications and subsequent destructive test results) shall be limited to 50,000 psi.
7. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself, will provide watertight joints under all operating conditions when properly installed.
8. Full and complete information regarding location, type, size, and extent of all welds shall be shown on the shop drawings. The shop drawings shall distinguish between shop and field welds. Shop drawings shall indicate by welding symbols or sketches the details of the welded joints, and the preparation of parent metal required to make them. Joints or groups of joints in which welding sequence or technique are especially important shall be carefully controlled to minimize shrinkage stresses and distortion.

## I. Mitered End Cut Welded Butt Joints or Lap Joints (via Bell Ends)

1. For deflection angles of less than 5 degrees, the Contractor can utilize Mitered end cuts with welded butt or lap joints per AWWA M11 Steel Pipe Guide and applicable requirements.

## J. Flanges

1. AWWA C207, Class D flanges (matching ANSI/ASME B16.1, Class 125 flanges for bolt hole size and drilling) shall be used for pressures up to 150 psi.
2. AWWA C207, Class E flanges (matching ANSI/ASME B16.1, Class 125 flanges for bolt hole size and drilling) shall be used for pressures between 150 psi and 250 psi.
3. AWWA C207, Class F flanges (matching ANSI/ASME B16.1, Class 250 flanges for bolt hole size and drilling) shall be used for pressures between 250 psi and 300 psi or when Class 250 butterfly valves or other appurtenances using flanges corresponding to AWWA C207 Class F are required.
4. Flanges shall be flat-faced type only. Segmented flanges shall not be used.

## 2.6 CEMENT-MORTAR LINING OF PIPE

### A. General

1. Except as otherwise required, interior surfaces of all steel pipe, fittings, and specials shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with AWWA C205.

2. The progress of the application of mortar lining shall be regulated in order that all hand work, including the repair of defective areas is cured in accordance with the provisions of AWWA C205.
  2. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting.
  3. The lining machine shall be of a type that has been used successfully for similar work.
  4. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications at no additional cost to the CITY.
- B. The minimum lining thickness shall be in accordance with AWWA C200, Table 1 of Section 4.
- C. The pipe shall be left bare where field joints occur as indicated. Ends of the linings shall be left square and uniform. Feathered or uneven edges will not be permitted.
- D. Defective linings, as determined by the CITY, shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feathered edged joints.
- E. Cement-mortar for patching shall be the same materials as the mortar for machine lining, except that a finer grading of sand and mortar richer in cement shall be used when field inspection indicates that such mix will improve the finished lining of the pipe.
- F. For all pipe and fittings with plant-applied cement-mortar linings, the pipe manufacturer shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out of the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.
- G. Cement-Mortar Lining for Field Application
1. The materials and design of in-place cement-mortar lining shall be in accordance with AWWA C602 and the following supplementary requirements.
    - a. Portland cement shall conform to Type II, ASTM C150.
    - b. Pozzolanic material shall not be used in the mortar mix.
    - c. Admixtures shall contain no calcium chloride.
    - d. The minimum lining thickness shall be as indicated for shop-applied cement mortar lining and the finished inside diameter after lining shall be as shown.

## 2.7 CEMENT MORTAR COATING OF PIPE

- A. The exterior surfaces of pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of rust-inhibitive primer and a finish coat
- B. All pipes for buried service, including bumped heads, shall be coated with a 1-inch minimum thickness of reinforced cement-mortar coating.
1. Exterior surfaces of pipe or fittings passing through structure walls shall be cement mortar coated six (6) inches beyond the inside wall face.
  2. Unless otherwise specified, the reinforcement for the coating of pipe sections may be spiral wire, wire fabric, or wire mesh in accordance with AWWA C205.
  3. The welded wire fabric shall be securely fastened to the pipe with welded clips or strips of steel.
  4. The wire spaced 2 inches on centers shall extend circumferentially around the pipe.
  5. The ends of reinforcement strips shall be lapped 4 inches and the free ends tied or looped to assure continuity of the reinforcement.

## 2.8 FABRICATION OF SPECIALS

### A. General

1. Specials and fittings shall conform to dimensions stipulated in AWWA C208.
2. Reinforcement for wyes, tees, outlets, and nozzles shall be designed in accordance with AWWA Manual M-11. Reinforcement shall be designed for the pressure indicated and shall be in accordance with the Standard Details.
3. Specials and fittings shall be equal in pressure design strength and shall have the same lining and coating as the adjoining pipe.
4. Unless otherwise specified, the minimum radius of elbows shall be 2.5 times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11-1/4 degrees.

B. Fittings may be fabricated from pipe that has been mechanically lined or coated.

C. Access manholes with covers shall be as indicated. All threaded outlets shall be forged steel suitable for 3000 psi service.

D. Outlets 12-inch and smaller may be fabricated from Schedule 30 or heavier steel pipe in the standard outside diameters, i.e. 12-3/4 inch, 10-3/4 inch, 8-5/8 inch, 6-5/8 inch, and 4-1/2 inch.

E. The design of outlet reinforcement shall be in accordance with the procedures given in Chapter 12 of AWWA Manual M-11, except that the design pressure, P, used in the M11 procedure shall equal the greater of 1.25 Pw or 0.9376 Pt. Unless otherwise indicated, outlets 2 inches in diameter and smaller need not be reinforced.

F. In lieu of saddle or wrapper reinforcement as required by the design procedure in Manual M-11, pipe or specials with outlets may be fabricated in their entirety of steel plate having a thickness equal to the sum of the pipe wall plus the required reinforcement.

G. Where required by the M-11 design procedure crotch plate reinforcement shall be furnished.

H. Steel welding fittings shall conform to ASTM A234.

### I. Ends for Mechanical-Type Couplings

1. Except as otherwise required, where mechanical-type couplings are indicated, the ends of pipe shall be banded with Type C collared ends using double fillet welds. Where pipe 12-inch and smaller is furnished in standard schedule thicknesses, and where the wall thickness equals or exceeds the coupling manufacturer's minimum wall thickness, the pipe ends may be grooved.

### J. Lining

1. All requirements pertaining to thickness, application and curing of lining indicated for straight pipe shall apply to specials, with the following proviso. If the special cannot be lined centrifugally, it shall be lined by hand. In such case, the lining shall be reinforced with 2-inch by 4-inch No. 12 welded wire fabric positioned approximately in the center of the lining. The wires spaced 2-inches on center shall extend circumferentially around the pipe with the fabric securely fastened to the pipe. Splices shall be lapped 4 inches and the free ends tied or looped to assure continuity.

### K. Coating

1. All requirements pertaining to thickness, application and curing of coating for straight pipe shall apply to specials. Pipe above ground or in structures shall be field painted as required in Section 04000.

- L. Specials and fittings that cannot be mechanically lined and coated shall be lined and coated by hand-application, using the same materials as are used for the pipe and in accordance with the applicable AWWA C602 Standards. Coating and lining applied in this manner shall provide protection equal to that indicated for the pipe.
- M. Areas of lining that have been damaged by such fabrication shall be repaired by hand applications in accordance with applicable AWWA C602 Standards.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF PIPE**

- A. Immediately before placing each section of pipe in final position for jointing, the bedding for the pipe shall be checked for firmness and uniformity of surface to support the pipe for its full length.
- B. All buried pipe shall be installed with 10 gauge copper tracer wire.
- C. When the pipe is being laid, it shall be turned and placed where possible, so that any slightly damaged portion will be on top. The damaged area shall be repaired for the protection of any exposed steel.
- D. All damaged areas along the pipe shall be repaired using materials and methods acceptable to the CITY.
- E. Moderate deflections and long radius curves may be made by means of beveled joint rings, by pulling standard joints, by using short lengths of pipe, or a combination of these methods; provided that pulled joints shall not be used in combination with bevels.
- F. The maximum total allowable angle for beveled joints shall be 5 degrees per pipe joint.
- G. The maximum allowable angle for pulled joints shall be in accordance with the manufacturer's recommendations or the angle which results from a 3/4 inch pull out from normal joint closure, whichever is less.
- H. All horizontal deflections or fabricated angles shall fall on the alignment. [In congested city streets or at other locations where underground obstructions may be encountered, the chord produced by deflecting the pipe shall be no further than 6 inches from the alignment indicated.
- I. All vertical deflections shall fall on the alignment and at locations adjacent to underground obstructions, points of minimum earth cover, and pipeline outlets and structures. The pipe angle points shall match the angle points indicated.
- J. For pipe wall thicknesses of 3/8-inch or less, the maximum radial offset (misalignment) for submerged arc and gas metal arc welded pipe shall be 0.1875 times the wall thickness or 1/16-inch, whichever is larger.
- K. For pipe wall thickness greater than 3/8-inch, the maximum radial offset shall be 0.1875 times the wall thickness or 5/32-inch, whichever is smaller.
- L. Bevels shall be provided on the bell ends.
- M. Mitering of the spigot ends will not be permitted.
- N. For pipe 24 inches in diameter and larger, pipe struts shall be left in place until backfilling operations have been completed.
- O. Struts in pipe smaller than 24 inches may be removed immediately after laying, provided that the deflection of the pipe during and after backfilling does not exceed that indicated. After the backfill has been placed, the struts shall be removed and shall remain property of the CONTRACTOR.

- P. The openings of all pipe and specials where the pipe and specials have been cement mortar lined in the shop shall be protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water or any undesirable substance. The bulkheads shall be so designed to prevent drying out of the interior of the pipe. The CONTRACTOR shall introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads.

### 3.2 RUBBER GASKETED JOINTS

- A. Immediately before jointing pipe, the spigot end of the pipe shall be thoroughly cleaned, and a clean rubber gasket lubricated with a NSF approved vegetable-based lubricant shall be placed in the spigot groove.
- B. The volume of the gasket shall be “equalized” by moving a metal rod between the gasket and the spigot ring around the full circumference of the spigot ring.
- C. The bell of the pipe already in place shall be carefully cleaned and lubricated with a NSF approved vegetable-based lubricant. The spigot of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position.
- D. Tilting of the pipe to insert the spigot into the bell will not be permitted.
- E. After the pipe units have been joined, a feeler gauge shall be inserted into the recess and moved around the periphery of the joint to detect any irregularity in the position of the rubber gasket. If the gasket cannot be “felt” all around, the joint shall be disassembled. If the gasket is undamaged, as determined by the CITY, it may be reused, but only after the bell ring and gasket have had an additional coat of lubrication applied.

### 3.3 WELDED JOINTS

#### A. General

1. Field welded joints shall be in accordance with AWWA C206.
2. Where exterior welds are performed, adequate space shall be provided for welding and inspection of the joints.
3. During installation of welded steel pipe in either straight alignment or on curves, the pipe shall be laid so that the lap joint clearance, at any point around the circumference of the joint, shall comply with the requirements of AWWA C206.
4. Unless double fillet welds are indicated, field welded lap joints may, at the CONTRACTOR’s option, be made on either the inside or the outside of the pipe.
5. Butt straps, where used or required, shall be a minimum of 6 inches wide, the same thickness as the pipe wall and shall provide for a minimum of 3/4 inch lap at each pipe joint.
6. The pipe ends shall be cut straight on joints where butt straps are used for realignment, adjustment, or deflection, and fillet welds shall be made as indicated.
7. After the pipe and pipe joint are properly positioned in the trench, the length of pipe between joints shall be backfilled to at least 1 foot above the top of the pipe. Care shall be exercised during the initial backfilling to prevent movement of the pipe and to prevent any backfill material from being deposited on the joint.
8. Prior to the beginning of the welding procedure, any tack welds used to position the pipe during laying shall be removed. Any annular space between the faying surfaces of the bell and spigot shall be equally distributed around the circumference of the joint by shimming, jacking, or other suitable means. The weld shall then be made in accordance with AWWA C206. Where more than one pass is required, each pass except the first and final one shall be peened to relieve shrinkage stresses; and all dirt, slag, and flux shall be removed before the succeeding bead is applied.

9. As soon as practicable after welding of each joint, all field-welded joints shall be tested by the liquid penetrant inspection procedure conforming to the requirements of ASTM E165 under Method "B" and "Leak Testing." All defects shall be chipped out, rewelded and retested.
10. Following tests of the joint, the exterior joint spaces shall be coated in accordance with these specifications after which backfilling may be completed.

### 3.4 JOINT COATING AND LINING

- A. The interior and exterior joint recesses shall be thoroughly wiped clean and all water, loose scale, dirt and other foreign material shall be removed from the inside surface of the pipe.
- B. The cement for joint grout and mortar shall be portland cement acceptable under ASTM C150 and shall be of the same type used for the pipe coating.
- C. After the pipe has been laid and after sufficient backfill has been placed between the joints to hold the pipe securely in place, the outside annular space between pipe sections shall be completely filled with grout formed by the use of polyethylene foam-lined fabric bands.
- D. The grout shall be composed of one part cement to not more than 2 parts sand, thoroughly mixed with water to a consistency of thick cream.
- E. The grout space prior to filling shall be flushed with water so that the surface of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured.
- F. The joint shall be filled with grout by pouring from one side only, and shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe and up the opposite side. Pouring and rodding the grout shall be continued to allow completion of the filling of the entire joint recess in one operation.
- G. Grouting of the outside joint spaces shall be kept as close behind the laying of the pipe as possible except that in no case shall grouting be closer than 3 joints of the pipe being laid.
- H. Grout Bands (Diapers)
  1. The grout bands or heavy-duty diapers shall be polyethylene foam-lined fabric with steel strapping of sufficient strength to hold the fresh mortar, resist rodding of the mortar and allow excess water to escape.
  2. The foam plastic shall be 100 percent closed cell, chemically inert, insoluble in water and resistant to acids, alkali and solvents.
  3. The fabric backing shall be cut and sewn into 9-inch wide strips with slots for the steel strapping on the outer edges.
  4. The polyethylene foam shall be cut into strips 6 inches wide and slit to a thickness of 1/4-inch which will expose a hollow or open cell surface on one side.
  5. The foam liner shall be attached to the fabric backing with the open or hollow cells facing toward the pipe.
  6. The foam strip shall cover the full interior circumference of the grout band with sufficient length to permit an 8-inch overlap of the foam at or near the top of the pipe joint.
  7. Splices to provide continuity of the material will be permitted.
  8. The polyethylene foam material shall be protected from direct sunlight.
- I. The polyethylene foam-lined grout band shall be centered over the joint space with approximately equal widths extending over each pipe end and securely attached to the pipe with steel straps. After filling the

exterior joint space with cement grout, the flaps shall be closed and overlapped in a manner that fully encloses the grout with polyethylene foam. The grout band shall remain in position on the pipe joint.

J. Joint Lining

1. After the backfill has been completed to final grade, the interior joint recess shall be filled with mortar of stiff consistency mixed in proportions of one part cement to 2 parts sand.
2. The mortar shall be tightly packed into the joint recess and troweled flush with the interior surface, and all excess shall be removed.
3. At no point shall there be an indentation or projection of the mortar exceeding 1/16inch.
4. For pipe smaller than 24 inches in diameter, before the spigot is inserted into the bell, the bell shall be daubed with mortar containing one part cement to 2 parts sand. The spigot end then shall be forced to the bottom of the bell and excess mortar on the inside of the joint shall be swabbed out.

K. The lining machine shall be of a type that has been used successfully for a similar size of pipe. No ball ("rabbit") shall be used. These joints shall be videotaped by the CONTRACTOR or hand holes shall be provided at each joint, all at no additional cost to the CITY.

L. The CONTRACTOR shall perform all work in a thorough and workmanlike manner by trained personnel, under the supervision of experienced personnel skilled in machine application of cement-mortar lining to pipelines of size comparable to this work.

M. Curing of the in-place cement-mortar lining shall be in accordance with AWWA C602.

N. The CONTRACTOR shall provide additional protective devices as required to ensure that the airtight covers, which maintain a moist condition in the pipeline, are not damaged.

O. Defective areas encompassing the full diameter of the pipe shall be replaced by machine wherever the length measured along the pipe centerline is greater than 5 feet; otherwise defective areas may be replaced by hand.

- END OF SECTION -

**SECTION 15140  
ELECTRIC ACTUATORS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Furnish and install electric actuators in accordance with the Contract Documents.

1.2 RELATED WORK SPECIFIC ELSEWHERE

- A. Related Sections:
  - 1. Section 11000 - Equipment General Provisions
  - 2. Section 15201 - Valve and Gate Actuators
  - 3. Division 16 - Electrical

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 - Submittals.
- B. Submit complete manufacturer catalog information showing dimensions, electrical requirements, operating instructions, etc.

1.4 OPERATION & MAINTENANCE MANUALS

- A. Provide six (6) hard copies plus one (1) electronic version in PDF format.
- B. Operation and Maintenance Manual shall be furnished in accordance with Section 01730 – Operating and Maintenance Data.

1.5 QUALITY ASSURANCE

- A. The manufacturer shall provide a 2-year equipment warranty.

**PART 2 – PRODUCTS**

2.1 GENERAL

- A. The actuator shall be AUMA, or Engineer Approved Equal.
- B. The actuator shall be compact and low profile to minimize space requirements.
- C. The actuator shall provide adjustable operation up to 90°.
- D. The actuator shall provide easy access for field wiring and adjustment.
- E. The actuator shall be built to withstand line vibration and shock without failure.

2.2 ENCLOSURE – WEATHERPROOF

- A. Actuators shall be O-ring sealed, watertight to NEMA 4X/6 and submersible to IP 68-8 (26 feet (8meters) for 96 hours)) in accordance with EN 60529. During submersion it must be possible to operate the actuator at least 10 times. Enclosure must allow for temporary site storage without the need for electrical supply connection. All external fasteners shall be of stainless steel. Gear case shall be cast iron. In order to prevent

condensation, a heater must be installed inside the actuator, suitable for continuous operation. Actuator must provide an alarm signal in case of failure of anti-condensation heater.

- B. When required, actuators for hazardous locations shall be certified explosion proof for Class I, Division 1 & 2, Groups C & D or Groups B, C & D.

## 2.3 MOTOR

- A. The motor shall be a single phase, permanent split capacitor induction type with Class F or better insulation.
- B. The motor shall contain a built-in UL approved automatic reset thermal overload protector set at 275°F (135°C) embedded in the motor windings.
- C. Motors shall be 230 VAC or 120VAC, 1 Phase, 60 Hz as specified in plans.
- D. The actuator shall be sized to guarantee valve closure at the specified torque and/or thrust requirement as indicated by the valve manufacturer or supplier. The actuator must be adequately sized to provide the torque required to operate the valve at 90% of the nominal voltage. The operating speed shall provide valve closing and opening at approximately 12 inches per minute for gate valves, 4 inches per minute for globe valves and as indicated in the valve list for quarter turn valves. Quarter turn valves will be furnished with mechanical stops that restrict the valve/actuator travel. One actuator size (same outside dimensions) shall be available covering output speeds from 4.8 to 216 rpm for a given torque range, to avoid over sizing and unnecessary weight load on valve stem, flange and yoke. An increase of actuator size caused by higher actuator output speed is not acceptable.
- E. The electric motor shall be Class F insulated, with a duty rating of at least 15 minutes at 104°F (40°C) ambient temperature at an average load of at least 35% of rated actuator torque. Motor shall be specifically designed and built by the actuator manufacturer for electric actuator service characterized by high starting torque, low stall torque and low inertia. Commercially available motors shall not be acceptable. Electrical disconnection of the motor shall be by means of a plug and socket and motor removal shall be possible without loss of lubricant. The actuator must include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel regardless of the connection sequence of the power supply.
- F. The following criteria shall be provided for motor protection:
  - 1. The motor shall be de-energized without damage in the event of a stall condition when attempting to move a jammed valve.
  - 2. The motor shall be de-energized in the event of an over torque condition
  - 3. A minimum of three thermal devices imbedded in the motor windings shall be provided to de-energize the motor in case of overheating.
  - 4. Lost phase protection
- G. Other DC and AC motors shall be available upon request.

## 2.4 ACTUATOR GEAR TRAIN SYSTEM

- A. The actuator shall have a self-locking gear train system consisting of a worm and worm gear output drive mechanism, which will hold the valve in the desired position without the need for an electro-mechanical braking system.
- B. The spur gear train shall have precision cut multi- staged gears which will withstand locked rotor conditions and are permanently lubricated at the factory.
- C. The actuator gearing shall be totally enclosed in a grease-filled cast iron gear case suitable for operation in any orientation. Oil lubrication is not permitted. Actuator gearing shall be hardened steel with alloy bronze worm wheel. The design should permit the opening of the gear case for inspection or disassembly without releasing

the stem thrust or taking the valve out of service. Where required per application, electric actuators will be provided with worm gearboxes. The worm gearboxes shall be supplied with full 360° bronze or ductile iron worm wheels and end-of-travel mechanical stops on the worm shaft. Designs with segmented worm gears and end-of-travel stops in the gearbox housing will not be permitted.

## 2.5 MECHANICAL TRAVEL STOPS

- A. Mechanical stainless steel travel stops shall be provided and located outside the actuator enclosure for ease of adjustment.
- B. Stainless steel lock nuts shall be provided to hold the travel stops in position.
- C. O-ring seals for waterproof protection shall be provided.
- D. The mechanical travel stops shall limit the travel of the actuator in either direction to the full travel range of the valve.
- E. Stainless steel spacers shall be provided to prevent adjustment of travel stops above 0° and below 90°.

## 2.6 MANUAL OVERRIDE

- A. The actuator shall be equipped with a manual override hand wheel to rotate the valve without electrical power.
- B. The manual override system shall ensure efficient manual operation without the use of extra tools or levers.
- C. A motor power cutout switch shall be provided to cut power to the motor when the actuator manual override is engaged.

## 2.7 DISCONNECT SWITCHES

- A. Each electric actuator shall have a disconnect switch voltage noted in the drawings.
- B. Acceptable Manufacture: Rotary or approved equal.

## 2.8 TRAVEL LIMIT SWITCHES

- A. Travel limit switches shall limit the actuator travel in both the open and closed direction of travel.
- B. Travel limit switches shall be held in brackets for accurate and repeatable valve position feedback.
- C. Travel limit switch cams shall be infinitely adjustable by finger touch or screw driver.
- D. All travel limit switches shall be:
  - 1. Single Pole Double Throw (SPDT) Form C, UL Listed, and CSA Approved.
  - 2. 10A at 125/250 VAC and 1/2A at 125 VDC.
- E. Travel limit switches shall be pre-wired to a terminal block for ease of access and all internal wiring shall range from 12-22 AWG.

## 2.9 LOCAL CONTROLS

- A. Local controls with 'OPEN - STOP - CLOSE' pushbutton type controls and a lockable selector switch with 'LOCAL - OFF - REMOTE' function. Local controls shall be supplied with indicating lights red for 'OPEN', yellow for 'FAULT' and green for "CLOSED".

## 2.10 SERVICE REQUIREMENTS

A. Actuators shall be designed for electric operation under the following service conditions:

1. Temperature range:
  - a. -40°F to +160°F in Open/Close Service
  - b. -40°F to +140°F in Modulating Service
2. Duty Cycle:
  - a. 25% for Intermittent Operation
  - b. 100% for Continuous Operation

## 2.11 TESTING

A. All actuators shall be factory tested at rated load to ensure proper operation. Each actuator shall be performance tested. Test documentation must be provided if requested indicating the following:

1. Torque sensing tripping points in both the open and closed directions of travel
2. Current at the maximum torque tripping point
3. Actuator output speed
4. High voltage test

## 2.12 MOUNTING

A. All actuators shall comply with ISO 5211 and mount directly to the valve mounting flange and stem without the need for any brackets or couplings.

## 2.13 PROJECT SPECIFIC EQUIPMENT

A. Torque Limiting System: Shall include two SPDT mechanical switches and two factory-calibrated adjusting screws.

1. The switches, in response to a predetermined load on the actuator output shaft, shall interrupt power to the motor.
2. The switches shall operate at any point and in both directions of actuator travel.

B. Heater: Prevents internal condensation build-up.

1. Shall be a self-regulating temperature control type.
2. Shall be pre-wired to the terminal block for ease of connection to external source.
3. Rated output shall be 5 W at 120 or 220 VAC.

C. Local Control Station: Permits local electrical operation of the actuator.

1. Shall flush mount to the actuator and include:
  - a. A local-off-remote control switch.
  - b. An open-stop-close switch.
  - c. Two lights which indicate open and closed valve position.
  - d. Two ¾" NPT conduit entries in base of enclosure for customer wiring.
2. Enclosure shall be aluminum and weatherproof.

D. Battery Back Up: User-selectable valve fail position upon loss of power supply in 24V applications.

1. Shall flush mount to the actuator and include:
  - a. Visual and remote indication of battery status and operation.
  - b. Field selectable valve fail position.
  - c. Two ¾" NPT conduit entries in base of enclosure for customer wiring.
2. Enclosure shall be aluminum and weatherproof.

E. Potentiometer: Shall include two SPDT mechanical switches and two factory-calibrated adjusting screws.

1. The switches, in response to a predetermined load on the actuator output shaft, shall interrupt power to the motor.
  2. The switches shall operate at any point and in both directions of actuator travel.
- F. Auxiliary Switches: Indicates travel position for remote customer control systems.
1. All auxiliary switches shall be:
    - a. Single Pole Double Throw (SPDT) Form C, UL Listed, and CSA Approved.
    - b. 10A at 125/250 VAC and 1/2A at 125 VDC
  2. Up to 6 additional auxiliary switches may be added.
- G. Servo NXT: Precise modulating control of the valve position (where modulating is required).
1. Shall accept an analog input command signal proportional to the desired valve position.
  2. The analog input signal shall be configurable to either current or voltage input:
    - a. 4-20mA DC, 0-10V DC, 2-10V DC, 0-5V DC.
  3. Shall have an analog output retransmission signal proportional to the actual valve position.
  4. The analog output signal shall be configurable to either current or voltage output:
    - a. 4-20mA DC, 0-10V DC, 0-5V DC.
  5. LED driven menu display shall be provided for simplified commissioning, monitor and control of actuator.
  6. Voltage spike and transient protection shall be provided on all input terminals and output terminals.
  7. Independent isolation shall be provided between analog input command signal and output retransmission signal to eliminate ground loops.
  8. 120/230VAC units shall have inductive isolation between line voltage and logic level voltages.
  9. Control characteristic shall be linear and duty cycle shall be 100%.
  10. Calibration shall be accomplished by pressing a single button to initiate the calibration routine.
  11. Independent adjustments shall be provided for deadband and for both open and closed speed control of the actuator.
  12. Internal feedback shall be by means of a 10k Ohm potentiometer.
  13. Manual mode operation shall be provided to allow for control of actuator when no command signal is present.
  14. On-board fault indications shall be provided.
  15. Shall be designed to meet UL and CE standards.
- H. Series 70 DeviceNet: Network control and feedback of valve position.
1. Shall be available as an option to provide on/off or modulating capability.
- 2.14 ACTUATOR APPROVALS & CERTIFICATIONS
- A. CE
1. Low Voltage Directive: 2014/35/EU
  2. EMC Directive: 2014/30/EU
  3. Machinery Directive: 2006/42/EC
  4. RoHS Directive: 2011/65/EU
  5. IP65
- B. ABS

- C. Bureau Veritas Certification
  - D. CSA Certification
    - 1. For select 120VAC units.
  - E. UL Certification (cULus)
    - 1. For select 120VAC units.
    - 2. NEMA Type 4, 4x.
- 2.15 HAZARDOUS LOCATION
- A. Certified to UL and CSA standards.
    - 1. For select 120VAC units.
    - 2. NEMA Type 4x, 7, 9.
  - B. Hazardous location enclosure shall be UL certified to:
    - 1. Class I, DIV 1 & 2, Group C, D
    - 2. Class II, DIV 1 & 2, Group E, F, G
    - 3. Operating Temperature Code: T3B (165°C)
  - C. All unused conduit entry points to be sealed for ingress protection.

### **PART 3– EXECUTION**

#### **3.1 INSTALLATION**

- A. Install per manufacturer’s recommendations.
- B. Each actuator shall be supplied with a start-up kit comprising installation instruction manual, electrical wiring diagram and cover seals to make good any site losses during the commissioning period. In addition, sufficient actuator commissioning tools shall be supplied to enable actuator set up and adjustment during valve/actuator testing and site installation commissioning
- C. Each actuator must be performance tested and individual test certificates shall be supplied free of charge. The test equipment should simulate a typical valve load, and the following parameters should be recorded.
  - 1. Current at maximum torque setting
  - 2. Torque at max. torque setting
  - 3. Flash test voltage
  - 4. Actuator output speed or operating time.

- END OF SECTION -

**SECTION 15200**  
**VALVES, GENERAL**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Furnish and install all valves, actuators, and appurtenances, complete and operable, in accordance with the Contract Documents. These specifications shall not apply to valves, actuators, and appurtenances to be provided by process equipment vendors as part of process systems or equipment already approved by the ENGINEER.
- B. **ALL VALVES INSTALLED ON POTABLE WATER LINES SHALL BE NSF 61 CERTIFIED AND RATED TO BE INSTALLED ON POTABLE WATER SYSTEMS.**
- C. The requirements of Section 11000 - Equipment General Provisions, apply to the WORK of this Section.
- D. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls indicated in other Sections of the Specifications.
- E. Where a valve is to be supported by means other than the piping to which it is attached, the CONTRACTOR shall obtain from the valve manufacturer a design for support and foundation that satisfies the criteria in Section 11000. The design, including drawings and calculations sealed by an engineer, shall be submitted with the Shop Drawings. When the design is approved, the support shall be provided.
- F. Unit Responsibility: A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve; however, the CONTRACTOR shall be responsible for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.
- G. Single Manufacturer: Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.2 SUBMITTALS

- A. General: Submittals shall be furnished in accordance with Section 01300 – Submittals.
- B. Shop Drawings: Shop Drawings shall contain the following information:
  - 1. Valve name, size, Cv factor, pressure rating and identification number (if any).
  - 2. Complete information on valve actuator, including size, Manufacturer, model number, limit switches, and mounting.
  - 3. Cavitation limits for all control valves.
  - 4. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, handwheels, position indicators, limit switches, integral control systems, needle valves, and control systems.
- C. Technical Manual: The Technical Manual shall contain the required information for each valve.
- D. Spare Parts List: A Spare Parts List shall contain the required information for each valve assembly, where indicated.

### 1.3 QUALITY ASSURANCE

- A. Valve manufacturer and model shall be as described in the Drawings or Engineer approved equal.

### 1.4 SPARE PARTS

- A. The CONTRACTOR shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the OWNER after expiration of the correction of defects period.

## PART 2 – PRODUCTS

### 2.1 PRODUCTS

- A. General: Valves and gates shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators. Valves with no clear way to determine position shall be provided with position indicators. Stem extensions shall be provided on valves where operation of the valve cannot be easily accomplished from ground level.
- B. Valve Actuators: Unless otherwise indicated, valve actuators shall be in accordance with Section 15201 - Valve and Gate Actuators and Section 15140 - Electric Actuators.
- C. Valve Labeling: A label shall be provided on all shut-off valves and control valves except for hose bibs. The label shall be of 1/16-inch plastic or steel, minimum 2 inches by 4 inches in size, as indicated in Section 15005 - Piping Identification Systems, and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.
- D. Valve Testing: As a minimum, unless otherwise indicated or recommended by the ENGINEER, valves 3 inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4 inches in diameter and larger shall be factory tested as follows:
  - 1. Hydrostatic Testing: Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.
  - 2. Seat Testing: Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop-tight for resilient seated valves.
  - 3. Performance Testing: All valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.
- E. Valve Marking: Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

## 2.2 MATERIALS

- A. General: Materials shall be suitable for the intended application. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:
1. Cast Iron: Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  2. Ductile Iron: ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
  3. Steel: ASTM A 216 - Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service, or to ASTM A 515 - Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service.
  4. Bronze: ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.
  5. Stainless Steel: Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 304 or 316 stainless steel.
  6. PVC: Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.
  7. CPVC: Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.
  8. NSF Standard 14: All materials shall be listed for use in contact with potable water.
- F. Bodies: Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done by certified welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.
- G. Bonnets: Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes. Below grade valves with above grade worm gear drives/handwheels or electric actuators shall include extended bonnets for mating up to the worm gear drives/handwheel or electric actuator.
- H. Stems: Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with variable stem packing, O-rings, Chevron V-type packing, or other suitable seal. Where subject to dezincification, bronze valve stems shall conform to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum, with a minimum tensile strength of 30,000 psi, a minimum yield strength of 14,000 psi, and an elongation of at least 10 percent in 2 inches. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used, except that zinc content shall not exceed 16 percent.
- I. Stem Guides: Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.
- J. Internal Parts: Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.

- K. Nuts and Bolts: Nuts and bolts on valve flanges and supports shall be in accordance with Section 05500 - Miscellaneous Metalwork.
- L. Coatings: Valve coatings shall be in accordance with section 09800 - Special Coatings or as recommended by the valve manufacturer.
- M. Environment: Submerged valves shall be of stainless steel construction as recommended by the valve manufacturer or as approved by the ENGINEER.

## 2.3 VALVE ACCESSORIES

- A. Valves shall be furnished complete with the accessories required to provide a functional system.

## **PART 3 – EXECUTION**

### 3.1 VALVE INSTALLATION

- A. General: Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the Manufacturer's written instructions and as indicated. Gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.
- B. Access: Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment.
- C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are indicated, the CONTRACTOR shall properly assemble and install such items so that systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

- END OF SECTION -

**SECTION 15201  
VALVE AND GATE ACTUATORS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide all valve and gate actuators and appurtenances, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section shall apply to all valves and gates, except where otherwise indicated in the Contract Documents.
- C. Single Manufacturer: Where two or more valve or gate actuators of the same type or size are required, the actuators shall all be produced by the same Manufacturer.

1.2 SUBMITTALS

- A. General: Submittals shall be furnished in accordance with Section 01300 – Submittals and Section 15200 - Valves, General. The shop drawing shall substantiate compliance with the Contract Documents requirements.
- B. Shop Drawings: Shop Drawings of all actuators shall be submitted together with the valve and gate submittals as a complete package.

**PART 2 – PRODUCTS**

2.1 GENERAL

- A. General: Unless otherwise indicated, all shut-off and throttling valves, and externally actuated valves and gates, shall be provided with manual or power actuators. All actuators shall be complete and operable with mounting hardware, motors, gears, controls, wiring, solenoids, hand wheels, levers, chains, and extensions, as applicable. All actuators shall be capable of holding the valve in any intermediate position between fully open and fully closed without creeping or fluttering.
- B. Manufacturers: Where indicated, certain valves and gates may be provided with actuators manufactured by the valve or gate Manufacturer. Where actuators are furnished by different manufacturers, coordinate selection to have the fewest number of manufacturers possible.
- C. Materials: All actuators shall be current models of the best commercial quality materials and liberally sized for the maximum expected torque. All materials shall be suitable for the environment in which the valve or gate is to be installed.
- D. Mounting: All actuators shall be securely mounted by means of brackets or hardware specially designed and sized for this purpose and of ample strength. The word "open" shall be cast on each valve or actuator with an arrow indicating the direction to open in the counter-clockwise direction. All gear and power actuators shall be equipped with position indicators. Where possible, manual actuators shall be located between 48 and 60 inches above the floor or the permanent working platform.
- E. Standard: Unless otherwise indicated and where applicable, all actuators shall be in accordance with ANSI/AWWA C 540 - AWWA Standard for Power-Actuating Devices for Valves and Sluice Gates.
- F. Functionality: Electric, pneumatic, and hydraulic actuators shall be coordinated with the power requirements of Division 16 and instrumentation equipment indicated in Section 17100 - Process Control and Instrumentation Systems.

## 2.2 MANUAL ACTUATORS

- A. General: Unless otherwise indicated, all valves and gates shall be furnished with manual actuators. Valves in sizes up to and including 8 inches shall have direct acting lever or handwheel actuators of the Manufacturer's best standard design. Larger valves and gates shall have gear-assisted manual actuators, with an operating pull of maximum 60 pounds on the rim of the handwheel. All buried and submerged gear-assisted valves, all gates, all gear-assisted valves for pressures higher than 250 psi, all valves 30 inches in diameter and larger, and where so indicated, shall have worm-gear actuators, hermetically-sealed and grease-packed, where buried or submerged. All other valves 10 inches to 24 inches in diameter may have traveling-nut actuators, worm-gear actuators, spur- or bevel-gear actuators, as appropriate for each valve.
- B. Buried Valves: Unless otherwise indicated, all buried valves shall have extension stems to grade, with square nuts or floor stands, position indicators, and cast-iron or steel pipe extensions with valve boxes, covers and operating keys. Where so indicated, buried valves shall be in cast-iron, concrete, or similar valve boxes with covers of ample size to allow operation of the valve actuators. Covers of valve boxes shall be permanently labeled as requested by the local Utility Company or the ENGINEER. Wrench-nuts shall comply with AWWA C 500 - Metal - Seated Gate Valves for Water Supply Service, and a minimum of 2 operating keys, or one key per 10 valves, whichever is greater, shall be furnished.
- C. Buried and Submerged Actuators: Buried and submerged valve actuators and gear assemblies shall be provided with Type 304 and/or 316 stainless steel bolting and trim, and shall be rated for continuous submerged service. If buried, the valve actuator shall be suitable for a submerged service at a water depth of 10 feet (minimum). If submerged, the actuator shall be suitable for a submerged service at a water depth of 30 feet (minimum).

## PART 3 – EXECUTION

### 3.1 SERVICES OF MANUFACTURER

- A. Field Adjustments: Field representatives of manufacturers of valves or gates with pneumatic, hydraulic, or electric actuators shall adjust actuator controls and limit-switches in the field for the required function.

### 3.2 INSTALLATION

- A. All valve and gate actuators and accessories shall be installed in accordance with Section 15200 - Valves, General. Actuators shall be located to be readily accessible for operation and maintenance, without obstructing walkways. Actuators shall not be mounted where shock or vibrations will impair their operation, nor shall the support systems be attached to handrails, process piping, or mechanical equipment.
- B. Inspection, Startup, and Field Adjustment: An authorized representative of the Manufacturer shall visit the site and witness the following:
  - 1. Installation of the equipment for not less than 1 day.
  - 2. Inspection, checking, and adjusting the equipment for not less than 1 day.
  - 3. Startup and field-testing for proper operation for not less than 1 day.

- END OF SECTION -

**SECTION 15202  
BUTTERFLY VALVES**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Provide butterfly valves and appurtenances, (air and water service) complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 11000 – Equipment General Provisions apply to this Section.
- C. The requirements of Section 15200 - Valves, General apply to this Section.
- D. The requirements of Section 15201 - Valve and Gate Actuators apply to this Section.

1.2 SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Submittals.
- B. **Complete Shop Drawings**
- C. Drawings of butterfly valves and actuators.
- D. Drawings showing valve port diameter complete with dimensions, part numbers and materials of construction.

1.3 QUALITY ASSURANCE

- A. Valves shall be subjected to performance, leakage, and hydrostatic tests in accordance with procedures and acceptance criteria established by AWWA C504.
- B. The valves shall be certified to NSF/ANSI 61 Drinking Water System Components and certified to be Lead-Free in accordance with NSF/ANSI 372.
- C. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

**PART 2 - PRODUCTS**

2.1 BUTTERFLY VALVES

- A. **General:** Butterfly valves steady-state water working pressures and steady-state differential pressure shall be as indicated on the plans. Operator input torque ratings shall fully comply with the requirements of AWWA C504. Operation shall be clockwise to close, counterclockwise to open. The minimum number of turns to close the valve shall have a minimum of two turns per diameter inch and a maximum of five turns per diameter inch of valve. Compression between the seat and disc edge shall be adjustable from both the upstream and downstream side of the valve disc and the seat shall be field replaceable without disassembly of the disc shaft. Seats with unidirectional adjustment, seats retained in the valve body by the use of fasteners and /or retaining rings, and seats retained on the valve disc are not acceptable.
- B. Valves shall be of the body type, pressure class, connection, end joint, and actuator type indicated. Flanged end connections shall fully conform to ANSI B16.1 Class 125.

- C. **Valve Actuation:** Where indicated in the plans, the butterfly valve shall be supplied with an automatic actuator. The valve actuator shall be sized to the specified conditions in Section 15140 – Electric Actuators. If actual operating conditions are not provided, per AWWA C504, the valve actuator shall be sized to operate the valve at rated working conditions. Each valve and valve actuator shall be assembled, adjusted, and tested by the valve manufacturer as a unit per the latest revision of AWWA C504.
- D. **Construction:** Unless otherwise indicated, all materials of construction shall be suitable for the service, whether water or air. The seats shall be positively clamped or bonded into the disc or body of the valve. Resilient seats shall provide a 360° continuous, uninterrupted seating surface that shall be field adjustable and replaceable without requiring epoxy, syringes, needles or pressure vessels. Valve actuation shall be per Section 15140 – Electric Actuators and Section 15201 – Valve and Gate Actuators.

Description	Material Standards
Valve Bodies	Cast Iron ASTM A126 Class B
Valve Stem	Stainless Steel T304 ASTM A276
Valve Discs	Cast Iron ASTM A48 / Ductile Iron ASTM A536 (64-45-12)
Seat Body / Hardware	Stainless Steel T316 ASTM A276
Resilient Seat	EPDM or Buna-N
Shaft Bearings	Teflon Lined with Non-Metallic Fiberglass Composite Backing
Painting / Coating	Shop Painted / Refer to Section 09800 – Special Coatings

- E. **Manufacturers, or Equal:**
1. DeZurik BAW
  2. Or Engineer Approved Equal

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. All exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator. The installation shall be in accordance with Section 15200 – Valves, General.

- END OF SECTION -

**SECTION 15203  
CHECK VALVES**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Provide check valves and appurtenances, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 15200 - Valves, General apply to this Section.

1.2 SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Submittals.

**PART 2 - PRODUCTS**

2.1 SWING CHECK VALVES (3-INCH AND LARGER)

- A. General: Swing check valves shall be of the full waterway body type, with a domed access cover and vent port. Swing check valves shall be suitable for cold working pressures of 250 psig and shall be capable of accepting air cushion, lever and weight or level and spring.
- B. The valves shall meet ANSI/AWWA C508 - Swing-Check Valves for Waterworks Service, and shall be certified to NSF 61 and be lead free in accordance with NSF 372.
- C. Body: The valve body and cover shall be of ductile iron conforming to ASTM A-536 (Grade 65-45-12) with flow area equal to the nominal pipe inside diameter throughout the valve. Seat shall be constructed on a 45 degree angle to reduce disc travel. The top access port shall be full size allowing for the removal of the disc without removing the valves from the line. The seat and internal body shall be fully coated with a two part thermosetting epoxy suitable for use in potable water applications.
- D. Disc: The resilient disc shall feature a fully encapsulated steel pressure plate with integral molded O-ring on the face of the elastomer. Nylon reinforcements shall be provided in the flexible hinge area of the disc assembly. The flex portion of the disc contains nylon reinforcement and shall be warranted for twenty-five years.
- E. Backflow Actuator: If required, check valves shall be provided with a screw-type backflow actuator to allow for the opening of the valve during no flow conditions. The backflow shall be a rising-stem type to indicate position. A stainless steel T-handle shall be provided for ease of operations.
- F. Position Indicator: Check valves shall be provided with a mechanical position indicator to indicate disc position.
- G. Connections: Swing check valves shall be provided with flanges drilled in accordance with ASME B16.1, Class 125 cast iron flanges or ASME B16.42, Class 150 for ductile iron flanges.
- H. Lever and Weight: Unless noted otherwise, all swing check valves shall be supplied with a factory equipped level and weight assembly. The lever shall be equipped with three holes for adjusting the bolted weight assembly. When the valve is closed, the lever and weight shall be located 30 degrees below horizontal. Lever and spring assemblies can be provided at the Engineer's discretion.

- I. Materials:
  - 1. Body & Cover: ASTM A536 Ductile Iron (Grade 65-45-12)
  - 2. Seat: Bronze
  - 3. Disc: Buna-N Rubber
  - 4. Trim: Bronze
  - 5. Diaphragm: Nylon Reinforced Buna-N Rubber.
  - 6. Stem, Nut & Spring: Stainless Steel T316, ASTM A313
  - 7. Body Pattern: Globe
  - 8. Tubing & Fitting: Copper and Bronze.
- J. Manufacturers:
  - 1. Val-Matic
  - 2. Or Engineer Approved Equal.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Valves shall be installed in accordance with provisions of Section 15200 - Valves, General and the manufacturer's requirements.

- END OF SECTION -

**SECTION 15230  
MISCELLANEOUS VALVES**

**PART 1 - GENERAL**

1.1 THE REQUIREMENT

- A. Provide all miscellaneous valves and appurtenances, complete and operable, in accordance with the Contract Documents.
- B. Valves that shall be installed on potable water system must be NSF 61 Certified and rated for potable water installations.
- C. The requirements of Section 15200 - Valves, General, apply to this Section.

1.2 SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Submittals.

1.3 OPERATION AND MAINTENANCE MANUAL

- A. Provide six (6) hard copies plus one (1) electronic version in PDF format.
- B. Operation and Maintenance Manual shall be furnished in accordance with Section 01730 – Operating and Maintenance Data.

1.4 QUALITY ASSURANCE

- A. Manufacturer and model shall be described on the Drawings or Engineer approved equal.
- B. The manufacturer shall provide a 2 year equipment warranty.

1.5 SPARE PARTS

- A. Spares shall be as requested by the ENGINEER. Payment for spares shall be made in accordance with the General Conditions.
- B. A list of spare parts for each piece of equipment shall be obtained from the manufacturer and submitted at the same time as Shop Drawings. The name, address, and telephone number of the nearest distributor for each piece of equipment shall be furnished.

**PART 2 - PRODUCTS**

2.1 AIR-VACUUM AND AIR-RELEASE VALVES

- A. **Air and Vacuum Valves:** Air and vacuum valves shall be capable of venting large quantities of air while pipelines are being filled, and allowing air to re-enter while pipelines are being drained. The valve shall be the size indicated or the size recommended by the manufacturer based on the proposed operating conditions, with flanged or screwed ends to match piping. Bodies shall be of high-strength cast iron. The float, seat, and all moving parts shall be constructed of Type 316 stainless steel. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be manufactured and designed for minimum 150 psi water-working pressure, unless otherwise indicated.

- B. **Air-Release Valves:** Air-release valves shall vent accumulating air while system is in service and under pressure and be of the size indicated and shall meet the same general requirements as indicated for air and vacuum valves except that the vacuum feature will not be required. Valves shall be manufactured and designed for a minimum water-working pressure of 150 psi, unless otherwise indicated.
- C. **Combination Air Valves:** Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. Valves shall have the same general requirements as indicated for air and vacuum valves. Valves shall be manufactured and designed for a minimum water-working pressure of 150 psi, unless otherwise indicated.
- D. **Construction:** Unless otherwise indicated, all materials of construction shall be suitable for the service. For air valves installed on vertical turbine pumps, the valve shall automatically open allowing full line unrestricted air re-entry to prevent vacuum from forming in the suction column. The valves shall be certified to NSF/ANSI 61 Drinking Water System Components and certified to be Lead-Free in accordance with NSF/ANSI 372. Valves shall conform to the AWWA C-512.

Description	Material Standards
Body and Cover	Cast Iron ASTM A126 Class B / Ductile Iron ASTM A536 (65-45-12)
Float	Stainless Steel ASTM A240
Seat	Buna-N
Painting / Coating	Shop Painted / Refer to Section 09800 – Special Coatings

- E. **Manufacturers, or Equal:**
  - 1. DeZurik APCO
  - 2. Or Engineer Approved Equal

**PART 3 - EXECUTION**

3.1 INSTALLATION

- A. Valves shall be installed in accordance with the manufacturer's printed recommendations, and with provisions of Section 15200 – Valves, General.
- B. Altitude valves sensing line must be installed per manufacturer's recommendations and requirements.

- END OF SECTION -

**SECTION 15500**  
**VENTILATING, HEATING AND AIR CONDITIONING**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. Provide ventilating, heating and air conditioning systems, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 11000 - Equipment General Provisions apply to the WORK of this Section.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. All work and materials shall be in full accordance with the latest rules and regulations or publications of the Health and Safety Rules (Air Conditioning Systems), the local Plumbing Code, the local Building Code, and all other local codes. Nothing in the Contract Documents shall be construed to permit work in violation of the above codes, rules, and regulations. In the absence of applicable codes, the installation and workmanship shall follow the standards set by the American Society of Heating, Refrigeration and Air Conditioning.

1.3 SUBMITTALS

- A. **Shop Drawings:** Shop drawings shall be submitted in accordance with Section 01300 - Submittals.
- B. **Equipment Numbers:** Equipment is identified by assigned numbers for reference and location purposes in the Contract Documents. The appropriate equipment numbers shall be included on the Shop Drawings and on other submittals.

1.4 WARRANTY

- A. Air conditioners, and all fans and blowers, shall carry the manufacturer's standard warranty, and all such warranties shall be furnished upon final acceptance of the completed systems. All reciprocating refrigerant compressors shall carry a 5-year warranty by the manufacturers.

**PART 2 – PRODUCTS**

2.1 GENERAL

- A. **Quality:** All mechanisms or parts shall be amply proportioned for the stresses which may occur during operation or for any other stresses which may occur during fabrication and erection. Individual parts that are alike in all units shall be alike in workmanship, design, and materials and shall be of the manufacturer's top line, industrial-commercial grade.
- B. **Supports:** All equipment and appurtenances shall be firmly anchored or connected to supporting members. All supports required for the proper installation of the equipment, but not forming an integral part of the building structure, shall be provided by the heating and ventilating subcontractor, unless otherwise indicated. Equipment shall be supported on restrained spring-type vibration isolators.
- C. **Noise/Vibration Control:** The system shall be free of any objectionable vibrations and noise. Flexible connections shall be provided in all ducts and piping connections to fans, compressors, and any other vibrating equipment.
- D. **Electric Motors:** Electric motors shall be provided in accordance with Section 16460 - Electric Motors

2.2 DUCTWORK AND MISCELLANEOUS ACCESSORIES

- A. **Construction:** Sheet metal ducts and plenums shall be constructed with airtight joints and seams in accordance with ASHRAE standards and SMACNA Duct Construction Manual. All joints on concealed ducts shall be taped with pressureless tape and adhesive, except welded or soldered joints. Ductwork materials shall be galvanized steel or aluminum, unless otherwise indicated. Minimum duct gauges required are as follows:

Maximum Dimension of Duct (inches)	Galvanized Steel U.S. Standard Gauge	Aluminum B and S Gauge
12 and less	26	24
13 through 30	24	22
31 through 54	22	20
55 through 84	20	18

- B. **Supports:** Supports for horizontal ducts and plenums shall be galvanized steel angles with hanger rods. Supports for vertical ducts shall be band iron strap or angle bracket type. Inlet ducts shall be amply braced to withstand maximum negative pressure.
- C. **Insulation:** The exterior of all ductwork inside of buildings downstream of air conditioning or heating units, other than ducts located in air conditioned spaces, shall be insulated with 2-inch thick flexible glass fiber insulation with a UL-labeled vapor barrier. All joints shall be taped to provide a continuous vapor seal. The insulation shall be attached to the ducts with adhesive applied in a 50 percent coverage. Insulation also shall be secured to the bottom of rectangular ducts over 24 inches wide with mechanical fasteners spaced 12 inches on centers. Ductwork to be internally lined will not require exterior insulation.
- D. **Lining:** The interior of supply and return ducts and plenums within 10-foot distance from fans and all ductwork exposed to the weather shall be lined. Duct lining shall be 1-inch thick fiber glass fastened to the inside of the ducts. Fastening shall be 100 percent coverage adhesive and mechanical fasteners 12 inches on center in both directions starting approximately 6 inches from ends of insulation. All exposed edges, ends, and rough surfaces shall be painted with adhesive or taped with 3-inch canvas tape dipped in adhesive.
- E. **Bird Screens:** Removable bird screens shall be provided on all outside air intakes and exhaust air discharges to outside air. Screens shall be secured in frames of same metal as screens. Bird screens shall be 1/2-inch mesh stainless steel by 14-gauge.
- F. **Flexible Connectors:** Flexible duct connections shall be made with banded or flanged 8-oz canvas, or reinforced plastic, or equal at each point where a blower unit is connected to a duct. A minimum clearance of 3 inches between the duct and source of vibration shall be maintained.
- G. **Diffusers, Grilles, and Registers:** All supply air registers and diffusers, return air, and exhaust grilles shall be constructed with smooth corners, flanges, and sponge rubber gaskets and material as noted on the Diffuser Schedule in the Contract Documents. All supply and return air registers and diffusers shall have individually variable blades and volume control dampers as indicated. All ceiling or duct-mounted outlets shall be off-white. Wall-mounted outlets shall be factory prime-coated. Terminals shall be **Titus; Metalaire; Krueger; or equal.**
- H. **Acoustic Louvers:** Acoustic louvers shall be provided as indicated. Acoustic louvers shall have a minimum noise reduction of 14 dB at octave band No. 3. The CONTRACTOR shall submit certified data from a laboratory substantiating the acoustical performance. Static pressure drop shall not exceed 0.100 inches W.C. at 750 fpm.

- I. Acoustic louvers shall be of galvanized formed steel construction with air foil blades. Frame and blade face shall be of 16 and 18-gauge, respectively. Air-side blades shall have perforations, and blades shall be packed with 3.5 lb. density fiber glass or with inert, vermin-and moisture-proof mineral fiber for better acoustical performance. Louvers shall be flush with exterior wall, with mounting frames caulked to provide weather-tight connections. All protruding inside edges shall be provided with smooth moldings. Acoustic louvers shall be **Ruskin, Industrial Acoustics Company; or equal**. Coat louvers in accordance with Section 09800 – Special Coatings.
- J. **Turning Vanes:** Square-turn elbows shall be fitted with shop-fabricated double-blade turning vanes mounted inside rails. Construction shall be of the same material as the duct work and be rigid enough to prevent vibration at high air flow.
- K. **Air Extractors:** An air extractor shall be provided on each take-off from main supply duct adjacent to any diffuser, register, or grille where a splitter is not used. Air extractors shall be **Carnes; Tuttle and Bailey; or equal**. Extractors shall have synchronized steel curved blades, heavy side rails, and screw operator.

## 2.3 CONTROLS

- A. **General:** All cooling, ventilating, and air conditioning equipment shall be provided with manual and automatic control systems as indicated. The exhaust fan shall be interlocked with the air conditioner to prevent fan operation while the A/C unit is operating. The exhaust fan shall be controlled from a HAND-OFF-AUTOMATIC switch and line-voltage cooling thermostat, wall-mounted. Individual exhaust fans shall have manual switches for single or 2-speed motors as indicated.
- B. **Thermostats:** Room thermostats shall be of the modulating electric type, except where 2-position action is required. Thermostats shall be located in air-conditioned spaces and shall have a range of 40 to 100 degrees F. All thermostats shall have exposed adjustment dials and a thermometer on the front face. Mounting height shall be 5 feet. An insulating back shall be provided where exterior wall mounting is shown. Guards shall be provided for room thermostats installed in areas other than administrative offices or control rooms.
- C. **Manufacturers:** Control system components and thermostats shall be as manufactured by Honeywell; Johnson Controls Company; General Controls; or equal.

## 2.4 PIPING

- A. Piping in air conditioning systems shall be galvanized steel in accordance with Section 15025 - Steel Pipe. Equipment drains shall be of Type "K" copper tube.

## 2.5 FANS

- A. **General:** Location, type, capacity, and motor horsepower shall be as indicated. Fans shall be complete with motors, variable motor bases, variable drives, safety cages, belt guards, flexible connections to supply and/or suction ducts, vibration isolators, and necessary accessories. All fans shall be suitable for continuous operation.
- B. **Performance:** Fans shall be guaranteed to deliver the quantities of standard air against the respective static pressure without deviating by more than 5 percent. Every fan wheel, regardless of size, shall be statically and dynamically balanced, and shall be free from objectionable vibration or noises.

## 2.6 SIDE WALL MOUNTED CENTRIFUGAL EXHAUST FAN

- A. Side Wall Exhaust fan shall be direct mounted, direct driven, propeller type. Fan blades shall be fabricated of aluminum. Propellers shall be statically and dynamically balanced in accordance with ACMA standard 204. Motors shall be continuous duty ball bearing design, permanently lubricated, heavy duty type, matched to the fan load and furnished at the specified RPM, voltage, phase, and enclosure. Motor drive frame assemblies and fan panels shall be epoxy painted steel. Drive frame assemblies shall be welded wire or formed channels and fan panels shall have prepunched mounting holes, formed flanges, and a deep formed inlet venturi. Motor shall meet the requirements of Section 16460 – Electric Motors. Fan shall be certified for air and sound performance in accordance with ACMA.
- B. **Performance:** Fans shall be guaranteed to deliver the quantities of standard air against the respective static pressure without deviating by more than 5 percent. Every fan wheel, regardless of size, shall be statically and dynamically balanced, and shall be free from objectionable vibration or noises. Fan performances indicated in the schedule shall be minimum. Fan shall have a motor size of 1/2 HP and operate at 0.5” static pressure in inches water gage. The total flow shall be 1700 cfm.
- C. Fan manufacturers shall be Greenheck, or Engineer approved equal. Damper manufacturers shall be Arrow, Ruskin or equal.

## 2.7 AIR CONDITIONER

- A. Air conditioning system shall have the following features as a minimum:
  - 1. Cooling Capacity: 48,000 Btu/h
  - 2. Outdoor Condenser Unit: Neoprene isolator pads, liquid line filter drier and sight glass as well as insulated refrigerant lines with 3/4” Armstrong Armaflex and Childers aluminum jacket. Sizing per manufacturer’s recommendations to achieve desired cooling capacity. All outdoor air conditioners shall have heavy galvanized or prime-coated steel cabinets of weather resistant design. Air conditioning unit shall be of the packaged, pedestal design as indicated.
  - 3. Indoor Wall-Mounted Fan: Furnished with manufacturer recommended screw mounting bracket. 3/4” condensate drain with p-trap at vent from unit. All drain pans shall have galvanized steel or copper drain lines connected to the nearest floor sink or drain in accordance with the applicable Plumbing Code.
  - 4. Air conditioner shall be provided with a wired remote controller. All units shall be controlled from cooling room-thermostats. Unless otherwise indicated, motorized dampers shall be controlled from outside air thermostats.
  - 5. All air conditioning units shall have direct expansion coils and, where indicated, gas or electric heaters; filter compartments with access door and industrial type disposable filters mounted on steel frames; mixing boxes with return air, fresh air and relief dampers; mounting frame or curb and restrained spring-type vibration isolators.
- B. Acceptable Manufacturers
  - 1. Daikin
  - 2. Or Engineer Approved Equal.

## 2.8 FILTERS

- A. All air handling units and air conditioners shall be provided with filter compartments. The filters shall be of the disposable, high efficiency, industrial type, set into galvanized mounting frames with fastening clips for easy removal.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. **Roughing-In:** It shall be ascertained that all inserts, chassis, shafts, and openings are correctly located; otherwise all new openings shall be cut at no additional expense.
- B. **Checking:** Test and make tight all work, furnish all equipment necessary to carry out the tests and thoroughly clean the system before startup.
- C. **System Balancing:** After completion of all required work, the system, as a whole, shall be checked and balanced. System balancing shall include the following:
  - 1. Adjusting fans, dampers, diffusers, registers, valves, and other devices so that the quantities of air, water, and steam called for on the Drawings are supplied, returned, or exhausted.
  - 2. Measuring and recording at least once the water and air temperatures delivered through each coil on full heating and full cooling: making all necessary adjustments to obtain the required conditions.
  - 3. Measuring and recording current on each fan and motor, and checking for proper operation of all equipment.
  - 4. Adjusting any variable blade registers to the correct setting to obtain the design conditions.

- END OF SECTION -



**SECTION 16000**  
**GENERAL ELECTRICAL REQUIREMENTS**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. It is the intent of this part of the Contract Documents to cover the work and materials necessary for erecting a complete electrical system, tested and ready for continuous use. The system shall be constructed in accordance with the Contract Documents, and Federal, State, and Local codes and regulations.

1.2 RELATED WORK

- A. The CONTRACTOR shall coordinate the work with other trades, and furnish and install the equipment in accordance with the manufacturers' requirements.
- B. Related Sections:
  - 1. Division 00 General Conditions
  - 2. Division 01 General Requirements
  - 3. Division 02 Earthwork
  - 4. Division 03 Concrete
  - 5. Division 09 Painting and Special coatings
  - 6. Division 11 Equipment
  - 7. Division 13 Special Construction
  - 8. Division 15 Mechanical
  - 9. Division 17 Instrumentation

1.3 GENERAL PROVISIONS

- A. Minimum sizes of equipment, and electrical devices, are indicated but it is not intended to show every offset and fitting, nor every structural or mechanical difficulty that will be encountered during the installation of the work.
- B. Work indicated on the Plans is approximately to scale, but actual dimensions and detailed Plans should be followed as closely as field conditions permit. Field verification of scale dimensions on Plans is governed by field conditions. Installation of systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination.
- C. Discrepancies indicated on different Plans, between Plans and actual field conditions, or between Plans and Contract Documents shall be promptly brought to the attention of the ENGINEER for clarification, prior to purchasing and installing equipment.
- D. The alignment of equipment and conduit shall be adjusted to accommodate architectural changes, or to avoid work of other trades, without extra expense to the CITY.
- E. The CONTRACTOR shall furnish and install the parts and pieces necessary to the installation of equipment, in accordance with the best practice of the trade, and in conformance with the requirements of these Contract Documents.
- F. Items not specifically mentioned in these Contract Documents, or noted on the Plans, or indicated on reviewed shop drawings, but which are obviously necessary to make a complete working installation, shall be deemed to be included herein.

- G. The CONTRACTOR shall lay out and install electrical work prior to installation of the pre-fabricated building. Furnish and install sleeves and openings through floors and walls, required for installation of conduits. Sleeves shall be rigidly supported and suitably packed, or sealed, to prevent ingress of wet concrete. Spacers shall be installed in order to prevent conduit movement. Dimensions indicated for electrical equipment and their installation are restrictive dimensions.
- H. The CONTRACTOR shall furnish and install inserts and hangers required to support conduits and other electrical equipment. If the inserts, hangers, sleeves, or other mounting hardware are improperly placed, or installed, the CONTRACTOR shall do necessary work, at their own expense, to rectify the errors.
- I. Electrical equipment shall be capable of operating successfully at full-rated load, without failure, at an ambient air temperature of 60 degrees C, and specifically rated for the altitude indicated on the Plans. Electrical equipment not rated for operation at that temperature shall be provided with air conditioning to meet the manufacturers' operating temperature.
- J. If any contradictions, contrasts, non-homogeneity, or inconsistency appears, the more strict criteria noted and the collective requirements in any and all of the project documents shall apply.
- K. The CONTRACTOR shall perform necessary saw cutting, core drilling, excavating, removal, shoring, backfilling, and other work required for the proper installation of conduits, whether inside or outside of the buildings and structures. The CONTRACTOR shall repair and patch where demolition has taken place in a manner to match existing original structure.

#### 1.4 REGULATIONS, CODES, AND STANDARDS

- A. Electrical work, including connection to electrical equipment integral with mechanical equipment, shall be performed in accordance with the latest published regulations, codes, and standards, of the following:
  - 1. National Electrical Code (NEC)
  - 2. State and local codes
  - 3. Institute of Electrical and Electronic Engineers (IEEE)
  - 4. American National Standards Institute (ANSI)
  - 5. American Society for Testing and Materials (ASTM)
  - 6. Insulated Cable Engineers Association (ICEA)
  - 7. National Electrical Manufacturers Association (NEMA) Standards
  - 8. Federal Occupational Safety and Health Act (OSHA)
  - 9. National Fire Protection Association (NFPA)
  - 10. InterNational Electrical Testing Association (NETA)
- B. When applicable, the material used in the performance of the electrical work shall be listed by the Underwriters' Laboratories, Inc. (UL) for the class of service for which they are intended.

#### 1.5 SUBMITTALS

- A. It is the obligation of the CONTRACTOR to organize their work, so that a complete electrical, instrumentation, and control system for the facility will be provided, and will be supported by accurate shop and record drawings, and O&M manuals.
- B. The CONTRACTOR shall submit detailed shop drawings and data prepared and organized by the suppliers. The quantity of submittal sets required shall be as specified in the Contract Documents.

- C. The submittals shall be neatly grouped and organized by specification section number, and sub-section. Related information shall be highlighted, and the specific product shall be marked. All submittals shall be complete, and presented in one package. Incomplete submittals will be returned without review. If a portion of the project requires a fast track schedule, that portion only may be submitted earlier under a separate cover letter. The following shall be submitted to the ENGINEER and returned, reviewed by the CONTRACTOR before fabrication is started.
1. A complete list of the equipment and materials, including the manufacturer's name, product specification, descriptive data, technical literature, performance charts, catalog cuts, installation instructions, and spare part recommendations for each different item of the equipment specified. The above shall clearly show all the specified requirements as described in the Specifications including but not limited to specific U.L. and NEMA rating, technical capabilities, test result verifications, and acceptance letters.
  2. Drawings containing complete point-to-point wiring and schematic diagrams, control diagrams, and any other details required to demonstrate that the system has been coordinated and will operate as intended. Drawings for each panel, cabinet, or enclosure shall show a complete Bill of Materials, wire numbers for internal panel and field wiring, terminal block numbers, proposed internal layout with assembly details, anchoring, support, and appurtenances of equipment, and equipment relationship to other parts of the work including clearances for maintenance and operations.
  3. Any exceptions to these specifications, with the reasons for requesting such exceptions, with calculations and drawings for redesign of related components, including detail drawings showing internal and assembly details, with installation instructions. Proposed layout showing any modifications or exceptions to related work made necessary by this work, with calculations and drawings showing such modifications or exceptions.
- D. Upon Project acceptance, the CONTRACTOR shall submit "Record Drawings" of the electrical, control, and instrumentation systems, along with step-by-step procedure manuals for the installation, operation start-up, and maintenance of the equipment. Each set shall include installation, operating, troubleshooting, and maintenance and overhaul instructions in complete detail. It shall also include possible breakdowns and repairs, and troubleshooting guides, as well as simplified wiring and control diagrams of the system installed. This shall provide the CITY with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all equipment, devices, assemblies, and accessory components shall be included, together with complete parts lists and ordering instructions.
1. Record Drawings:
    - a. The CONTRACTOR shall maintain a marked-up set of Contract Document Plans showing actual installed circuit numbers, conduit sizes, cable tray routing, number of conductors, conductor sizes (larger than #12 AWG), and all other deviations from the design Plans.
    - b. Underground conduit and concealed items shall be dimensioned on the Plans from permanent, visible, building features.
    - c. The CONTRACTOR shall provide actual motor size, starter size, and overload heater size, along with all other protective equipment for all 480 V and 4160 V (if applicable) motor circuits as part of the single line diagrams.
    - d. The CONTRACTOR shall revise all conductor identification and panel schedules to indicate as-built conditions.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL MATERIALS AND METHODS**

- A. Materials, equipment, and parts comprising any unit, or part thereof, specified or indicated on the Plans, shall be new and unused, of current manufacture, and of highest grade consistent with the state of the art. Damaged materials, equipment, and parts are not considered to be new and unused, and will not be accepted.

- B. Field verification of scale dimensions on Plans is directed, since actual locations, distances, and levels will be governed by actual field conditions. The CONTRACTOR shall also review architectural, structural, civil, mechanical, and other Plans, and the accepted electrical and mechanical shop drawings, and shall adjust their work to conform to the conditions indicated therein.
- C. The fabricator of major components, such as distribution panelboards, switchgear, and motor control centers, shall also be the manufacturer of the major devices therein.
- D. Refer to various Division sections for individual equipment manufacturers. Indicated manufacturers are subject to strict compliance with the specifications and complete project documents. The reference to a particular manufacturer does not relieve the CONTRACTOR from conforming to the specified requirements.

## 2.2 NAMEPLATES

- A. Where indicated elsewhere in these specifications, or on the Plans, the CONTRACTOR shall furnish and install nameplates, which shall be white laminate with black letters. The nameplates shall be fastened to the various devices with round head stainless steel screws. Each disconnecting means for service, feeder, branch, or equipment conductors, shall have nameplates indicating its purpose.

## 2.3 EQUIPMENT ASSEMBLIES

- A. Equipment assemblies, such as Service Entrance Sections, Switchgear, Switchboards, Control and Distribution Panels, and other custom fabricated electrical enclosures shall bear a UL label as a complete assembly. The UL label on the individual components making up the assembly will not be considered sufficient to meet the present requirement. Whenever a generic UL label does not apply for the assembly, a serialized UL label shall be affixed to the assembly, and the serial number shall be submitted with the assembly record shop drawings.
- B. Custom fabricated electrical control panels, and enclosures, shall bear a UL label affixed by a local UL inspector.

## PART 3 – EXECUTION

### 3.1 UTILITY SERVICE AND EQUIPMENT

- A. Electrical Utility: The CONTRACTOR shall be responsible for contacting and coordinating the electrical utility work with the City of Vernon Public Utilities Department.
- B. The CONTRACTOR shall be responsible for furnishing and installing equipment and material required to bring electrical power service to the service location in conformance with the electrical utility requirements. The CONTRACTOR may have to provide the following for the electrical utility company's primary (from utility power line to the utility transformer) and secondary (from utility transformer to the service) electrical lines in accordance with the electrical utility company's specifications and requirements:
  - 1. Conduits (verify quantity and sizes).
  - 2. Trenching, backfill, and compacting (verify trench size(s), backfill material, and compaction percentage requirements).
  - 3. Concrete pad(s) (for pad-mounted transformer(s)).
  - 4. Cable protection along the vertical drop at the utility company's pole (if pole-mounted transformer(s)).
  - 5. Ensuring that the utility has provided the available short circuit duty at the point of service.
  - 6. Other items required by the power utility company's specifications.

- C. The CONTRACTOR shall also submit copies of service entrance shop Drawings to the utility, per utility submittal requirements, prior to submittal to the ENGINEER. The CONTRACTOR shall obtain written approval from the City of Vernon Public Utilities Department that the service entrance equipment is acceptable prior to release the order to the supplier for fabrication. A copy of the approval letter from the utility shall be transmitted to the ENGINEER along with the submittal.
- D. Telephone Service: The CONTRACTOR shall be responsible for contacting the Telephone Company to coordinate requirements to provide telephone service, as called for on the Plans.
- E. The CONTRACTOR shall provide trenching, conduit, and backfill for the Telephone Company's communication lines from the Telephone Company's main distribution panel to the telephone company's connection box at this project site, as required by the Telephone Company.

### 3.2 INSTALLATION OF ELECTRICAL EQUIPMENT

- A. Coordinate the installation of electrical equipment with other trades.
  - 1. Arrange for equipment to be built-in during structure construction.
  - 2. Where equipment cannot be built-in during construction, arrange for sleeves, box-outs, and other openings, as required to allow installation of equipment after structure construction is complete.
- B. Verify that equipment will fit support layouts indicated.
- C. **Equipment Dimensions and Clearances:**
  - 1. Do not use equipment that exceeds the indicated dimensions., except as approved in writing by the ENGINEER.
  - 2. Do not use equipment or arrangements of equipment that reduce required clearances or exceed the space allocation.
- D. Install equipment in accordance with the manufacturer's instructions.
- E. **Equipment Access:**
  - 1. Install equipment so it is readily accessible for operation and maintenance.
  - 2. Equipment shall not be blocked or concealed.
  - 3. Do not install electrical equipment such that it interferes with normal maintenance requirements of other equipment.
- F. Equipment shall be installed plumb, square and true with the building construction, and shall be securely fastened.
- G. Outdoor wall-mounted equipment, and indoor equipment mounted on earth, or water bearing walls, shall be provided with corrosion-resistant spacers to maintain 1/4-inch separation between the equipment and the wall.
- H. Screen or seal all openings into outdoor equipment to prevent the entrance of rodents and insects.
- I. Equipment fabricated from aluminum shall not be imbedded in earth or concrete.
- J. **Provide all necessary anchoring devices and supports:**
  - 1. Use supports as detailed on the Plans and as specified.
  - 2. Supports and anchoring devices shall be rated and sized based on dimensions and weights verified from approved equipment submittals.
  - 3. Hardware shall be stainless steel.

4. Do not cut, or weld to, building structural members.
  5. Do not mount safety switches and external equipment to other equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.
- K. CONTRACTOR shall verify exact rough-in location and dimensions for connection to electrical items furnished by others.
1. Shop drawings shall be obtained from those furnishing the equipment.
  2. Proceeding without proper information may require the CONTRACTOR to remove and replace work that does not meet the conditions imposed by the equipment supplied.
  3. Provide sleeves wherever openings are required through new concrete or masonry members. Place sleeves accurately and coordinate locations with the ENGINEER.
  4. Should any cutting and patching be required on account of failure of the CONTRACTOR to coordinate penetrations, such cutting and patching shall be done at the expense of the CONTRACTOR.
    - a. The CONTRACTOR shall not endanger the stability of any structural member by cutting, digging, chasing, or drilling and shall not, at any time, cut or alter the work without the ENGINEER's written consent.
      - 1) Provide additional reinforcing if required.
      - 2) Cutting shall be done neatly using proper tools and methods.
    - b. Subsequent patching to restore walls, ceilings, or floors to their original condition shall be done by the CONTRACTOR.
- L. Provide concrete foundations or pads required for electrical equipment as indicated or specified.
1. Floor-mounted equipment shall be mounted on a 4-inch concrete housekeeping pad. Pad shall be poured on top of the finished floor or slab.

### 3.3 TEMPORARY POWER

- A. The CONTRACTOR shall furnish, install, and maintain, temporary power and lighting systems needed for construction. This temporary system shall include weatherproof panel(s) for the CONTRACTOR's main breakers and distribution system. Ground fault interrupting equipment shall be installed. Connections shall be watertight, with wiring done with Type SO portable cable. After construction is completed, the CONTRACTOR shall remove temporary power equipment and devices.

### 3.4 CUTTING AND REPAIRING

- A. Where it becomes necessary to cut into existing work for the purpose of making electrical installations, core drills shall be used for making circular holes. Other demolition methods for cutting or removing shall be reviewed by the ENGINEER prior to starting the work.
- B. The CONTRACTOR shall repair damage caused by construction, or demolition work, and restore damaged areas to original condition.

### 3.5 CORROSION PROTECTION

- A. Wherever dissimilar metals, except conduit and conduit fittings, come in contact, the CONTRACTOR shall isolate these metals, as required, with neoprene washers, 9 mil polyethylene tape, or gaskets. Where fastening conduit, electroplated, or equivalent fasteners and stainless steel bolts shall be used.
- B. Factory finishes damaged during shipping or construction shall be restored to original new condition. Rust shall be removed, and bare metal surfaces shall be primed and painted to match the original surrounding finish.

- C. Electrical panels, switchgear, motor control centers, and other electrical equipment shall be shipped in sealed dust and moisture proof plastic sheet enclosures, and the seal maintained until units are installed. Said units shall be new and free of any dirt, dust, water, grease, rust, damaged parts or components. Relays, starters, circuit breakers, switches, contacts, insulators, mechanisms, and buses shall be free of dust, dirt, oil, moisture, metal shavings, and other debris before testing and energizing.
- D. Once equipment is installed, it shall be protected at all times with plastic sheet covers until the area is free of dirt, dust, paint spray, water, and other trades. Heat shall be provided to eliminate condensation.

### 3.6 COORDINATION OF THE ELECTRICAL SYSTEM

- A. The CONTRACTOR shall verify actual equipment, and motor full-load, and locked-rotor current ratings. The necessary minimum equipment, wire, and conduit sizes are indicated on the Plans. If the CONTRACTOR furnishes equipment of different ratings, the CONTRACTOR shall coordinate the actual current rating of equipment furnished with the branch circuit conductor size, the overcurrent protection, the controller size, the motor starter, and the branch circuit overcurrent protection. The branch circuit conductors shall have a current carrying capacity of not less than 125 percent of the actual full-load current rating. The size of the branch circuit conductors shall be such that the voltage drop from the overcurrent protection devices, up to the equipment, shall not exceed 2 percent, when the equipment is running at full-load and rated voltage.

### 3.7 TESTING

- A. The electrical work shall be free from improper grounds, and from short circuits. The correctness of the wiring shall be verified first by visual comparison of the conductor connections with connection diagrams. Next, individual circuit continuity checks shall be made by using electrical circuit testers. Last, the correctness of the wiring shall be verified by the actual electrical operation of the electrical and mechanical devices. Any deviation from the wiring indicated on the Plans, or accepted Drawings, shall be corrected and indicated on the record drawings.
- B. Each conductor shall be identified as required by the Contract Documents. This identification shall be indicated on the record drawings to enable rapid and accurate circuit tracing by maintenance personnel.

### 3.8 SINGLE LINE DIAGRAMS

- A. Single line diagrams, as indicated on the Drawings, show circuit voltages, circuit protection rating, and other pertinent data. Where conflicts exist on the Drawings, the single line diagrams shall take precedence. Grounding conductors are not necessarily indicated. See grounding requirements specified elsewhere herein.

- END OF SECTION -

**SECTION 16100**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 - GENERAL**

1.1 DESCRIPTION

- A. This Section outlines the wiring requirements for the electrical work unless otherwise specified.

1.2 SUBMITTALS

- A. Submit for the CITY's approval material lists, shop drawings, factory test reports and technical data to the extent required in this Section and Section 16000.

1.3 WIRING

- A. Wiring for Furnished Equipment. The wiring from electrical panels, control panels and motor control centers to the furnished equipment shall include all the required materials and installations to complete the wiring as shown on the Drawings, specified and required.

**PART 2 - PRODUCTS**

2.1 GENERAL

- A. Provide basic materials and all wiring installations as indicated, specified and required.

2.2 METAL CONDUITS

- A. Conduits shall be steel, hot-dipped galvanized and equipped with couplings and thread protector caps. The surfaces and threads shall be corrosion-resistant coated. Conduits shall be in ten foot lengths and manufactured by Allied Tube & Conduit Co., Nucor, Youngstown, or approved equal. Conduits shall be a minimum size of 3/4 inch above ground, and a minimum size of 1 inch below ground. Supports shall be provided for all conduits.
- B. Rigid Steel Conduit shall be provided for all exposed exterior installation unless otherwise indicated and/or specified.
- C. Electrical Metallic Tubing may be substituted for rigid steel conduit on the interior of the control building unless otherwise indicated and/or specified.

2.3 PVC COATED - METAL CONDUITS

- A. The PVC coated galvanized rigid conduit must be UL Listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Electrical Rigid Metal Conduit - Steel, UL514B Standard for Conduit, Tubing, and Cable Fittings.
- B. The PVC coated galvanized rigid conduit must be ETL Verified to the Intertek ETL SEMKO High Temperature H2O PVC Coating Adhesion Test Procedure for 200 hours. The PVC coated galvanized rigid conduit must bear the ETL Verified PVC-001 label to signify compliance to the adhesion performance standard.

- C. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
- D. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
- E. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
- F. Form 8 Condulets, 1/2" through 2" diameters, shall have a tongue-in-groove gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
- G. Form 8 Condulets shall be supplied with plastic encapsulated stainless steel cover screws.
- H. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.
- I. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30°F (-1°C).
- J. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.
- K. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.
- L. Independent certified test results shall be available to confirm coating adhesion under the following conditions.
  1. Conduit and conduit exposure to 150°F (65°C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D1151)
  2. The interior coating bond shall be confirmed using the Standard Test Methods for Rating Adhesion by Tape Test (ASTM D3359).
  3. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
  4. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.
- M. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameter of the coated conduit. All U bolts will be supplied with plastic encapsulated nuts that cover the exposed portions of the threads.
- N. Installation of the PVC Coated Conduit System shall be performed in accordance with the Manufacturer's Installation Manual. To assure correct installation, the installer shall be certified by Manufacturer to install coated conduit.
- O. Type 304 stainless steel screws shall be furnished and used to attach the cover to the conduit body. All coated material shall be installed and patched according to the manufacturer's recommended installation and patching instructions.
- P. Conduit straps shall be PVC coated or stainless steel.

Q. Approved Material: PVC coated galvanized rigid conduit and Fittings as manufactured by Plasti-Bond, Perma-Cote, Kor Kap, or approved equal.

#### 2.4 NONMETALLIC CONDUITS

- A. Nonmetallic conduits shall be Schedule 40 polyvinyl chloride as manufactured by Carlon, Allied Tube & Conduit Co., Cantex, JM Eagle, or approved equal. All conduits shall be of one type, and low temperature, corrosion, and moisture resistant.
- B. Nonmetallic Conduit may be installed for underground conduit runs which are outside of the buildings and structures and run between buildings and structures. Rigid steel bends and risers shall be used with nonmetallic conduit wherever conduit rises above grade. Each nonmetallic conduit shall contain an appropriately sized grounding conductor per NEC requirements.

#### 2.5 FLEXIBLE CONDUIT

- A. Liquid-tight flexible metal conduit shall be provided for short connections to equipment as shown on the drawings and as required which withstand temperatures from -50 degrees Fahrenheit to +220 degrees Fahrenheit.
- B. Liquid-tight Conduit shall have an interlocked flexible galvanized steel core with a permanently bonded exterior gray polyvinyl chloride jacket.
- C. Conduits, 1-1/4 inch and smaller shall have an internal copper bonding conductor wound spirally in the space between each convolution for the equipment ground provided by the manufacturer.
- D. Separate Ground Conductor shall be provided by the CONTRACTOR in liquid-tight flexible conduits that do not have the internal copper bonding conductors included by the manufacturer.
- E. Manufacturers for liquid-tight flexible conduit shall be Anaconda, Electri-Flex, or approved equal.

#### 2.6 CAST METAL BOXES AND FITTINGS

- A. Provide conduit outlet bodies, boxes, fittings, gaskets and covers for lighting outlets, lighting switches, receptacles, control stations, alarm, switch and thermostat outlets, etc. in exposed conduit installations as indicated and required. Cast boxes and fittings shall be finished as specified in Section 16000. The outlet bodies, boxes, fittings and covers shall be cast iron alloy with threaded hubs, and of sufficient size to provide free space for all conductors that shall be enclosed. The materials shall be manufactured by Crouse-Hinds, Appleton, Pyle-National, or approved equal.
- B. Covers and Gaskets shall be provided for all conduit outlet bodies, boxes and fittings. The covers shall be cast iron alloy and equipped with neoprene gaskets.
- C. PVC Coated Fittings shall have the same polyvinyl chloride coating that is on the conduit to which they shall be connected. The PVC coating shall be bonded to the surfaces of cast outlet bodies, boxes, fittings and supports by Kor-Kap, Robroy, Youngstown, or approved equal.
- D. Plastic Fittings shall be solvent weld type, and shall match the conduit to which they shall be connected.
- E. Expansion/Deflection Fittings shall be provided as indicated, specified and required. The fittings shall permit movement between two conduits without damage to the conduits and conductors. The expansion/deflection fittings consist of cast metal conduit hubs securely attached to a flexible outer neoprene jacket. A flexible copper grounding strap shall be provided inside the fitting and

connected to the two hubs. The linear expansion or contraction shall be a movement up to 3/4 inch. The linear misalignment shall be a movement up to 3/4 inch. The angular misalignment shall be a movement up to 30 degrees. The expansion/deflection fittings shall provide flexible and watertight conduit joints.

- F. Thread Lubricant shall be provided for all metal conduit threads. The lubricant shall inhibit corrosion and maintain grounding continuity, and shall be Crouse-Hinds STL, Thomas and Betts "Kopr-Shield" or approved equal.
- G. Couplings and Elbows shall be of the same type as the conduit to which they shall be connected, except where rigid steel bends and risers are connected to nonmetallic conduits where conduits rise above grade. For metallic conduits, the couplings and elbows shall be steel, hot dipped galvanized, threaded and one-piece. For plastic conduits, couplings and elbows shall have plain ends for tight weld fits, which form watertight joints.

## 2.7 STEEL BOXES AND FITTINGS

- A. Provide the steel boxes and fittings as indicated and required.
- B. Pull Boxes shall be of sufficient size to accommodate the connected conduits and enclosed conductors. Boxes 24 inches square and smaller shall have gasketed screw type covers. Larger boxes shall have bi-parting gasketed hinged doors with latch mechanisms, handles and cylinder locks complete. Provide two keys for each lock. Pull boxes shall be painted as specified in Section 16000 and 16118. The pull boxes shall be Hoffman, Boss, Cooper B-Line, or approved equal.

## 2.8 WATER SEAL FITTINGS

- A. Provide the malleable iron water seal fittings connected to rigid steel conduits as indicated, specified and required.
- B. Sealing Bushings shall be provided on the ends of exterior underground conduits that terminate at indoor equipment. The bushing shall consist of a thick neoprene sealing ring secured between two metal plates by socket head screws. When the conduit sealing bushing is in place and the screws are tightened, the neoprene shall become compressed between the metal plates and be forced against the conduit inside wall and also against the conductor insulation to form a watertight seal inside the conduit.
- C. Wall and Floor Seals shall be provided to completely seal the areas around the conduits that pass through concrete walls and floors. Seals shall have a neoprene grommet between two pressure rings, which provides a watertight seal on the outer surface of the entering conduits.

## 2.9 CONDUIT FITTINGS

- A. Provide all the hot-dip galvanized steel and iron conduit fittings required to complete the wiring installations.
- B. Liquid-tight Conduit Fittings shall be Types LT, ST, CT as manufactured by Crouse-Hinds, Appleton, Pyle-National or approved equal.
- C. Union shall be provided, as required, for conduit connections to threaded outlet bodies, boxes, and equipment, for connecting two steel conduits together. Unions shall be type UNY or UNF. Running threads are not acceptable. Union shall be Appleton, Crouse-Hinds, Pyle-National or approved equal.

- D. Bushing Reducers shall be provided in conduit fitting hubs for connections to smaller conduits. Reducers shall be Appleton, Thomas and Betts, or approved equal.
- E. Conduit Enlargers shall be provided for connecting two conduits of different sizes together. The enlargers shall be Appleton, Thomas and Betts, or approved equal.
- F. Locknuts shall be provided on the threads of conduits that enter through close fitting openings in enclosures. Locknuts shall have notches all around for tightening with a screwdriver. Locknuts shall be Appleton, OZ Gedney, Thomas and Betts or approved equal.
- G. Metallic Insulated Bushings with ground terminals shall be provided on the ends of threaded steel conduits and nipples that terminate through openings in sheet steel enclosures. The malleable iron grounding bushings shall have smooth and well rounded surfaces to protect the conductor insulation. The conduit threads shall be deep, clean and easily attached to the conduits. The bushings shall be OZ Gedney, Thomas and Betts or approved equal.
- H. Plugs shall be the recessed type and installed in all unused conduit fitting hubs and couplings. Plugs shall be Appleton, Crouse-Hinds or approved equal.
- I. Interchangeable Hubs shall be provided for rigid steel conduit connections to sheet steel enclosures. The interchangeable hub shall have an insulated throat, sealing ring and vibration-proof nut. Machined serrations on hub and nut shall bite into the metal enclosure assuring an equipment ground. The hubs shall be Myers "Scru-Tite", "Space-Saver", Raco, or approved equal.

## 2.10 CONDUCTORS AND CABLES

- A. Conductors and cables shall be new, single conductor, copper, not smaller than #12 AWG (except fixture wire or control power conductors) unless otherwise indicated, and as shown on the Drawings. No running splices will be allowed for new conductor installations. Where modifications to existing conductor runs, and conductors are unable to be replaced, an acceptable means of splicing would be to use STA-KON butt splice or equal, with heat shrinkable insulating cover (T&B cat #H5 or equal). Use calibrated T&B #WT1455 ratchet tool for compression of terminal at all STA-KON terminals and connectors.
- B. Steel Interlocked Armor cables shall be provided for power circuits to the motors when called for on the Drawings. The cables shall be 600 volts, three conductor, rated 90 degrees centigrade and stranded copper. The conductors shall be individually polyethylene insulated, grouped together with fillers and ground wires, and covered with binding tape. The cable shall be enclosed in an interlocked aluminum or galvanized steel armor that shall be protected with a polyvinyl chloride outer jacket. The interlocked armor cables shall be approved for submersible pump power wiring installations. The power cables shall be manufactured by General Electric, Okonite, Cyprus or approved equal. The power cables shall be securely attached to steel messenger cables with stainless steel binding tape as shown on the Drawings unless otherwise indicated.
- C. Conductors 250MCM and Larger shall be stranded, 600 volts, ethylene propylene rubber insulation, Type RHW. Conductors shall be manufactured by Rome, Southwire, or approved equal.
- D. Conductors smaller than 250MCM shall be stranded, 600 volt and Type XHHW-2. Conductors shall be manufactured by Rome, Southwire, or approved equal.
- E. Ground and Neutral Conductors shall be provided for the required ground and neutral wiring.
  - 1. The insulated ground and neutral conductors shall be the same type as the phase conductors.
  - 2. Bare ground conductors shall be copper, soft drawn, annealed, concentric lay, stranded conforming to ASTM Specifications B3 and B8.

- F. Fixture Wires shall be rated 90 degrees centigrade, #16 AWG stranded, thermoplastic insulated with an outer jacket. The wire shall be Type TFFN and manufactured by Brand-Rex, Carol Cable, or approved equal.
- G. Control power conductors shall be type XHHW stranded #14 gauge with manufacturer sequential number identification on exterior of insulation jacket.
- H. Instrumentation Signal Cables shall be Type TC single twisted pair or multi twisted pairs of stranded, copper cables with 600 volt, 15 mil polyvinyl chloride insulation over each conductor, overall aluminum-mylar tape shield, overall tinned copper drain wire and 45 mil minimum polyvinyl chloride jacket overall, 90 degrees centigrade dry/75 degrees centigrade wet rating. Twisted pair cables that are required to be shielded, shall have aluminum-mylar tape shields and tinned copper drain wires over individual twisted pairs of cable. Single twisted pair cables shall be #16 AWG minimum. Cables shall be manufactured by Belden, Okonite, or approved equal.
- I. Wire Lubricant shall be provided to ease the pulling of cables and conductors in conduits. The lubricant shall be Aqua Gel, Polywater or approved equal. "Yellow 77" is not acceptable.

## 2.11 WIRE CONNECTORS

- A. Connectors shall be provided for splices and terminal connections of all copper conductors and cables. The connector shall fit the conductor to which it shall be connected, and the assembly shall have joint contact surfaces not less than 50 percent.
- B. High voltage conductors (480V) shall be terminated in junction boxes using appropriately sized and color coded Weidmuller terminal blocks (green = grounding conductors, white or gray = neutral/grounded conductors, black red or blue for medium voltage (120V-240V) and brown, orange and yellow for high voltage conductors (480V)).
- C. Compression Connectors for # 8 AWG and larger shall be copper lugs for terminal connections, and two-way copper sleeves and taps for splice connections. A crimping tool shall be provided to make tight and neat compression connections. The connectors and crimping tool shall be Square D, Thomas and Betts, Buchanan or approved equal.
- D. Tapered Spring Connectors shall have live springs attached to inner steel housings and enclosed with plastic insulators. Connectors shall be provided for # 10 AWG conductors and smaller, and shall be Buchanan Type B2, Scotchlok Type B, Thomas and Betts Type PT or approved equal.
- E. Ground Clamps shall be provided for cable connections to ground rods and metal pipes as shown on the Drawings. Clamps shall be copper alloy, heavy duty, corrosion resistant and consist of U-bolts and saddles with bolted cable connections. The ground clamps shall be OZ Gedney, Thomas and Betts, Burndy or approved equal.
- F. Electrical Tape shall be plastic, 0.007 inches thick, and resistant to abrasion, alkalies, acids, corrosion, moisture, low and high temperatures. The tape shall be Scotch No. 33 Plus, Plymouth Premium Black No. 4453, or approved equal.
- G. Wire Markers shall be provided to identify each conductor at equipment terminals, and in intermediate junction boxes, pull boxes, handholes and manholes. At motor control centers and control panels, identify each motor or other electrical device circuit conductor with the motor or device number shown on the drawings and with the terminal number of the motor control center or control panel to which the conductor is connected. At motor and device terminals, at control stations, and in junction boxes, pull boxes, handholes and manholes, identify each motor or device circuit conductor with the terminal number of the motor control center or control panel to which the conductor is connected. In addition to identifying each conductor with the terminal number, in junction boxes, pull boxes, handholes and manholes, identify each group of

conductors forming a motor or device circuit with the motor or device number shown on the drawings. At panelboards, junction boxes, pull boxes, handholes and manholes, identify each panelboard circuit conductor with the panelboard number and circuit number. The individual conductor wire markers shall be adhesive and manufactured by Thomas and Betts, Brady, Scotch 3M or approved equal. The wire marker to identify groups of conductors shall be nylon cable tie markers as manufactured by Brady, Seton, Thomas and Betts, Panduit or approved equal. The marker pads on the cable tie markers shall be large enough to show the motor or device numbers. The motor or device numbers on the cable tie markers shall be 3/16 inch high minimum and shall be applied to the marker pads using marking pens for the purpose which shall be provided by the manufacturer of the cable tie markers. When a device is not numbered on the drawings, use a short descriptive title or assign numbers and provide the CITY with a list of the devices and assigned numbers. Electrical devices include items such as solenoid valves, vibrators, horns, heaters, analyzers, computers, instruments, etc.

## 2.12 PANELBOARDS

- A. Panelboards shall be factory assembled, metal enclosed, dead front and equipped with bus, time switches, contactors, terminals and thermal-magnetic molded case circuit breakers as shown on the drawings.
- B. Circuit Breakers shall be molded case, quick-make, quick-break, single and multipole, and bolted type. Each circuit breaker shall have clear indications for "ON," "OFF", and "TRIP" positions. The minimum interrupting capacity shall be 10,000 symmetrical amperes at 240 volts. As indicated, provide devices to lock the branch circuit breaker in the "ON" and "OFF" positions. Ground fault protection, 5 milliampere sensitivity, shall be provided for the indicated 120 volt branch circuits, which shall be an integral part of the regular branch breaker. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than the regular single pole circuit breaker.
- C. Copper Bus shall be provided for panelboards. Bus shall be provided for the complete length of the panelboard branch circuit area including circuits indicated as spaces. Bus bars shall be drilled and tapped for the indicated spaces for installation of future circuit breakers.
- D. Single Phase Panelboards, three wire, shall be bussed so that any two adjacent single-pole breakers shall be connected to opposite polarities. A single handle two-pole circuit breaker can be installed in any location, and in place of two adjacent single pole breakers.
- E. Terminals and connectors shall be provided for the feeder, neutral and branch conductors shown on the Drawings.
- F. Circuit Numbers shall start at the top of the panelboard. Odd numbers shall be assigned in sequence on the left side, and even numbers shall be in sequence on the right side of the panelboard.
- G. The Cabinet shall enclose the bus and breaker assembly, and shall be steel fabricated and coated with corrosion-resistant finish as specified in Section 16000 and 16160. The front of the panelboard shall include a trim, hinged door, flush cylinder lock with catch. The lock shall be furnished with two keys, and all locks shall be keyed alike. Fronts shall not be removable when the door is in the locked position.
- H. Contactors shall be provided as indicated and specified in this Section.
- I. Metal Circuit Directory frame and card with clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4-inch high and 3 inches long for each branch circuit. The card shall be completely typed to identify each connected and spare circuit.

## 2.13 MOTORS AND CONTROLS

- A. The motors shall be furnished and installed with the driven equipment as indicated and specified per plans.
- B. Motor Wiring shall be provided as shown on the Drawings. Include the wiring interconnections between the motors, motor starters, control panels and controls as required.
- C. Control Power shall be 120 volts, single phase and 60 hertz unless otherwise indicated. A separate control transformer shall be provided for each motor magnetic starter, contactor and grouped relays as indicated.
- D. Contactors shall be provided for circuits as shown on the Drawings, specified and required. The contactor shall be electrically held unless otherwise indicated, 600 volt, 60 hertz, industrial duty, and connected to 120 volts AC circuit with remote control device. The drawings shall indicate the number of poles and ampere ratings for the contactors and the locations, which shall be mounted inside motor control centers, panelboards or separate metal enclosures as indicated. Enclosures shall be finished as specified in Section 16000 and 16160. The silver alloy power contacts shall be load break within the rating of the contactor without assistance from additional arcing contacts. The magnetic coil shall be continuous duty, encapsulated and easily removable. The magnet shall provide rapid action on pickup or dropout and satisfactory operation without hum. The 120 volt circuit shall be provided by an individual control power transformer for each contactor. The contactors shall be Square D Class 8903, Cutler-Hammer Type C30, Allen-Bradley Bulletin 702 or approved equal.

## 2.14 OVERCURRENT PROTECTION

- A. Circuit breakers, fuses, relays and other protective devices that protect the conductors and equipment against overload currents and short circuit currents shall be provided as indicated, specified and required. The circuit breakers shall be coordinated as specified in this Section and Section 16000 and 16141.
- B. Circuit Breakers shall be molded case type unless otherwise indicated. Breakers shall be quick-make and quick-break on manual or automatic operation. The drawings shall indicate the number of poles and ampere trip ratings. The handle mechanism shall be trip-free which prevents holding the contacts against overload or short circuit conditions.
  - 1. The thermal device shall provide time-delay tripping on overloads, and the magnetic device shall provide instantaneous tripping on short circuits. The instantaneous magnetic trip shall be adjustable and accessible from the front of the circuit breaker on frame sizes above 100 amperes. Non-automatic breakers shall have no tripping devices, and shall be used for manual switching of circuits. Molded case thermal-magnetic circuit breakers shall have at least the following interrupting capacities in symmetrical amperes at 480 volts unless otherwise indicated.
    - a. 100 Ampere Frame - 22,000.
    - b. 225 Ampere Frame - 22,000.
    - c. 400 Ampere Frame - 30,000.
    - d. 600 Ampere Frame - 30,000.
    - e. 800 Ampere Frame - 30,000.
    - f. 1,000 Ampere Frame - 30,000.
    - g. 1,200 Ampere Frame - 30,000.
    - h. 2,000 Ampere Frame - 65,000.
    - i. 2,500 Ampere Frame - 65,000.
    - j. 4,000 Ampere Frame - 65,000.

2. Solid state circuit breakers shall be equipped with programmers, integral current sensors, logic and trip circuitry, sensor-powered shunt trips and integral ground fault protection. The programmer shall include silicon transistors, silicon diodes, silicon controlled rectifiers and printed circuitboards to assure the circuit breaker's reliability and stability. Each printed circuit board shall be given a protective epoxy coating to prevent moisture absorption, fungus growth and signal leakage. Gold plated surfaces shall be provided on all electrical connectors and adjustment taps. Sensing power and signals shall be derived from three current transformers inside the circuit breaker, which shall supply power to the solid state programmer. The trip shall utilize logic circuitry contained in the programmer. The ampere setting shall be a tap adjustment which selects the continuous current setting of the breaker. These tap adjustments shall be made with knobs on the front of the programmers. Regulated DC power shall be provided by the full wave rectifiers and filters in the power supply. There shall be individual signals from the programmer which shall trip the breaker on overloads, short circuits, ground faults and high temperatures. The interrupting capacity for the solid state circuit breaker shall be 100,000 symmetrical amperes at 480 volts, unless otherwise indicated. It shall be possible to lock the operator handle in the "off" position with a padlock.
3. Molded plastic housings that contain standard molded case circuit breakers and current limiters connected to the load side of the breakers shall be provided as indicated. The circuit breaker shall be ambient temperature compensated, and shall be provided with thermal overload protection. The integrally fused circuit breaker shall be capable of interrupting short circuit currents up to 100,000 symmetrical amperes at 480 volts, unless otherwise indicated. The time current limiting characteristics of the fuses shall be coordinated with the time current tripping characteristics of the circuit breaker. The fuse limiters shall be individually interlocked with the breaker element tripping mechanism so that no fuse can be inserted or removed until the circuit breaker is in the "off" position. An interlock shall be provided so the circuit breaker cannot be closed if a fuse limiter is either missing or has blown. Fuse limiters shall be individually removable from the molded case housing. It shall be possible to lock the operator handle in the "off" position with a padlock.
4. Motor circuit protectors (MCP) shall be provided as shown on the drawings. They shall be molded case magnetic-trip-only circuit breakers. Each pole shall provide instantaneous protection by means of a single adjustable magnetic element that trips all currents equal or above the trip setting. The single adjustment screw shall adjust all poles simultaneously. Tripping shall be clearly indicated by the handle automatically assuring a position midway between the manual "OFF" and "ON" positions. All poles shall be constructed to open, close and trip simultaneously. The contacts shall be of non-welding silver alloy. It shall be possible to lock the operator handle in the "OFF" position with a padlock.
5. As indicated, motor circuit protectors shall be provided with current limiters having an interrupting capacity of 100,000 amperes, unless otherwise indicated. The MCP and limiter shall be fully coordinated so the motor circuit protector shall open all three poles if the limiter operated. The current limiters shall be so constructed that they can only be replaced by an identical or similar limiter having the same interrupting capacity. It shall be possible to lock the motor circuit protector handle in the "OFF" position with a Padlock.
6. The circuit breakers shall be mounted inside low voltage switchgears, motor control centers, switchboards or separate metal enclosures as indicated. Breakers shall be equipped with indications for the "trip","on", and "off" positions, and connectors that fit the conductors shown on the drawings. Submittal shall include complete descriptive data, technical data and manufacturers Certified Test Reports for circuit breakers 600 amperes and larger. The molded case circuit breakers shall be manufactured by Square D, Allen Bradley, Cutler Hammer, Siemens, General Electric, or approved equal.

- C. Fused Switches shall be provided in metal enclosures that are suitable for locations shown on the Drawings. Each switch shall be industrial type, heavy duty, horsepower rated, quick-make, quick-break and equipped with fuses, cover-handle interlock, "ON-OFF" indications and feature to lock the operating handle in the "OFF" position. The drawings shall indicate the volts, amperes and number of poles. The switches shall include connectors that shall fit the conductors shown on the drawings. The fuses shall be Fusetron or Low-Peak dual-element type and capable to interrupt 200,000 amperes, unless otherwise indicated. Ratings for volts and amperes shall be shown on the drawings. The enclosure shall be finished as specified in Section 16160. On the front of the enclosure, attach a plastic nameplate that identifies the load. The fused switches shall be manufactured by Square D, Allen Bradley, Cutler Hammer, Siemens, General Electric, or approved equal.
- D. Overload Relays shall be provided in each phase of all circuit breakers and magnetic starters to properly protect the conductors and equipment that shall be connected on the circuits. Provide one spare overload relay for each overload relay provided.
- E. Overcurrent Protection Device Coordination. All overcurrent protection devices on this project shall be coordinated so that they will perform as follows:
  - 1. When two or more overcurrent protective devices in series with each other experience current flow greater than their rated current, the device with the lowest rated current shall trip and/or open the circuit first and thereby prevent the higher rated devices from operating.
  - 2. The Supplier of the circuit breakers shall prepare a coordination study to verify the above stated performance requirements. The study shall be documented by the Supplier and the documents shall include but not be limited to the following:
    - a. Manufacturer's overcurrent device operating curve printed on transparent paper for each overcurrent device. In the case of fuses, both minimum melt and maximum clearing time curves shall be included.
    - b. One reproducible copy of all project single line diagrams so marked to show which operating curve applies to each overcurrent device on the diagram (the operating curves shall also be correspondingly marked).
    - c. A tabulation of the required settings of all of the adjustable overcurrent devices so that the performance requirements are met. This documented coordination study shall be submitted for review before the overcurrent devices are supplied for the project. Circuit breakers which have ground fault protection features are specifically required to meet this performance requirement.

## 2.15 WIRING DEVICES

- A. Receptacles and switches shall be specification grade, heavy duty and provided in galvanized steel and cast metal boxes with covers as identified and located on the drawings. Unless otherwise indicated, the device phenolic color shall be ivory for all flush duplex receptacles and local switches, and their coverplates. Unless otherwise indicated the device phenolic color shall be brown for all duplex receptacles and local switches which are installed in surface mounted boxes. Galvanized steel boxes shall be installed in the walls for flush devices. All surface device outlets shall have cast iron boxes.
- B. Convenience Receptacles, for exterior installations, shall be single, grounding type, polarized, NEMA 5-15R, rated 20 amperes and 125 volts AC, and shall have side screw terminals for copper wire unless otherwise indicated equipped with ground fault capabilities. The metal coverplate shall attach to the box with corrosion resistant screws. The plug opening in the coverplate shall have an ethylene propylene rubber gasket. Attached to the coverplate shall be a stainless steel hinge-spring metal cover. The receptacles shall be ivory and manufactured by Hubbell, Slater, P&S, Arrow Hart, General Electric or approved equal. The convenience outlet

shall be weatherproof with the hinged cover closed. Also, the outlet shall be weatherproof with the hinged cover open and a cord plug attached to the receptacle. The coverplate shall be manufactured by Crouse-Hinds, Appleton, Intermatic or approved equal.

- C. Local and Weatherproof Switches shall be toggle type, rated 20 amperes and 120-277 volts AC, and equipped with side screw terminals for copper wire. Single pole switches shall be #1221, #1991, #4901 brown and ivory. Three way switches shall be #1223, #1993, #4903 brown and ivory. The switches shall be manufactured by Hubbell, Slater, P&S, Arrow Hart, General Electric or approved equal.

## 2.16 DISCONNECT SWITCHES

- A. Provide the non-fusible disconnect switches, as indicated, specified and required.
- B. Switches shall be steel enclosed, heavy duty, NEMA 1 and NEMA 3R as required, 2-pole and 3-pole, 250 volt and 600 volt, ampere rating as indicated, and finished as specified in Section 16000. On the front of the enclosure, attach a plastic nameplate that identifies the load. Disconnect switches shall be manufactured by Square D, Allen Bradley, Cutler Hammer, Siemens, General Electric, or approved equal.
- C. Mechanisms shall have quick-make and quick-break operating handles and provisions for padlocking in the "OFF" position. The switch shall have an interlock to prevent unauthorized opening of the hinged cover when the switch is in the "ON" position, and an interlock to prevent closing the switch mechanism with the hinged cover open.
- D. Copper Lugs shall be included for the copper wire connections. The lug shall fit the conductor which shall be connected to the lug.

## 2.17 SUPPORTS

- A. Provide the galvanized and PVC coated metal channels, fittings, stanchions, clamps, hangers, and required hardware to support all conduit and equipment as required.
- B. Channels shall be steel and cold rolled. One side of the channel shall have a continuous slot. On both sides of the slot, the edges turn inward and form a guide for the spring nuts. The fittings shall be fabricated from steel and attached to the channel with bolts and spring nuts. The channel, fittings and hardware shall be hot-dipped galvanized and manufactured by Unistrut, GTE Products Co., Ideal Industries, Joslyn Mfg & Supply Co., or approved equal.
- C. One-Hole Clamps shall be malleable iron, galvanized for steel conduits and equipped with clamp-backs. The clamps shall be Thomas and Betts, Appleton or approved equal.
- D. Beam Clamps shall be malleable iron, galvanized, right angle and parallel types. The clamps shall be manufactured by Thomas and Betts, Appleton or approved equal.
- E. Spacers shall be plastic and provided to support underground conduits for concrete encasements. The spacers shall be Carlon, Johns-Manville, Underground Products or approved equal.
- F. Steel Anchors shall be sleeve and stud types for securing equipment to concrete foundations, floors and walls. The anchors shall be Phillips "Red Head", Diamond or approved equal. Concrete foundation to include 4" housekeeping pad.
- G. Toggle Bolts shall be steel, spring wing type for securing equipment to hollow walls and ceilings. Toggle bolts shall be Phillips "Red-Head", Diamond or approved equal.

- H. Conduit Hangers shall be heavy gauge formed steel, galvanized and equipped with carriage bolts, 1/4-inch rods and nuts. The hangers shall be Appleton, Ideal Industries, Joslyn Mfg & Supply Co. or approved equal.
- I. U-Bolts shall be heavy gauge steel, galvanized and equipped with two hexagon steel nuts. The U-bolts shall be Kindorf, Allied Tube & Conduit Co., or approved equal.
- J. Hardware shall be provided to securely attach all equipment and materials.

## 2.18 NAMEPLATES

- A. Nameplates shall be provided as indicated to identify equipment, and the positions and circuits within the equipment. Also, individually enclosed equipment shall be provided nameplates as indicated.
- B. The Nameplates shall be laminated black plastic with 1/4 inch high white letters, NEMA ES-1, 3-ply, 1/16-inch thick, beveled and satin finished. Nameplate inscriptions shall include the identifications for the equipment and loads and shall identify the controls on control equipment as shown on the Drawings.
- C. Plastic Nameplates shall be provided for switchgears, motor controllers, substations, service equipment, switchboards, motor control centers, panelboards, and individually enclosed circuit breakers, disconnect switches, magnetic starters, relays, manual starters and control stations unless otherwise indicated. Provide lighting switch nameplates as indicated on the Drawings.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Provide the wiring installations and equipment installations, including connections and interconnections as indicated, specified and required. Assure proper fits for all equipment and materials in the spaces shown on the Drawings.
- B. Excavations and Backfills. Earthwork shall be performed for equipment foundations, supports and underground conduits as indicated and as specified.
- C. Concrete shall be provided for electrical equipment foundations, support foundations and conduit encasements as indicated and as specified. Concrete foundation to include 4" housekeeping pad.
- D. Painting. Painting shall be provided all for exterior exposed surfaces. Field damaged finishes on equipment shall be touched-up with paint that is equal in quality and color to the original. Finish shall be ANSI 61 Gray or other as approved by the CITY.

### 3.2 RACEWAYS

- A. Provide all the cable tray and conduit installations, including the outlet bodies, boxes, gaskets, covers, fittings and supports to complete the raceway systems as shown on drawings and as required. Install ground conductors in all non-metallic conduits.
- B. Exposed Installations. The installations shall be completed with hot-dipped galvanized cable trays, rigid steel conduits and intermediate steel conduits with wrench tight connections. In hazardous areas, only rigid steel hot-dipped galvanized conduits shall be installed. In corrosive areas, PVC coated galvanized rigid steel conduits shall be installed. Maintain a minimum clearance of 12 inches for conduits that shall be installed near hot pipes or surfaces (150 degrees Fahrenheit or higher). Exposed conduits shall be installed parallel or perpendicular to buildings and structures.

- C. Flexible Conduits. Flexible conduits shall be liquid-tight with fittings for short tight connections (30 inches maximum) to equipment, except in Class 1, Division 1 areas. A separate ground conductor shall be installed in flexible conduit that does not have the internal copper bonding conductor included by the manufacturer.
  - 1. Flexible Couplings. The couplings shall be explosion-proof with fittings for short, flexible, tight connections to equipment in Class 1, Division 1 hazardous areas.
- D. Threads. All steel conduit threads shall be coated with a corrosion resisting lubricant, and the connections shall be made watertight. The lubricant shall maintain the grounding continuity.
  - 1. Locknuts and Bushings. Locknuts and bushings shall be installed on the threads of steel conduits that enter through close-fit openings in enclosures.
- E. Sealing Bushings. The bushings shall be installed on the ends of exterior conduits that terminate at indoor equipment. The bushing shall provide a water-tight seal inside the conduit.
- F. Seal Fittings. Seal fittings shall be connected to rigid steel conduits in hazardous areas to prevent gases and flames to pass from one area to another through the conduit system. Also, sealing fittings shall be installed to completely water seal inside conduits and the areas around steel conduits that pass through concrete floors and outside walls.
- G. Expansion/Deflection Fittings. Expansion/Deflection fittings shall be connected to steel conduits as indicated and required.
- H. Penetrations. Penetrations through concrete for sleeves and conduits shall be approved by the CITY. Submit the sizes, locations and methods for all penetrations.
- I. Stub-ups. All steel conduit stub-ups shall be painted per requirements in Pertinent Sections. Conduits shall be painted a minimum of 4 inches above and below concrete slabs. Finish shall be applied before concrete is poured. Identify spare stub-ups under control panels, motor control centers and switchboards with tags as to the location of the termination of the conduit at the other end.
- J. Terminations. Conduits entering equipment, including control panels, motor control centers, switchboards, etc. shall enter in the same vertical section in which the circuit will terminate. Tag conduits at each end for identification.
- K. Tool Marks. Conduits and fittings that have tool marks shall be smoothed and finished with paint that matches the original finish.
- L. Conduit Through Roof. Provide a watertight seal around the conduit on the roof. Coordinate the work with the roofing contractor.
- M. Furnished Equipment. Provide conduit installations as shown on the Drawings, and specified in other Sections of the Specifications for furnished equipment.
- N. Alterations. Alterations to existing installations shall be completed as indicated and specified.

### 3.3 BOXES AND FITTINGS

- A. Outlet bodies, boxes, gaskets, covers, fittings and supports shall be installed as indicated, specified and required.
- B. Cast Iron. Cast iron outlet bodies, boxes, gasketed covers and fittings shall be connected to exposed galvanized rigid steel conduits.

- C. Sheet Steel. Sheet steel boxes shall be provided with close-fit holes for steel conduit connections. Weatherproof boxes shall be provided with interchangeable conduit hubs for steel conduit connections as indicated.
- D. Interchangeable Hubs. The hubs shall be installed in steel enclosures for rigid steel conduit connections. Cut a close fitting hole in the sheet steel enclosure and place the interchangeable hub in the opening. Connect the hub on the conduit and make a tight connection to the enclosure.
- E. The purpose of all circuits shall be legibly identified at the panel, receptacles, junction boxes and equipment in a permanent manner (i.e. Etched Plates, Conductor Tag, Permanent Marker, Etc.). The labeling shall include panel circuit number, "To" and "From" identification and marked "Spare" where applicable.

### 3.4 CONDUCTORS AND CABLES

- A. Install all the conductors and cables for the wiring as indicated, specified and required.
- B. Conductors. Conductors shall be completely installed and connected. Apply wire lubricant to ease the pulling of conductors in conduits. Recommended pulling tensions shall not be exceeded. Splice and terminal connections shall be made tight with spring and compression connectors. The connectors shall be crimped with a tool that provides uniform and tight connections. Connectors shall be sized as outlined in paragraph on Wire Connectors in this Section. Include all the required wiring interconnections. When routing conductors and cables through precast concrete pull boxes and manholes, the longest (not shortest) route from entrance to exit shall be used.
- C. Insulate. All connections shall be insulated as required with tight wraps of plastic tape. Apply insulation putty to fill irregularities and voids in splices. High and medium voltage cable splices shall be completed as instructed by the cable manufacturer.
- D. Furnished Equipment. Provide wiring installations as shown on the Drawings, and specified in other Sections of the Specifications for furnished equipment.
- E. The purpose of all circuits shall be legibly identified at the panel, receptacles, junction boxes and equipment in a permanent manner (i.e. Etched Plates, Conductor Tag, Permanent Marker, Etc.). The labeling shall include panel circuit number, "To" and "From" identification and marked "Spare" where applicable.

### 3.5 PANELBOARDS

- A. Install and completely connect all the factory assembled panelboards as shown on the Drawings.
- B. Elevation. The elevation to the top of the panelboard shall be six feet above grade unless otherwise indicated.
- C. Clearance Space. Provide at least 1/2-inch clearance between the back of the panelboard cabinet and the RTU Cabinet.
- D. Anchor Bolts. Securely attach the panelboard to the wall with anchor bolts.
- E. Locking Devices. Attach locking devices on the handles of branch circuit breakers for the "ON" position as shown on the Drawings.
- F. Circuit Director Card. Completely type the card to identify each connected and spare circuit.
- G. Tight Connections. Provide tight connections for feeder and branch circuit wiring.

### 3.6 MOTORS AND CONTROLS

- A. Install all the wiring and control equipment as indicated, specified and required.
- B. Motors. Motors shall be provided with the driven mechanical equipment.
- C. Wiring. The wiring installations shall be complete. Include all the required wiring interconnections between the motor magnetic starters, and between the starters and the instrument control panels. Provide motor frame conduit connection boxes as required. Be certain that all wiring connections provide the proper motor rotation.
- D. Magnetic Starters. The magnetic starters shall be provided in the motor control centers unless otherwise indicated.

### 3.7 OVERCURRENT PROTECTION

- A. Install all the overcurrent protective equipment as indicated, specified and required.
- B. Metal Enclosures. The enclosures for individual equipment shall be constructed to satisfy the condition in the location where they shall be installed.
- C. Overload Relays. Overload relays shall be provided in the control equipment for three phase and single phase circuits as required. Check the full load amperes for each motor and the overload relay rating. Replace the relays that shall not satisfactorily protect the connected motors.
- D. Trip Settings. Circuit breakers shall assure the required circuit protection with the indicated trip settings.
- E. Fuses. Provide fuses that have the current and voltage ratings to protect the circuits shown on the Drawings.

### 3.8 WIRING DEVICES

- A. Install the required local switches, convenience outlets and clock outlets complete, including the supports and wiring.

### 3.9 DISCONNECT SWITCHES

- A. Provide the complete installations for fused disconnect switches and non-fused disconnect switches where shown on the Drawings and as required.
- B. Mounting Height. Switches shall be installed 5 feet from grade or floor to the top of the enclosure unless otherwise indicated.
- C. Connections. The steel enclosures shall be connected complete with steel conduits terminating into interchangeable hubs attached to the enclosures. Wire connectors shall be provided for connecting the copper conductors.

### 3.10 SUPPORTS

- A. Install the required structural channels, brackets, stanchions, U-bolts, clamps, anchors, hangers, fittings and other hardware to securely attach and support all the equipment and conduits.
- B. Painting. Brackets, stanchions and other unfinished steel supports shall be painted per requirements of "Painting and Protective Coatings" Section of the Specifications.

### 3.11 NAMEPLATES

- A. Nameplates shall be positioned and lined-up to provide a neat appearance. They shall be attached to the cleaned metal surfaces of enclosures as directed by the CITY.
- B. Nameplates. Nameplates shall be installed on primary interrupters, switchgears, substations, switchboards, service equipment, motor controllers, motor control centers, panelboards, and individually enclosed circuit breakers, disconnect switches, magnetic starters, manual starters, relays and control stations unless otherwise indicated. Install lighting switch nameplates as indicated on the Drawings.

### 3.12 CHECKING, ADJUSTING AND TESTING

- A. Provide the required labor and equipment, and all checking, adjusting and testing operations on the electrical installations.
- B. Check all wire terminals shall be checked to assure tight connections.
- C. Adjust. Adjust repeat cycle timers, interval timers and time delay relays and other devices so the controls shall operate in the indicated sequence.
- D. Wiring Tests. The tests shall be performed to detect wrong connections, short circuits, continuity and grounds. Insulation tests shall be made with a hand crank test instrument on all cables and conductors. NOTE: WARNING. Do not make insulation tests on any conductors either signal or power that are connected to semi-conductor type equipment. Remove the conductors from the equipment before insulation testing; severe damage may result from meggar-type instruments. Power feeders and branch conductors shall be tested phase to phase, and phase to ground. Phase to ground tests on shielded cable shall mean "conductor to shield". After insulation resistance tests have been performed, high voltage and medium voltage shielded cables shall be "hi-Pot" tested in accordance with the current ICEA Standards and the manufacturer's recommendation. Voltage shall be applied and removed in a slow, even manner, and the conductors shall be grounded for at least one minute after the voltage is removed to insure that no charge remains. Test voltage and application time for the various cables and conductors shall be submitted to the CITY. Correct any defects in the wiring systems.
- E. Equipment Tests.
  - 1. Perform equipment tests as indicated and directed by the manufacturer. Refer to Section 16000 for Manufacturers' Certified Reports on primary interrupters, substations, switchgears, service equipment and motor control centers.
- F. Test Data. Test data for equipment, shielded cables and supply voltage shall be submitted to the CITY.
- G. Supply Voltage. Test the supply voltage while the normal plant loads are operating. If the voltage is not within normal limits (plus or minus one percent), notify the power company and request a voltage correction.
- H. Operation Tests. Perform operation tests and observe that all loads operate satisfactorily.

- END OF SECTION -

## SECTION 16111 CONDUITS

### PART 1 – GENERAL

#### 1.1 SCOPE OF WORK

- A. Furnish and install conduits as required, and as shown on the Plans. Materials employed shall be as shown on the Plans.

#### 1.2 SUBMITTALS

- A. Submit product literature including manufacturer part number, model number, material, size, and specifications. Material shall not be installed until the ENGINEER has reviewed the submittal data.
- B. Shop Drawings shall be submitted for review and acceptance showing routing, conduit size, and number and size of wires in each conduit before installation of conduit and any related work.
- C. Proposed routing of conduits buried under floor slabs-on-grade.
- D. Identify conduit by tag number of equipment served or by circuit schedule number.
- E. Proposed routing and details of construction including conduit and rebar embedded in floor slabs, columns, etc. Identify conduit by tag number of equipment served or by circuit schedule number.
- F. Proposed location and details of construction for openings in slabs and walls for raceway runs.
- G. Refer to Section 16000 and Section 01300 for further submittal requirements.

#### 1.3 REFERENCES

- A. American National Standards Institute (ANSI): C80.1, Electrical Rigid Steel Conduit.
- B. National Electric Manufacturers Association (NEMA): RN-1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- C. **Underwriters Laboratories Inc. (UL):**
  - 1. 1, Flexible Metal Conduit.
  - 2. 6, Electrical Rigid Metal Conduit - Steel.
  - 3. 360, Liquid-Tight Flexible Metal Conduit.
  - 4. 467, Grounding and Bonding Equipment.
  - 5. 514C, Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.
  - 6. 651, Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
  - 7. 870, Wireways, Auxiliary Gutters, and Associated Fittings.
  - 8. 884, Underfloor Raceways and Fittings.
  - 9. 1203, ExplosionProof and Dust-IgnitionProof Electrical Equipment for Use in Hazardous (Classified) Locations.

## PART 2 – PRODUCTS

### 2.1 RACEWAYS

- A. Exposed conduit in an unclassified or hazardous area shall be galvanized rigid steel (GRS) unless specifically indicated otherwise on the Plans. Conduits in the corrosive areas shall be PVC coated GRS unless otherwise indicated. Underground and/or concrete encased conduits shall be PVC, unless otherwise indicated. All wiring, except as otherwise noted, shall be in conduit. Conduit size shall not be less than the National Electrical Code (NEC) size required for the conductors therein and shall not be smaller than 3/4-inch. No underground conduit shall be less than one inch.
- B. Condulet type fittings shall be Form 7, Crouse-Hinds, Appleton, or equal with wedge nut covers. All condulets located outdoors or in wet locations shall be weathertight.
- C. In unclassified areas, flexible conduit shall be grounding type, weatherproof, corrosion resistant, and watertight. All sizes of liquidtight flexible conduit shall have an external bonding jumper. The maximum length shall be per NEC. Connectors shall be Raco, OZ Gedney type 4Q-L, or equal.
- D. Couplings, connectors, and fittings shall be standard types specifically designed and manufactured for the purpose. They shall be installed to provide a firm mechanical assembly and electrical conductivity throughout.
- E. Expansion fittings shall be OZ Gedney type AX with jumper for exposed locations and type DX at structural expansion joints, Spring City, or equal. Conduits shall have expansion fittings in accordance with NEC.
- F. The conduits and fittings shall be supported per NEC requirements as a minimum.

### 2.2 GALVANIZED RIGID STEEL (GRS)

- A. Conduit and couplings shall be hot-dipped galvanized with zinc coated threads and outer coating of zinc bichromate, in accordance with ANSI C80.1 standards, as manufactured by Allied Tube & Conduit Corporation, Nucor, Youngstown, or equal.
- B. Steel conduit shall not be buried in earth without concrete encasement and additional corrosion protection. A half-lapped wrapping of 20 mil PVC based corrosion protection tape shall be used.

### 2.3 PVC COATED GALVANIZED RIGID STEEL (PVC-GRS)

- A. PVC coated GRS conduit shall be installed where shown on the Plans or elsewhere specified and shall conform to NEMA RN-1 and ANSI C80.1 standards.
- B. The zinc surface of the conduit shall remain intact and undisturbed on both the inside and the outside of the conduit throughout the preparation and application processing. A Polyvinyl Chloride (PVC) coating shall be bonded to the galvanized outer surface of the conduit. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the plastic. The thickness of the PVC coating shall be a minimum of 0.040-inch (40 mil).
- C. A loose coupling shall be furnished with each length of conduit. A PVC coating shall be bonded to the outer surface of the coupling and a PVC sleeve equal to the outside diameter of the uncoated conduit shall extend beyond both ends of the coupling approximately one pipe diameter or 1-1/2 inches, whichever is smaller. The wall thickness of the coating on the coupling and the sleeve shall be a minimum of 0.055-inch (55 mil).
- D. A PVC coating shall be bonded to the inner and outer surface of all conduit bodies and fittings and a PVC sleeve shall extend from all hubs. The wall thickness of the coating on conduit bodies and fittings and the sleeve walls shall be identical to those on couplings in length and thickness. The covers on all

conduit bodies shall be coated on both sides and shall be designed to be completely interchangeable. The inside of conduit bodies shall remain undisturbed in the processing.

- E. Type 304 stainless steel screws shall be furnished and used to attach the cover to the conduit body. All coated material shall be installed and patched according to the manufacturer's recommended installation and patching instructions.
- F. Conduit straps shall be PVC coated or stainless steel.
- G. PVC coated conduit and fittings shall be as manufactured by Kor Kap Corporation, Robroy, or equal.
- H. PVC coated flexible conduits shall be liquid and vaportight and manufactured in accordance with UL 360 standards.

#### 2.4 RIGID NONMETALLIC - PVC

- A. Where specifically indicated on the Plans, or elsewhere specified, conduit may be high density Schedule 40, 90 degrees C, heavy-duty PVC. The conduit shall be manufactured from virgin polyvinyl chloride compound which meets ASTM D1784, NEMA TC-2, and UL 651 standards. Smoke emissions shall be limited to less than 6 grams per 100 grams of material tested.
- B. Where conduit concrete encasement is indicated on the Plans, conduit supports shall be installed at five foot intervals. PVC conduit shall be manufactured by Carlon, Allied Tube & Conduit Co., Cantex, JM Eagle, or equal.

#### 2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Liquidtight flexible metal conduit shall be liquid and vaportight, oil and ultraviolet ray resistant and manufactured in accordance with UL 360 standards. Liquidtight flexible metal conduit shall be formed of a continuous, spiral wound, galvanized steel core with an extruded PVC jacket. The PVC jacket shall be rated for high ambient heat applications, 90 degrees Celsius.
- B. For corrosive locations, liquidtight flexible metal conduit shall be formed of a continuous, spiral wound, aluminum core with an extruded PVC jacket. The PVC jacket shall be impervious to corrosive liquids and vapors.
- C. An external bonding conductor shall be required for all flexible conduit connections. Flexible conduit and connectors shall be listed for grounding.
- D. Connectors for liquidtight flexible conduit shall be galvanized, furnished with a sealing ring and locknut, and suitable for wet locations.

### **PART 3 – EXECUTION**

#### 3.1 INSTALLATION

- A. Conduit runs are schematic only, and shall be modified as required to suit field conditions, subject to review and acceptance by the ENGINEER.
- B. Conduit shall run continuously between outlets and shall be provided with junction boxes where connections are made. Couplings, connectors, and fittings shall be acceptable types designed and manufactured for the purpose, and shall provide a firm mechanical assembly, and electrical conductivity throughout.

- C. Conduit runs shall be straight and true. Elbows, offsets, and bends shall be uniform and symmetrical. Changes in direction shall be made with long radius bends, or with fittings of the conduit type.
- D. Conduit runs in buildings and structures shall be exposed except as specifically noted, or accepted by the ENGINEER.
- E. Conduit runs shall not interfere with the proper and safe operation of equipment, and shall not block or interfere with ingress or egress, including equipment removal hatches.
- F. Exposed conduits shall be securely fastened with clamps, or straps, intended for conduit use. All exposed conduit shall be run on the walls and ceiling only and shall be parallel to the planes of the walls or ceiling. No diagonal runs will be permitted. Flexible conduit shall be used only for short lengths required to facilitate connections between rigid conduit to motors from junction boxes, or control equipment. The maximum length of flexible conduit shall be 3 feet.
- G. Conduit runs on water-bearing walls shall be supported one inch away from the wall on an accepted channel. When channel galvanizing, or other coating, is cut or otherwise damaged, it shall be field coated to original condition. No conduit shall be run in water-bearing walls, unless specifically designated otherwise.
- H. Conduit shall be thoroughly reamed to remove burrs. GRS shall be reamed during the threading process, and Rigid Nonmetallic PVC shall be reamed before applying fittings. A zinc rich cold galvanizing shall be used to restore corrosion protection on field cut threads. Bushings and lock nuts or hubs shall be used at conduit terminations. The total number of bends in any run between pull points shall not exceed 360 degrees. Junction boxes and pull boxes shall be installed at points acceptable to the ENGINEER. Conduit ends shall be plugged to prevent the entrance of moisture or debris during construction. All spare conduits shall be adequately capped and shall contain a suitable pull string.
- I. Joints shall be set up tight. Hangers and fastenings shall be secure, and of a type appropriate in design, and dimensions, for the particular application.
- J. Conduit runs shall be cleaned and internally sized (obstruction tested) so that no foreign objects, or obstructions remain in the conduit prior to pulling in conductors.
- K. After installation of complete conduit runs 2 inches and larger, conduits shall be snaked with a conduit cleaner equipped with a cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the conduit. Conduits through which the mandrel will not pass shall not be used.
- L. Expansion fittings shall be installed across all expansion joints and at other locations where necessary to compensate for thermal expansion and contraction.
- M. Provide trenching, backfill, and compaction for conduits installed underground.
- N. Each conduit shall be provided with stainless steel identification tags affixed by means of stainless steel wire to the conduit's termination bushing. The minimum size of the identification tags shall be 3/4-inch X 2-inch. The identification tag shall be embossed with the conduit number shown in the Design Plans. The letters and numbers on the tags shall, as a minimum, be 1/4"-inch high.

- END OF SECTION -

**SECTION 16118  
CONCRETE PULL BOXES**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall furnish and install pre-cast concrete pull boxes in the locations indicated on the Plans and as required.

1.2 SUBMITTALS

- A. Products shall be submitted for review prior to installation in accordance with the Contract Documents, Section 01300 and Section 16000.

**PART 2 – PRODUCTS**

- A. The pull boxes shall be designed for traffic conditions, and the pull box and cover shall be designed for heavy traffic bridge loading unless otherwise noted. The pull boxes shall have dimensions indicated on the plans. The pull boxes shall be constructed of concrete.
- B. The pull boxes shall be Quazite, Christy, Jensen, or equal, with covers. The covers shall be engraved "ELECTRICAL".

**PART 3 – EXECUTION**

3.1 INSTALLATION

- A. The pull boxes shall be installed on 12 inches of compacted gravel and shall be installed in such a manner that the cover of the pull box will be flush with finished grade.

- END OF SECTION -

**SECTION 16120**  
**SURGE PROTECTIVE DEVICES**

**PART 1 - GENERAL**

1.1 APPLICABLE STANDARDS AND TESTING

- A. UL 1449 - Surge Protective Devices
- B. UL 1283 – Electromagnetic Interference Filters
- C. UL 67 – Panelboards (UL 67 listing for internal panelboard SPD)
- D. NEC 2020 - (NEC Article 242 SPD Installation practice/NEC Article 250.53 Grounding)
- E. NFPA 78 - Guide on Electrical Inspections
- F. ISO 9001:2015 - Quality standard
- G. IEEE C62.41.1 and C62.41.2 - 2002 - (System shall be designed to meet American National Standards Institute/Institute of Electrical and Electronic Engineering Inc. C62.41)
- H. IEEE C62.45 2002. - (System shall be tested to meet the C62.45)
- I. Category A & B - (0.5  $\mu$ SEC x 100 kHz Ring Wave)
- J. Category B3 Biwave - (8 x 20  $\mu$ SEC at 3,000 Amperes and 1.2 x 50  $\mu$ SEC at 6,000 Volts)
- K. Category C3 Biwave - (8 x 20  $\mu$ SEC at 10,000 Amperes and 1.2 x 50  $\mu$ SEC at 20,000 Volts)
- L. The fusing elements must be capable of allowing the SPD's rated single impulse current to pass through the SPD at least one time without failure. The system shall be tested to 1,000 sequential ANSI/IEEE C62.41.1 and C62.41.2 Category C3 combination wave transients. The Category C3 combination wave is defined as a 1.2 x 50 microsecond wave at 20,000 volt open circuit voltage waveform and 8 x 20 microsecond wave at 10,000 ampere short circuit current waveform. In addition, the system components shall be tested repetitively 1,000 times testing based on an IEEE C62.33 (MOV test) and C62.35 (SAD test) without failure or degradation exceeding  $\pm 10\%$ .
- M. CBEMA (ITIC) and IEC - (Computer Business Equipment Manufacturers Association or Information Technology Industry Council and International Electrotechnical Commission define clamping voltage tolerance guidelines for sensitive equipment)

1.2 SUBMITTALS

- A. Must have approval fifteen days prior to bidding on project. Request for submittal must be in writing with the following items.
- B. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection notes, wire size and wiring diagram.
- C. Equipment Manual: The manufacturer shall furnish an installation manual with installation notes, start-up and operating instructions for the specified system. Installation instructions shall clearly state whether the system requires an external overcurrent device to maintain the system's UL 1449 listing.

- D. National Electrical Code (NEC) 242 - Installation requirements for SPD.
  - 1. Section 242.8, An SPD shall be a listed device (UL 1449).
  - 2. Section 242.10, SPD shall be marked with a short-circuit current rating and shall not be installed at a point on the system (ex. service, distribution or branch panels) where the available fault current (AIC rating) is in excess of that rating.
- E. UL 1449 stipulation for fused SPD - The manufacturer's authorized representative is required to submit the following:
  - 1. Certify that the SPD system is UL 1449 listed (UL Card).
  - 2. Indicate the type of internal or external fusing that is incorporated in the SPD system and what impact the fusing has on the performance of the device with respect to surge capacity and clamping levels.
- F. CBEMA (ITIC) & IEC - SVRs must meet voltage tolerance guidelines:
  - 1. SVR clamp levels for wye and single phase (L-N, L-G and N-G):
    - a. 400-600V for 120V systems, 800-1200V for 277V systems and 1200-1500V for 347V systems
  - 2. SVR clamp levels for delta circuits (L-L and L-G):
    - a. 1000-1200V for 240V systems, 1500-1800V for 480V systems and 1800-2000V for 600V systems

## **PART 2 - PRODUCTS**

### **2.1 SERVICE ENTRANCE/SWITCHBOARD/SWITCHGEAR**

- A. Acceptable Manufacturers:
  - 1. Current Technology
  - 2. LEA International Inc.
  - 3. Liebert
  - 4. Phoenix Contact
  - 5. General Electric
  - 6. OR approved equal
- B. Equipment shall be a multi-stage parallel protector rated for 277/480VAC, 3 PHASE, 4 WIRE, plus ground. The equipment's minimum surge current capacity shall be 400 kA per phase (L-N plus L-G) and 200 kA per mode (L-N, L-G, L-L and N-G).
- C. The system protection modules shall contain a technology that utilizes a symmetrical array of balanced metal oxide varistors (MOV). Each MOV will be individually coordinated to pass UL 1449.
- D. All primary transient paths shall utilize copper wire, copper bus bar and lugs of equivalent capacity to provide equal impedance interconnection between phases. No plug-in module or components shall be used in surge carrying paths.
- E. Each protection module shall have a visual indicator that signifies that the protection circuitry is on line. The unit shall not be taken off line to verify integrity of system. Redundant status indicators shall be mounted on the front of the door that monitors the system protection circuitry.

- F. The system shall be modular with field replaceable modules. Modular units shall contain a minimum of one module per phase.
- G. Each protection module shall have a capacitive filtering system connected in each Line to Neutral (L→N)(Wye) mode or Line to Line (L→L)(Delta) mode to provide EMI/RFI noise attenuation (UL 1283).
- H. **Protection modes:** The SPD shall provide Line to Neutral (L→N)(Wye), Line to Ground (L→G)(Wye or Delta), Line to Line (L→L)(Delta) and Neutral to Ground (N→G)(Wye) protection.
- I. **Service Conditions:** Rate surge protective device for continuous operation under the following conditions, unless otherwise indicated:
  - 1. MCOV: Maximum Continuous Operating Voltage of 125% or greater.
  - 2. Operating Temperature: 30 to 120 degrees F.
  - 3. Humidity: 0 to 85 percent, noncondensing.
  - 4. Altitude: Less than 20,000 feet above sea level.

## 2.2 BRANCH PANEL PROTECTION

- A. **Acceptable Manufacturers:**
  - 1. Current Technology
  - 2. LEA International Inc.
  - 3. Liebert
  - 4. Phoenix Contact
  - 5. General Electric
  - 6. OR approved equal
- B. Device shall meet all specification requirements in section 2.1 except as follows:
  - 1. Equipment shall be a multi-stage parallel protector rated for 277/480VAC, 3 PHASE, 4 WIRE, plus ground. The equipment's minimum surge current capacity shall be 400 kA per phase (L-N plus L-G) and 200 kA per mode (L-N, L-G, L-L and N-G).
- C. The system protection modules shall contain a technology that utilizes a symmetrical array of balanced metal oxide varistors (MOV). Each MOV will be individually coordinated to pass UL 1449.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. The specified service entrance/switchboard/switchgear system shall be installed with the shortest lead length possible not to exceed five (5') electrical feet from the power conductor(s) it is protecting, must have a grounding of 25 Ohms (per NEC Article 250.53(A)(2) Exception) or less and shall avoid any unnecessary or sharp bends. Utilize a 3 pole 15 amp breaker for connection means.
- B. The specified branch panelboard system shall be installed with the shortest lead length possible not to exceed a foot and half (1.5') electrical feet from the power conductor(s) it is protecting, must have a grounding of 25 Ohms (per NEC Article 250.53(A)(2) Exception) or less and shall avoid any unnecessary or sharp bends.

### 3.2 WARRANTY AND QUALITY ASSURANCE

- A. Manufacturer shall provide a product warranty for a period of not less than five (5) years from date of installation. Warranty shall cover unlimited replacement of SPD modules during the warranty period. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of SPD for not less than twenty (25) years. Utilize a 3 pole 15 amp breaker for connection means.

### 3.3 ACCEPTANCE

- A. Manufacturer's representative shall visit site, verify installation, and submit to Contracting Officer a letter stating that equipment and installation meets intent of Contract Documents and manufacturer's warranties and that guarantees are in effect.

- END OF SECTION -

**SECTION 16123**  
**600 VOLT CLASS CABLE**

**PART 1 –GENERAL**

1.1 SCOPE OF WORK

- A. This section covers the furnishing and installation of 600 Volt Class cables and conductors, terminations and splicing, and pulling lubricants.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents, prior to installation.

1.3 REFERENCES

- A. **Underwriters Laboratory, Inc.:**
  - 1. 44, Thermoset-Insulated Wires and Cables
  - 2. 83, Thermoplastic-Insulated Wires and Cables.
  - 3. 486A/B, Wire Connectors.
  - 4. 510, Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
- B. National Electrical Code.
- C. Insulated Cable Engineers Association.

**PART 2 – PRODUCTS**

2.1 ACCEPTED MANUFACTURERS

- A. Conductors and Multi Conductor Cables (MCC), subject to compliance with Contract Documents, the following manufacturers are acceptable: Okonite Company, Southwire, General Cable or equal.

2.2 CONDUCTORS

- A. Wire sizes shall be American Wire Gauge (AWG) sizes with Class B stranded construction. Number 2 AWG and smaller shall be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables shall be coded by the use of colored tape. Conductors sized No. 1 and larger shall be Type 2, rated for 90 degrees C. All circuit conductors, #6 or smaller shall be "THWN" stranded copper. All other conductors shall be "XHHW" stranded copper.
- B. Individual or multiple conductor cables for power, control, and alarm circuits of 480 volts or less shall be insulated for not less than 600 volts and shall have insulation type as indicated on the Plans. "THHN" shall conform to UL 83 and "XHHW" shall conform to UL 44. Where wire size is not indicated, they shall be of the size required by the NEC, except that no wire external to panels and motor control centers shall be less than No. 12 AWG, unless specifically noted on the Plans. Panel control wiring shall not be less than No. 14 AWG.
- C. All wiring shall be as indicated on the Plans. Wires shall be new and shall be soft drawn copper with not less than 97 percent conductivity. The wire and cable shall have size, grade of insulation, voltage, and manufacturer's name permanently marked on the outer covering at not more than 2-foot intervals. All wires

shall conform to the latest Standards of the ASTM, and ICEA, and shall be tested for their full length by these Standards. Insulation thickness shall be not less than that specified by the National Electrical Code.

### 2.3 TERMINATIONS AND SPLICES

- A. No splices shall be allowed except for lighting or receptacle circuits.

### 2.4 PULLING LUBRICANT

- A. All cables shall be properly coated with pulling compound (Aqua Gel, Polywater, or equal) before being pulled into conduits so as to prevent mechanical damage to the cables during installation. "Yellow 77" is not acceptable.
- B. Other lubricants to be substituted must be accompanied by a statement from the cable manufacturer as to its acceptable use with the cable being installed.

### 2.5 IDENTIFICATION

- A. All conductors shall be numbered with "tube sleeve" type tags with heat impressed letters and numbers.

- B. **Color code all wiring as follows:**

- 1. Lighting and power wiring:

CONDUCTOR	<u>120/208</u> <u>VAC</u>	480VAC	24V <u>DC</u>	120 VAC Control/ Power
Phase 1	Black	Brown	Blue	Red
Phase 2	Red	Orange		
Phase 3	Blue	Yellow		
Neutrals	White	White		White

- 2. Color code ends of feeder phase conductors only.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. The pulling tension and side-wall pressures, as recommended by the cable manufacturer, shall not be exceeded.
- B. All circuits shall be continuous from origin to termination without splices in intermediate pull boxes. Sufficient slack shall be left at the termination to make proper connections. In no case shall a splice be pulled into the conduit. Conductor splicing shall not be permitted without the ENGINEER's approval.
- C. Install all cables in conduit.
- D. Each feeder and branch circuit shall be installed in its own individual conduit unless combining feeder and branch circuits is permitted as defined in the following:
  - 1. As specifically indicated on the Plans.
  - 2. For lighting, multiple branch circuits may be installed in a conduit as allowed by the NEC and with the wire ampacity derated in accordance with the requirements of the NEC. Conduit fill shall not exceed the limits established by the NEC.
  - 3. When field conditions dictate and written permission is obtained from the ENGINEER.
- E. Feeder and branch circuits shall be isolated from each other and from all instrumentation and control circuits.

- F. Control circuits shall be isolated from all other feeder, branch and instrumentation circuits, except as noted above.
  - 1. 12 V DC, 24 V DC and 48 V DC control circuits may be combined in common conduit.
  - 2. 125 V DC control circuits shall be isolated from all other DC and AC control circuits.
  - 3. 120 V AC control circuits shall be isolated from all DC control circuits.
  
- G. Make splices only at pull or junction boxes.
  - 1. Crimp or indented-type connectors are not allowed, except for control circuits landed on terminal strips.

- END OF SECTION -

**SECTION 16124  
INSTRUMENTATION CLASS CABLE**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers cable use for process signal and controls.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents, prior to installation.

**PART 2 – PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with Contract Documents, the instrumentation cable shall be as manufactured by Belden, Okonite, General Cable or equal.

2.2 INSTRUMENTATION CABLE

- A. Instrument cable shall be Type TC, and have the number of individually shielded twisted pairs indicated on the Plans and shall be insulated for not less than 600 volts. Unless otherwise indicated, conductor size shall be No. 16 AWG minimum. Shielded, grounded instrumentation cable shall be used for all analog and low voltage digital signals.
- B. The cable jacket shall be PVC, flame retardant with 90 degrees C temperature rating. The cable shield shall be a minimum of 2.3 mil aluminum or copper tape overlapped to provide 100 percent coverage and a tinned copper drain wire.
- C. The conductors shall be bare soft annealed copper, Class B, 7 strand minimum concentric lay with 15 mils nominal thickness, PVC jacket, 4 mil nominal thickness, 90 degrees C temperature rating. One conductor within each pair shall be numerically identified. Conductor insulation shall be PVC without a nylon jacket.
- D. Pairs shall be assembled with a nominal 2-inch lay and shall then be group shielded with a minimum of 1.3 mil aluminum or copper tape overlapped to provide 100 percent coverage. All group shields shall be completely isolated from each other.

**PART 3 – EXECUTION**

3.1 INSTALLATION

- A. Feeder and branch circuits shall be isolated from each other, and from instrumentation and control circuits. Instrumentation cables shall be installed in separate raceways from other cables and wiring. This includes portions running through manholes. Instrumentation cable shall be continuous between instruments or between field devices and instrument enclosures. There shall be no intermediate splices or terminal boards, unless otherwise shown on the Plans.
- B. Maintain electrical continuity of the shield when splicing twisted shielded pair conductors. Drain wires shall be terminated inside enclosures at grounded terminal blocks. Only one end of each instrument loop cable drain wire shall be grounded. Ground drain wire of shielded conductors at one end only.

- C. Terminate instrumentation and control wiring, including spare wires, at control panels and motor control centers on terminal boards mounted inside the equipment.
  - 1. CONTRACTOR shall supply terminal boards as required.
  - 2. Do not field wire directly to devices.

- END OF SECTION -

**SECTION 16130  
OUTLET, PULL, AND JUNCTION BOXES**

**PART 1 – GENERAL**

1.1 SUMMARY

- A. **Section Includes:** 1. Outlet, pull and junction boxes.
- B. **Related Sections:**
  - 1. Division 00 - General Conditions
  - 2. Division 01 - General Requirements.
  - 3. Section 02084 – Underground Precast Concrete Utilities Structures
  - 4. Section 16000 – General Electrical Requirements
  - 5. Section 16111 - Conduits.
  - 6. Section 16141 - Wiring Devices.
  - 7. Section 16170 - Grounding.

1.2 QUALITY ASSURANCE

- A. **Referenced Standards:** Refer to Section 16000.

1.3 SUBMITTALS

- A. **Shop Drawings:** Refer to the Contract Documents, Section 01300 and Section 16000.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. See Section 16000.

**PART 2 – PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. **Subject to compliance with the Contract Documents, the following manufacturers are acceptable:**
  - 1. Galvanized steel boxes:
    - a. Appleton Electric Co.
    - b. Steel City.
    - c. Raco.
  - 2. Sheet metal boxes for non-classified areas:
    - a. Hoffman Engineering Co.
  - 3. Corrosion-resistant boxes:
    - a. Hoffman Engineering Co.
    - b. Crouse-Hinds.
  - 4. Hazardous location boxes (Class I, II & III):
    - a. Appleton Electric Co.
    - b. Crouse-Hinds.
    - c. Killark.

- d. O-Z/Gedney.
- 5. Raintight and watertight boxes:
  - a. Appleton Electric Co.
  - b. Crouse-Hinds.
- 6. Terminal boxes:
  - a. Hoffman Engineering Co.
- 7. Boxes in sidewalk shall be precast concrete:
  - a. Appleton Electric Co.
  - b. Crouse-Hinds.
  - c. O-Z/Gedney.
- 8. Boxes in earth:
  - a. Carlon Electric Products.
- 9. Exposed switch and receptacle boxes:
  - a. Appleton Electric Co.
  - b. Crouse-Hinds.

B. Submit requests for substitution in accordance with Specification Section 01630.

## 2.2 MATERIALS

### A. **Pull and Junction Boxes for Offices and other Dry Architecturally Finished Areas:**

- 1. Material: 14 GA, galvanized steel.
- 2. Concentric knockouts on all four sides.
- 3. Flat cover fastened with screws.
- 4. NEMA 1 classification.
- 5. UL listed.

### B. **Pull and Junction Boxes for General Use Unclassified Areas Suitable for NEMA 12 Enclosures:**

- 1. Material: 14 GA galvanized steel with seams continuously welded, ground smooth and no knockouts.
- 2. Zinc rich coating on all seams.
- 3. Stainless steel captivated cover screws threaded into sealed wells.
- 4. Flat door with oil resistant gasket.
- 5. NEMA 12 classification.
- 6. UL listed.

### C. **Pull and Junction Boxes for Wet Areas:**

- 1. Material: 14 GA steel with polyester powder coating inside and out over phosphatized surfaces.
- 2. Seams continuously welded, ground smooth, no knockouts.
- 3. Stainless steel clamps on four sides.
- 4. Flat cover with oil resistant gasket.
- 5. NEMA 4 classification.
- 6. UL listed.

**D. Pull and Junction Boxes for Corrosive Areas:**

1. Material: 14 GA steel with powdered epoxy resin coating inside and out or fiberglass-reinforced polyester material.
2. Steel boxes:
  - a. Seams continuously welded, ground smooth, no knockouts.
  - b. Rolled lip around all sides.
  - c. Hinged door.
  - d. Captivated stainless steel door screws.
  - e. Flat door with oil-resistant gasket.
3. NEMA 4X boxes shall be stainless-steel.
  - a. Hinged door with latch and lockout.
  - b. Neoprene door gasket.
  - c. Grounding bushing(s).
4. NEMA 4X classification.
5. UL listed.

**E. Pull and Junction Boxes for Hazardous Areas:**

1. Material: Cast gray iron alloy or copper-free cast aluminum.
2. Drilled and tapped openings or tapered threaded hub equipped.
3. Flat bolted-down or threaded cover with neoprene gasket.
4. Stainless steel hex head screws.
5. Explosion proof, UL listed for Class 1 Groups C and D.

**F. Pull and Junction Boxes for Sidewalks:**

1. Cast-iron box and cover, hot-dip galvanized.
2. Flange for flush mounting.
3. Checkered cover with neoprene gasket, pry bar slots and stainless steel screws.
4. UL listed.
5. Drilled and tapped holes.
6. Watertight NEMA 4 classification.

**G. Large Pull and Junction Boxes (100 CU IN and larger):**

1. Located in general use areas:
  - a. NEMA 12 construction:
    - 1) Welded steel.
    - 2) Furnished with gray enamel inside and out over phosphatized surfaces.
2. Located in wet and corrosive areas:
  - a. NEMA 4X with stainless steel screws.
  - b. Type 304 L welded stainless steel:
3. Constructed of 14 GA steel with seams continuously welded, ground smooth, no knockouts.
4. Rolled lip around all sides.
5. Rigid handles for covers larger than 9 SF or heavier than 25 LBS.
6. Split covers when heavier than 25 LBS.

**F. Traffic-rated Pull Boxes:**

1. Shall be pre-cast concrete and meets the requirement of Section 02084 – Underground Precast Concrete Utilities Structures

**H. Terminal Boxes:**

1. SS Boxes rated for NEMA 4X or unless noted otherwise.
2. Provided with plain blank screw cover, subpanel (removable back panel), and terminal points.
3. Refer to Drawing for dimensions and number of terminals.
4. Each terminal box shall be supplied with 15% spare terminals or 2 din-rail mounted terminals (whichever is greater)
5. Terminal blocks shall be screw-post barrier-type, din rail mounted, white center marker strip.
6. Rated 20 ampere, minimum 600 V. or as required by the specified conductors.

**I. Fiberglass Cable-Pulling Enclosure:**

1. Use: Access points to facilitate pulling of electrical cables in buried conduit runs.
2. Size and quantity: As shown on Drawings.
3. Type: Rectangular fiberglass composite, suitable for direct burial pedestrian traffic on top, -50 degrees Fahrenheit, chemical, sunlight, and weather resistant.
4. Provide matching top with "ELECTRIC" logo.

**J. Outlet Boxes:**

1. Use: Installation of wiring devices.
2. Boxes for exposed wiring:
  - a. Cadmium plated, cast, ferrous metal, with threaded hubs.
3. Boxes for concealed wiring:
  - a. Code gage, hot-dip galvanized steel.
  - b. Include bar hangers for metal stud partitions.
  - c. Provide barriers between switches in boxes with 277 V switches on opposite phases.
  - d. Use extension and plaster rings where required.
  - e. Provide grounding screw.

**PART 3 – EXECUTION**

**3.1 INSTALLATION**

- A. Use locknut and bushing for boxes in non-classified areas.
- B. Use cast metal boxes with threaded conduit hubs in hazardous areas.
- C. Use Type FS and FD boxes in wet areas and where exposed rigid steel conduit is required.
- D. Use epoxy resin coated, stainless steel, cast aluminum for corrosive areas.
- E. Fill unused punched-out, tapped, or threaded hub openings with insert plugs.
- F. Use outlet boxes sized to accommodate quantity of conductors enclosed.

- G. Use boxes sized to accommodate conduit tying into box.
- H. Install pull boxes or junction boxes in conduit runs where indicated or required to facilitate pulling of wires or making connections.
  - 1. Make covers of boxes accessible.
- I. Install pull boxes or junction boxes rated for the area classification.
- J. Install rigid conduit squarely into boxes which do not have hubs or are drilled and tapped.
  - 1. Install with locknut on the outside and bushing on inside.
- K. Install conduit into boxes with hubs, or that are tapped, using thread lubricant.
- L. Do not use back-to-back boxes on this Project.
- M. Support outlet boxes for incandescent fixtures and other ceiling-mounted devices in lay-in acoustical tile ceilings by bar hangers anchored to ceiling construction members which do not interfere with tile removal.

- END OF SECTION -

**SECTION 16141  
WIRING DEVICES**

**PART 1 – GENERAL**

1.1 SUMMARY

A. **Section Includes:**

1. Light switches, receptacles, device plates, dimmers, plug-in strips and tele-power poles.

B. **Related Sections:**

1. Division 00 – Conditions of the Contract
2. Division 01 – General Requirements.
3. Section 16000 – General Electrical Requirements
4. Section 16130 – Outlet, Pull, and Junction Boxes
5. Section 16170 – Grounding.

1.2 QUALITY ASSURANCE

- A. **Referenced Standards:** Refer to Section 16000.

1.3 SUBMITTALS

- A. **Shop Drawings:** Refer to the Contract Documents, Section 01300 and Section 16000.

**PART 2 – PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Light switches (except explosion proof):
  - a. Hubbell.
  - b. P&S.
  - c. Arrow Hart.
  - d. General Electric.
  - e. Leviton.
2. Explosion proof light switches:
  - a. Crouse-Hinds.
  - b. Appleton Electric Co.
  - c. Killark.
3. Door switches:
  - a. General Electric.
  - b. P&S.
  - c. Arrow Hart.
  - d. Micro-switch.
4. Receptacles (except explosion proof):
  - a. Hubbell.
  - b. P&S.

- c. Arrow Hart.
  - d. General Electric.
  - e. Leviton.
5. Explosion proof receptacles:
    - a. Crouse-Hinds.
    - b. Appleton Electric Co.
    - c. Killark.
  6. Welding receptacles:
    - a. Crouse-Hinds.
    - b. Appleton Electric Co.
  7. Tele-power poles:
    - a. Wiremold.
  8. Dimmers:
    - a. Lutron.
    - b. General Electric
    - c. P&S.
  9. Plug-in strip:
    - a. Wiremold.

B. Submit requests for substitution in accordance with Specification Section 01630.

## 2.2 MATERIALS

### A. **Light Switches for Unclassified Areas:**

1. Toggle type, quiet action, specification grade with grounding terminal.
2. Back and side wired.
3. Solid silver cadmium oxide contacts.
4. One-piece switch arm rated 20 A, 120/277 VAC.
5. UL listed.
6. Color: Ivory.
7. Wall plate: Type 304 stainless steel.
8. Type: As indicated on Drawings.

### B. **Receptacles for Unclassified Areas:**

1. Straight blade, grounding type, specification grade.
2. Back and side wired with wrap-around bridge.
3. Rated 20 A, 125 VAC.
4. UL listed.
5. Color:
  - a. For use on normal power: Ivory.
  - b. For use on UPS systems: Red.
  - c. For use on isolated ground systems: Orange.
6. Wall plate: Type 304 stainless steel.
7. Type: As indicated on Drawings.

**C. Light Switches for Wet Areas:**

1. Pressswitch type, quiet action, specification grade, with grounding terminal.
2. Back and side wired.
3. Solid silver cadmium oxide contacts.
4. One-piece switch arm rated 20 A, 120/277 VAC.
5. UL listed.
6. Color: Ivory.
7. Wall plate: Gray weatherproof pressswitch type.
8. Type: As indicated on Drawings.

**D. Receptacles for Wet Areas:**

1. Straight blade, grounding type, specification grade.
2. Back and side wired with wrap around bridge.
3. Rated 20 A, 125 VAC.
4. UL listed.
5. Color: Ivory.
6. Wall plate: Weatherproof, cast aluminum, UL listed, WDL open and closed.
7. Type: As indicated on Drawings.

**E. Ground Fault Circuit Interrupter Receptacles:**

1. Straight blade, grounding type, specification grade.
2. Rated 20 A, 125 VAC.
3. UL listed.
4. Test and reset buttons.
5. Wall plate: Indoor or weatherproof as required.
6. Feed-through type.

**F. Light Switches for Corrosive Areas:**

1. Corrosion-resistant NEMA 4X enclosure with switch consisting of:
  - a. Fiberglass reinforced polyester enclosure.
  - b. Fiberglass reinforced polyester gasketed wall plate with built-in toggle lever switch with stainless steel shaft.
  - c. Grounding bushing.
  - d. Rated 20 A, 125 VAC.
  - e. UL listed.
  - f. Type: As indicated on Drawings.
  - g. Color: Yellow.
2. Optional: Corrosion-resistant enclosure and switch consisting of:
  - a. Cast copper-free aluminum "FS" or "FD" ridge type hub box.
  - b. Toggle type, quiet action, specification grade with grounding terminal.
  - c. Rated 20 A, 125 VAC with solid silver cadmium oxide contacts.
  - d. UL listed.
  - e. Neoprene gasket.
  - f. Cast aluminum cover with stainless steel screws and lever to activate switch.

- g. Type: As indicated on Drawings.
- h. Color: Yellow.

**G. Receptacles for Corrosive Areas:**

1. Corrosion-resistant straight blade, grounding type, specification grade.
2. Back and side wired with wrap-around bridge.
3. Rated 20 A, 125 VAC.
4. UL listed.
5. Color: Yellow.
6. Box: "FS" or "FD" ridge type cast hub box of copper-free aluminum.
7. Gasket: Neoprene.
8. Wall plate: Weatherproof, cast aluminum, UL listed, WDL open or closed.
9. Type: As indicated on Drawings.

**H. Explosion proof Light Switches for Use in Hazardous Areas:**

1. Explosion proof, UL listed for Class I, Division 1 and 2, Groups B, C, and D; and Class II, Division 1 and 2 areas, Groups E, F, and G.
2. EDS factory sealed.
3. Malleable iron body and cover.
4. Aluminum sealing chamber.
5. Front operated handle with stainless steel shaft.
6. Rated 20 A, 125 VAC.
7. With grounding screw.
8. Type: As indicated on Drawings.

**I. Explosion proof Receptacles for Use in Hazardous Areas:**

1. Explosion-proof, UL listed for Class I, Division 1 and 2, Groups B, C, and D; and Class II, Division 1 and 2, Groups F and G.
2. Factory-sealed malleable iron receptacle with spring-loaded cover.
3. Malleable iron mounting box.
4. Rated 20 A, 125 VAC.
5. "Dead-front" construction requiring plug to be inserted and rotated to activate receptacle.
6. Type: As indicated on Drawings.

J. Welding Receptacles: 1. 60 A, 480 V, 3 pole, 4 wire, grounding type.

K. Plug-In Strip: Surface steel raceway plug-in strip with single 15 A, 125 V, 3 wire grounding-type receptacles spaced 18 IN on center.

1. Prewired with two #12 TW and one #12 TW green insulated ground.
2. Minimum 1-1/4 IN wide x 3/4 IN deep.
3. Suitable fittings and snap-in cover.

4. Finish:
  - a. Stainless steel.
5. Receptacle color:
  - a. For use on normal power: Ivory.
  - b. For use on UPS systems: Red.
  - c. For use on isolated ground systems: Orange.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. Surface mount receptacles and light switches in concrete construction.
- B. In masonry and metal stud construction, recess mount receptacles and light switches unless device precludes recessed mounting or unless otherwise noted on the Drawings.
- C. Where more than one receptacle is installed in a room, they shall be symmetrically arranged.
- D. Set switches and receptacles plumb and vertical to the floor.
- E. Set recess-mounted switches and receptacles flush with face of walls.
- F. Do not connect dimmers to loads in excess of 80 percent of the rating of the dimmer.
- G. Provide blank plates for empty outlets.

- END OF SECTION -

**SECTION 16143  
TERMINAL BLOCKS**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers terminal blocks for control and other wiring.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents prior to installation.

1.3 MANUFACTURERS

- A. Terminal blocks shall be Entelec, Phoenix Contact, Weidmuller, or equal.
- B. Surge protection blocks shall be Eaton, series SD, or equal.
- C. Power distribution blocks shall be IlSCO Corporation, or equal.

**PART 2 – PRODUCTS**

2.1 TERMINAL BLOCKS

- A. Terminal blocks shall mount on standard DIN rail, and be of the size required for conductors therein. A minimum of 25 percent spares shall be provided in each terminal box. No more than 2 conductors shall be allowed per termination. Jumper bar assemblies shall be installed for interconnecting terminal blocks, distributing power and signal commons. Terminal blocks shall be U.L. rated for 600 Volts, and 30 Amps, minimum.
- B. Grounding terminal blocks shall be provided for instrumentation cable shields. The terminal blocks shall have distinctive 2-color bodies, and shall be mounted to the DIN rail with metal screw down type clamps, providing a positive ground connection. One grounding terminal block shall be installed for every 2 instrument cables terminated. Grounding terminal blocks shall be U.L. rated for 600 Volts, and 20 Amps, minimum.
- C. Terminal blocks shall be available in a variety of colors, including red, green, blue, gray, black, yellow, and orange.
- D. DIN mount fuse holders shall have blown fuse indicators for DC and AC circuits. Fuse holders shall be of the compression clamp type. Fuse holders shall be U.L. listed, and rated for 600 Volts. Fuse sizes shall not exceed the U.L. current rating for the fuse holders.
- E. DIN rail shall be prepunched, zinc bichromate plated steel. Symmetrical DIN rail shall be 35mmX7.5mm, minimum.
- F. Terminal blocks for 4 to 20 milliamp signals shall have knife disconnect switches, and accessible test points for testing and measurement of current loop signals, without the need for removing wire terminations.

2.2 SURGE PROTECTION BLOCKS (SPB)

- A. Analog inputs and outputs shall be terminated at surge protection blocks (SPB). The SPBs shall be designed for a working voltage of 32 volts, and shall be fused.

- B. SPBs shall provide full hybrid line to line protection, and shall have a GDT rating of 10,000 A (8/20 $\mu$ s pulse waveform).
- C. SPBs shall be UL94 listed.

### 2.3 POWER DISTRIBUTION BLOCKS (PDB)

- A. PDBs shall be Electro tin plated and manufactured from high strength 6061-T6 aluminum alloy.
- B. PDBs shall be UL Recognized, rated 90 degrees C, and CSA Certified.
- C. PDBs shall provide flexibility in using the connector as an in line splice or to reduce conductor size for taps.
- D. PDBs shall be rated for 600 Volts and dual rated for Copper and Aluminum Conductors.
- E. PDBs shall have the sizes and ratings as shown on the Plans.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Each terminal block and fuse holder shall be identified with the circuit number, or conductor number, corresponding to the identification appearing on the shop Drawings for the equipment, or system.
- B. Terminal block and fuse holder markers shall be computer printed plastic-type, with permanent markings.
- C. End clamps and end sections shall be installed on each terminal block and fuse holder assembly.
- D. Terminal blocks for DC voltages shall be blue, and AC **voltages** shall be **gray**.

- END OF SECTION -

**SECTION 16150  
INDUCTION MOTORS**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

This Section outlines the electrical requirements for squirrel-cage induction motors.

1.2 SUBMITTALS

Submit for the Engineer's approval shop drawings, factory test reports, manufacturers' certified reports and technical data for motors supplied with driven equipment to the extent required in this Section, and the Specification Sections for mechanical equipment.

A. **Shop Drawings:** In addition to information to be included in the shop drawing and, shop drawings shall include the following:

1. Motor locked rotor and full load currents.
2. Power factors and efficiencies at full load, three quarters load and half load.
3. Motor housing material, winding material NEMA Design letter, NEMA Code Letter, ambient temperatures and maximum elevations in which motor is designed to operate continuously, service factor, NEMA insulation Class, temperature rise, type of enclosure, voltage, bearing life and dynamic balance; all of which shall comply to the requirements of the specifications.
4. Nameplate data.
5. Dimensions and weights of motors.
6. Motor construction details.
7. Speed torque/current at 100 percent volts.
8. Wiring diagrams, internal and typical external connections.

B. **Current Data:** Submit to the ENGINEER all field recorded current data. The data shall indicate the full load current for each motor and current rating for the overload relay in each motor starter and controller.

**PART 2 – PRODUCTS**

2.1 GENERAL

Motors shall be supplied by the manufacturer of the driven equipment as specified in this section, and specifically outlined in the driven equipment specifications. The Motors shall be completely fabricated, assembled, checked and tested at the factory in accordance with NEMA MG-1. The induction motors shall be Siemens, Louis Allis, Baldor-Reliance, U.S. Motors, or approved equal.

A. **Motor Ratings (non-submersible type):**

1. Torque and slip characteristics shall be as recommended by the manufacturer of the driven equipment and as specified. Motor manufacturer shall confirm motor capability to the specifications.
2. Motors shall operate continuously and satisfactorily in ambient temperatures from minus 10 degrees C to plus 50 degrees C at a maximum elevation of 1,200 feet without exceeding nameplate horsepower rating.
3. The motors shall have high power factor and the minimum power factor shall be 80 percent at full load.

4. Motors shall be designed for high efficiency. Motors with the following minimum efficiencies, at full load, shall be provided:
  - a. 80 percent minimum efficiency shall be provided for motors through 5 horsepower.
  - b. 85 percent minimum efficiency shall be provided for motors 7-1/2 through 15 horsepower.
  - c. 90 percent minimum efficiency shall be provided for motors 20 through 40 horsepower.
  - d. 92 percent minimum efficiency shall be provided for motors 50 through 125 horsepower.
  - e. 94 percent minimum efficiency shall be provided for motors 150 horsepower and larger.
5. The motors shall be sized so that the BHP does not exceed 95 percent of the full load nameplate horsepower.
6. The motor must be able to accelerate the driven machine from zero to top speed at 90 percent of rated voltage without overheating.
7. The maximum locked rotor KVA/HP code letter for motors smaller than 15 HP shall not exceed the requirements for NEMA Design B motors. The maximum locked rotor KVA/HP code letter shall be Code G for motors 15 HP through 250 HP unless otherwise indicated. The maximum locked rotor KVA/HP code letter shall be Code F for motors 300 horsepower and larger unless otherwise indicated.
8. All motors shall be insulated and braced for full voltage across the line starting regardless of the starting method used.
9. Motors 1/2 HP and larger shall be NEMA MG1-1.16 Design B and shall have NEMA MG1-1.65 Class F insulation.
10. The temperature rise by resistance above the temperature of the cooling medium, for each of the various parts of the motor shall not exceed the values of the NEMA MG1-1.65 Class B insulation system as indicated in NEMA MG 1-12.42. These are total temperatures, based on maximum ambient of 40° C (104° F), plus additional heat (temperature rise) generated by motor operation. Greater than 40° C ambient shall require at a minimum, Class H insulation special application considerations or special motor designs.
11. All open and TEFC motors 250 HP and less and all vertical motors shall have a 1.15 service factor. All horizontal motors larger than 250 HP shall have a 1.0 service factor.
12. Motors 1/2 HP through 250 HP shall be 460 volts, 3 phase, 60 Hertz unless otherwise indicated.
13. Motors smaller than 1/2 HP shall be 120/240 volts, 1 phase, 60 Hertz unless otherwise indicated.

**B. Motor Construction:**

1. Enclosures for induction motors shall be approved for the installations and as indicated. The enclosure types shall be one of the following as outlined in the driven equipment specifications unless otherwise indicated.
  - a. Totally-enclosed fan cooled
  - b. Totally-enclosed non-ventilated
  - c. Weather-protected, Type I
  - d. Weather-protected, Type II
  - e. Drip-proof fully guarded
  - f. Drip-proof
  - g. Splash-proof
  - h. Open
2. Provide epoxy vacuum pressure impregnated (VPI) motors when indicated in the driven equipment specifications. The windings in squirrel cage induction motors shall be completely filled with an insulating resin epoxy which also forms a protective coating.
  - a. The stator windings on all motors, except 56 and 140 frame sizes, shall be vacuum pressure impregnated with an epoxy or shall be epoxy encapsulated 56 and 140 frame size motors shall have extra dips and bakes of Class F varnish.

3. Housing, end brackets and all outside components shall be cast iron or aluminum except WP II or open drip-proof enclosures which may be fabricated steel or aluminum.
4. A condensate drain hole shall be provided on all enclosed motors. The drain hole shall be provided in each end bracket on horizontal motors. A single drain hole shall be provided in the lower bracket of vertical motors. Open motors shall be self draining. A U.L. approved breather/drain shall be provided on all explosion-proof motors.
5. The motors shall be equipped with terminal boxes for all conduit and wire connections as required.
  - a. The terminal boxes shall be properly sized, diagonally split, cast iron, and rotatable in 90 degree steps. Provide a gasket between the box and motor frame and between the box and the cover. Terminal boxes shall be attached to the motor frame with grade 5 zinc plated and chromated steel bolts or cap screws. All terminal boxes shall have threaded holes for conduit entrance.
6. The castings shall be coated with a red-oxide zinc-chromate primer, and finished with a corrosion resistant epoxy coating. All fabricated steel enclosures shall be coated on all inside and outside surfaces except shafts and register fits.
7. Provide stainless steel fasteners and nameplates of ample size with clear numerals and letters.
  - a. Nameplates shall indicate the manufacturer, serial number, model number, type, horsepower, phase, hertz, volts, design, full load amperes, locked rotor code letter, service factor, speed, insulation class, temperature rating, information required by NEMA MG 1-10.38 and other essential data.
  - b. Nameplate data shall be in the English language and units.
  - c. Nameplates shall be secured to the motor frame with corrosion resisting pins in accessible locations.
8. Ground lugs shall be provided in all main motor terminal boxes for grounding.
9. All motors shall have copper windings.
10. Antifriction bearings shall be grease lubricated except for vertical, high thrust motors, which may require oil lubrication.
  - a. Grease lubricated bearings shall include accessible fittings for in-service, periodic relubrication.
  - b. Oil lubricated bearings shall be a reservoir type with a sump for settling foreign matter, accessible and exterior fill and drain plugs and a visual oil level indicator with maximum and minimum indicator levels.
  - c. Horizontal, direct connected motor bearings shall be designed for 1 year minimum B-10 bearing life at NEMA minimum V-belt criteria for the rating.
  - d. Horizontal, V-belt connected motor bearings shall be designed for 3 year minimum B-10 bearing life for the application V-belt drive or 1 year minimum B-10 bearing lift at NEMA minimum V-belt criteria whichever is more restrictive.
  - e. Vertical motor bearings shall be designed for 2 year minimum B-10 bearing life at design operating thrust. At maximum operating thrust, B-10 life shall not be less than one year. Transient (shut-off) thrust shall not exceed 30% of the static deformation limit. Motor shall be designed for 30% momentary upthrust capacity except 3600 RPM units which must have 30% continuous upthrust capacity. Any system which exceeds 30% upthrust must be designed for continuous upthrust at one year B-10 bearing lift.
  - f. Pre-lubricated, double shield bearings are acceptable only on single phase and 56 frame motors.
11. The dynamic balance of motors built in frame size 143 and larger shall be 0.001 inches total amplitude or peak to peak displacement.
12. Accessories for motors 125 HP and larger shall include the following:
  - a. A set of non-linear, resistance temperature detectors, "PTC thermistors" or equal, shall be embedded in the winding. The detector relays shall have one normally open and one normally closed (spare) contacts, and shall be mounted in the motor control center. One relay shall have the normally open contact to actuate an alarm and shut down motor when the temperature rise reaches 15 degrees centigrade below the motor insulation temperature rating when operating in an ambient temperature of 40°C. The detector shall protect the motor against overheating caused

- b. by overloads, loss of cooling medium and single phasing.
  - b. A set of non-linear, resistance temperature detectors, "PTC thermistors" or equal, shall be required for bearing temperature. The detector relay shall have one normally open and one normally closed (spare) contacts, and shall be mounted in a box with cover on the motor frame. One relay shall have the normally open contact to actuate an alarm and shut down motor when the temperature rise reaches 15 degrees centigrade below the motor insulation temperature rating when operating in an ambient temperature of 40°C. The detector shall protect the motor against overheating caused by loss of cooling medium and bearing failure.
  - c. All of the above accessories shall have wires brought out in a terminal box or boxes.
13. Motors shall have a guaranteed maximum noise level that shall be in accordance with NEMA MG3 Standards Publication for Sound Level Prediction for Installed Rotating Electrical Machines, except where more restrictive requirements are outlined in other Sections of the Specifications.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. Provide all the equipment installations and wiring installations, including connections as indicated, specified and required. Assure proper fits for all equipment and materials in the spaces as shown on the Drawings.
- B. **Motors:**
  - 1. Provide power, control, alarm, and grounding installations for all motors as indicated and required.
  - 2. Check the connections and provide correct rotation for all motors.
  - 3. Record the full load current to each motor, and the overload relay rating in each motor starter for the certified data submittal.
  - 4. Provide the required wiring for all control equipment that shall be furnished and installed by other Sections of the Specifications.
  - 5. Field damaged factory finish on equipment shall be touched-up with paint that is equal in quality and color to the original factory finish.

#### **3.2 FACTORY TESTS**

- A. All Motors shall be given a standard commercial test as defined by NEMA MG 1-12.51 and IEEE 112a and b.
- B. All Motors 125 horsepower and Larger shall be given complete tests as defined by IEEE 112 Method A and B. Report of test shall include data on IEEE 112 Form A2, as applicable to the motor tested. Test shall confirm the following:
  - 1. Service factor temperature.
  - 2. Efficiency
  - 3. Torque
  - 4. No load, full voltage vibration level.
- C. Vibration Tests shall be per NEMA MG 1-12.06 and MG 1-2053.
- D. All Testing, other than lock conditions shall be at full voltage +5 percent.

3.3 FIELD CHECKS

- A. Motor Installations shall be complete and correct.
- B. Operation Tests shall be performed to observe that motors start, run and stop satisfactorily under design load.

- END OF SECTION -

## SECTION 16160 ENCLOSURES

### PART 1 – GENERAL

#### 1.1 SCOPE OF WORK

- A. This specification includes enclosures to house electrical controls, instruments, terminal blocks, and serve as junction boxes where shown on the Plans.

#### 1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents prior to installation.

#### 1.3 MANUFACTURERS

- A. Enclosures shall be manufactured by Hammond, Hoffman, Rittal, or equal.

### PART 2 – PRODUCTS

#### 2.1 STEEL

- A. Enclosures shall be fabricated from 14 gauge steel with seams that are continuously welded. Doors shall have full length piano hinges with the door removable by pulling the hinge pin.
- B. A rolled lip shall be provided around three sides of the door and around all sides of the enclosure opening. The gasket shall be attached with oil-resistant adhesive and held in place with steel retaining strips. Exterior hardware, such as clamps, screws, and hinge pins, shall be of stainless steel for outdoor installations. A hasp and staple shall be provided for padlocking. Each enclosure shall have a print pocket. All wires entering or leaving the enclosure shall terminate on terminal strips. All wires and terminals shall be clearly identified as specified elsewhere in these specifications.
- C. Finish shall be white enamel interior, light gray enamel, ANSI 61 exterior, over phosphatized surfaces. Special finishes and colors shall be furnished for wet locations. Plans should be checked for special conditions.

#### 2.2 NEMA RATING

- A. Unless otherwise indicated on the Plans, enclosures shall be NEMA 12 for indoors, NEMA 4X for corrosive areas, and NEMA 3R for outdoor installations. NEMA 4X enclosures shall be 316 stainless steel, unless noted otherwise. NEMA 4X enclosures shall also be used in wet or wash down areas.

#### 2.3 FIBERGLASS ENCLOSURES (where indicated in plans)

- A. Where called out in the Plans, fiberglass NEMA 4X enclosures shall be compression molded, fiberglass reinforced polyester, high impact, and heat resistant.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Enclosures shall be installed as indicated on the Plans, and according to manufacturer's instructions.
- B. Enclosures shall be properly grounded, and shall include ground straps connected to hinged doors and accessories.

- END OF SECTION -

## SECTION 16170 GROUNDING

### PART 1 – GENERAL

#### 1.1 SCOPE OF WORK

- A. A ground grid system consisting of the indicated configuration of copper wires, and ground rods, or concrete encased grounding electrodes ("UFERS") shall be provided to minimize station potential gradient irregularities and drain leakage and fault currents to earth.
- B. Whether indicated on the Plans or not, neutral conductors, cable shields, metallic conduits, cable terminations, junction boxes, poles, surge arresters, and other non-current-carrying metallic parts of equipment shall be grounded.

#### 1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents prior to installation.

#### 1.3 REFERENCES

- A. National Electrical Code (NEC) Article 250

### PART 2 – PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. A resistance of not greater than 25 ohms shall be provided, unless otherwise specified. Ground resistances shall be measured as herein described. Resistances of systems requiring separate ground rods, rather than a counterpoise, shall be measured separately before bonding below grade. The combined ground resistance of separate systems bonded together below grade may be used to meet the specified ground resistance, but the minimum number of rods indicated must still be provided.

#### 2.2 GROUND RODS

- A. Ground rods shall be copper-clad steel conforming to UL 467, 3/4 inch in diameter by 10 feet in length. Unless otherwise indicated, ground rods shall be driven into the ground until tops of rods are approximately 6 inches below finished grade. In counterpoise systems, tops of ground rods shall be approximately at elevations of counterpoises. Where the specified ground resistance cannot be met with the indicated number of ground rods, additional ground rods, longer ground rods, or deep-driven sectional rods shall be installed and connected until the specified resistance is obtained, except that not more than three additional ground rods shall be required at any one installation. Ground rods shall be spaced as evenly as possible at least 6 feet apart and connected below grade.

#### 2.3 CONNECTIONS

- A. Connections above grade shall be made with bolted solderless connectors, and those below grade shall be made by a fusion-welding process. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

#### 2.4 GROUNDING ELECTRODE CONDUCTOR

- A. Service entrance ground wires shall be sized in accordance with 2020 NEC Table 250.66, unless otherwise indicated on the Plans. After being located to provide maximum physical protection, exposed ground wires shall be securely attached to structural supports at not more than 2-foot intervals with suitable fasteners. Bends

greater than 45 degrees in ground wires are not permitted. Routing of ground conductors through concrete should be avoided, except where specifically called for in these Documents. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit, so as to provide an opening for the ground wire. The opening shall be sealed with a suitable compound after installation of the ground wire.

## 2.5 EQUIPMENT GROUNDING CONDUCTOR

- A. Neutral conductors shall be grounded where indicated. Equipment grounding conductors shall be sized in accordance with 2020 NEC Table 250.122, unless otherwise indicated. Ground wires shall be protected by conduit, where such wires run exposed above grade in non-fence-enclosed areas, or are run through concrete construction. Where concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit, so as to provide an opening for the ground wire. The opening shall be sealed with a suitable compound after installation of the ground wire. Bends greater than 45 degrees in ground wire connections to the ground rods, or counterpoises are not permitted.

## 2.6 EQUIPMENT GROUNDING

- A. Equipment frames of motor housings, metallic tanks, metallic equipment enclosures, metal splicing boxes, chain-link fencing, and other metallic noncurrent-carrying metal items, shall be grounded. Connections to earth shall be made in the same manner as required for system grounding. Equipment or devices operating at less than 750 volts may be connected to secondary neutral grounding electrodes.

## 2.7 SURGE ARRESTER GROUNDING

- A. Surge arresters shall be grounded. Resistance to ground for intermediate-class arresters shall be not more than 10 ohms and for distribution-class arresters shall be not more than 25 ohms. Ground wire connections shall be not less than No. 4 AWG for distribution arresters and No. 1/0 AWG for intermediate arresters. Connections to earth shall be made in the same manner as required for neutral conductors. Surge arrester grounds may use the same ground wires provided for equipment operating at more than 750 volts. Surge arrester and secondary neutral grounds shall be separate from and independent of each other but both grounds shall be bonded together below grade at the ground rods or may utilize a common counterpoise.

## 2.8 LIGHTING POLE GROUNDING

- A. Base of fighting poles shall be connected to an adjacent ground rod as indicated on Plans. A ground connection from poles back to neutral ground points shall also be provided utilizing equipment grounding conductor.

## 2.9 METALLIC STRUCTURES

- A. Metallic structures and buildings shall be grounded per NEC.

## 2.10 GROUNDING RINGS

- A. When required, grounding rings shall be installed using bare copper cable with ground rods at least 25 feet intervals using thermoweld connecting means as indicated on Plans in accordance with NEC requirements.

# PART 3 – EXECUTION

## 3.1 INSTALLATION

- A. It is the intent of these Contract Documents that all device and equipment grounds shall be run as a separate conductor in the conduit from the equipment to the distribution panels or system ground. Wireways and enclosures shall be properly bonded and grounded, and ground conductors shall be run for all circuits.

- B. Equipment cases and devices shall be grounded. Ground rods shall be driven, and concrete encased conduits installed, before a building, or structure is built, and ground conductors brought through the concrete to accessible points for grounding equipment. These systems shall be installed at each structure, where transformers, switchboards, panelboards, and MCCs are installed.
- C. Duct banks shall contain a concrete encased system bare copper ground conductor. The system ground conductors shall run continuously in duct banks, through handholes and other raceway boxes. The system ground shall be connected to the structure grounding systems to provide a continuous grounding system. Each metallic raceway, panel, switchboard, and other metallic devices associated with the electrical and control systems shall be bonded to this grounding system.
- D. Ground rod shall be installed not less than 6 inches below grade. Equipment, neutral, and surge arrester ground wires shall be connected to the ground grid as indicated.

### 3.2 TESTS

- A. Pre-Energization Tests --- Pre-energization tests shall include, but shall not be limited to tests that the equipment engineer is required to perform under paragraph "GENERAL REQUIREMENTS." No part of the electrical system shall be energized until all station grounding system components have been tested and demonstrated to comply with the requirements specified, and until associated test reports have been submitted and approved.
- B. Operating Test - After the installation is completed, the CONTRACTOR shall conduct an operating test for approval. Equipment shall be demonstrated to operate in accordance with the requirements herein. Tests shall be performed in the presence of the ENGINEER. The CONTRACTOR shall furnish instruments and personnel required for the test.
- C. Ground-Resistance Measurements - Ground-resistance measurements of each ground rod shall be taken and certified by the CONTRACTOR to the ENGINEER. No part of the electrical distribution system shall be energized prior to the resistance testing of that system's ground rods and grounding system and submission of test results to the ENGINEER. Test reports shall indicate the location of the ground rod and grounding system and the resistance and the soil conditions at the time the test was performed. When the building water service is used as a ground or part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 142 and Std 81.

### 3.3 TEST RESULTS

- A. The CONTRACTOR shall perform the above tests and submit a certified test report prior to energizing the equipment.

-END OF SECTION -

**SECTION 16190  
SUPPORTING DEVICES**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. Supports, anchors, sleeves, and seals, are indicated on the Plans, schedules, and specified in other sections of these Specifications.
- B. **Types of supports, anchors, sleeves and seals specified in this section include the following:**
  - 1. One-hole Conduit Straps
  - 2. One-Hole Conduit Straps with Clamp Backs
  - 3. Two-Hole Conduit Straps
  - 4. Conduit Hangers
  - 5. I-beam Clamps
  - 6. Channel Clamps
  - 7. Round Steel Rods
  - 8. Drop-in Anchors
  - 9. Wedge Type Anchor Bolts
  - 10. Lead Expansion Anchors
  - 11. Toggle Bolts
  - 12. Wall and Floor Seals
  - 13. Cable Supports
  - 14. U-Channel Strut System
  - 15. Sleeves

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents prior to installation.

**PART 2 – PRODUCTS**

2.1 MANUFACTURERS

- A. **Acceptable Manufacturers:** Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following: Abbeon Cal Inc., Elcen Metal Products Co., Ideal Industries, Inc., Joslyn Mfg and Supply Co., McGraw Edison Co., Rawlplug Co. Inc., Allied Tube and Conduit Corp., Cooper B-Line Inc., Greenfield Mfg Co., Inc., OZ Gedney, Power-Strut, and Unistrut, and Robroy Industries.

2.2 GENERAL

- A. Provide supporting devices that comply with manufacturers standard materials, design, and construction, in accordance with published product information, and as required for complete installations, and as specified herein.

## 2.3 SUPPORTS

### A. **Provide supporting devices of types, sizes, and materials indicated, and having the following construction features:**

1. One-Hole Conduit Straps: For supporting electrical metallic tubing, and liquidtight flexible conduit; zinc plated steel, stainless steel or galvanized steel; snap-on, heavy duty.
2. One-Hole Conduit Straps with Clamp Backs: For supporting rigid metal conduit, and intermediate metal conduit; cast galvanized steel.
3. Two-Hole Conduit Straps: For supporting electrical metallic tubing, rigid metal conduit, and intermediate metal conduit; zinc plated steel, stainless steel or galvanized steel.
4. Conduit Hangers: For supporting electrical metallic tubing, rigid metal conduit, and intermediate metal conduit; zinc plated steel, stainless steel or galvanized steel.
5. I-Beam Clamps: Electroplated zinc or hot dipped galvanized malleable iron.
6. Channel Clamps: Electroplated zinc or hot dipped galvanized steel.
7. Round Steel Rod: National coarse thread, electroplated.

## 2.4 ANCHORS

### A. **Provide anchors of types, sizes, and materials indicated, with the following construction features:**

1. Lead Expansion Anchors: For CMU walls, 1/4"-20 threads, set tool required.
2. Toggle Bolts: Electroplated steel, size as required.
3. Drop-in Anchors: Stainless steel, size as required.
4. Anchor Bolts: Stainless steel, size as required.
5. Half-round head, non-removable anchor bolts shall not be used.

## 2.5 SEALS

### A. **Provide seals of types, sizes and materials indicated; with the following construction features:**

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sized indicated; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.
2. Conduit sealing bushings shall be manufactured by OZ Gedney, Model CSMI, or equal.
3. The conductor sealing bushings shall be manufactured by OZ Gedney, Model CSBG, or equal.

## 2.6 CONDUIT CABLE SUPPORTS

- ### A. Provide cable supports with insulating wedging plug for non-armored type electrical cables in risers; construct 2" rigid metal conduit; 3-wires, type wire as indicated; construct body of malleable-iron casting with hot-dip galvanized finish.

## 2.7 U-CHANNEL STRUT SYSTEM

- A. Provide U-channel strut system for supporting electrical equipment, 12-gage hot-dip galvanized steel, of types and sizes indicated; construct with 9/16" diameter holes, 8" O.C. on top surface, with the following fittings that mate and match with U-Channel:
1. Fixture hangers
  2. Channel hangers
  3. End caps
  4. Beam clamps
  5. Wiring stud
  6. Thinwall conduit clamps
  7. Rigid conduit clamps
  8. Post Bases
  9. U-bolts

## 2.8 PIPE SLEEVES

- A. **Provide pipe sleeves from the following:**
1. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

## 2.9 PVC COATED U-CHANNEL STRUT SYSTEM

- A. Provide PVC Coated U-channel strut system for supporting electrical equipment, 20 mil PVC coated steel, of types and sizes indicated; construct with 9/16" diameter holes, 8" O.C. on top surface, with all Stainless Steel hardware, and the following fittings that mate and match with PVC Coated U-Channel:
1. PVC Coated Strut nut
  2. PVC Coated Pipe straps
  3. Touch up compound (Gray)

## 2.10 STAINLESS STEEL U-CHANNEL STRUT SYSTEM

- A. Provide Stainless Steel U-channel strut system for supporting electrical equipment, of types and sizes indicated; construct with 9/16" diameter holes, 8" O.C. on top surface, with all stainless steel hardware, and the following stainless steel fittings that mate and match with Stainless Steel U-Channel:
1. Fixture hangers
  2. Channel hangers
  3. End caps
  4. Beam clamps
  5. Wiring stud
  6. Post bases
  7. Rigid conduit clamps
  8. U-bolts

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturers written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices.
- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of 2 or more parallel runs of conduits to be supported together on channel type hangers where possible. Install supports with spacing indicated and in compliance with NEC requirements.
- D. Torque sleeve seal nuts, complying with manufacturer's recommended values. Ensure that sealing grommets expand to form watertight seal.
- E. Comply with manufacturer's recommendations for touch up of field cut ends or damaged PVC coated U-channel and fittings.
- F. Remove burrs and apply a cold zinc galvanizing paint to field cut galvanized U-channel strut.

- END OF SECTION -

**SECTION 16195  
ELECTRICAL IDENTIFICATION**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

A. **Electrical identification work specified in this section covers the following:**

1. Buried cable warnings
2. Electrical power, control and communication conductors
3. Operational instructions and warnings
4. Danger signs
5. Equipment/system identification signs

1.2 SUBMITTALS

A. **Submittals to the ENGINEER shall include the following:**

1. Manufacturer's data on electrical identification materials and products
2. Samples of each color, lettering style and other graphic representation required for each identification material or system

1.3 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering electrical identification products maybe incorporated in the work include, but not limited to, the following:

1. W.H. Brady Co.
2. Ideal Industries, Inc.
3. Panduit Corp.
4. or, equal

1.4 QUALITY COMPLIANCE

A. Comply with applicable requirements of UL Std. 969, "Marking and Labeling Systems", pertaining to electrical identification systems.

**PART 2 – PRODUCTS**

2.1 GENERAL

A. Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

2.2 COLOR CODED CONDUIT MARKERS

A. Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, plastic-sheet conduit markers, extending 360 degrees around conduits; designed for attachment to conduit by adhesive, adhesive lap joint of marker, matching adhesive plastic tape at each end of marker, or pretensioned snap-on. Except as otherwise indicated, provide lettering that indicates voltage of conductor{s} in conduit. Provide 8" minimum length for 2" and smaller conduit, 12" length for larger conduit.

- B. Unless otherwise indicated or required by governing regulations, provide white markers with black letters.
- C. Conduit identification shall be via stainless-steel tags. See comments for Section 16111.

### 2.3 CABLE AND CONDUCTOR WIRE MARKERS

- A. Cable and conductor wire markers shall be self-laminating vinyl on white background, printed using a Brady TLS2200 printer, Seton printer, or equal. Handwritten wire markers are not acceptable.

### 2.4 SELF-ADHESIVE PLASTIC SIGNS

- A. Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings; of sizes suitable for application areas and adequate for visibility, with proper wording for each application, e.g., 208V, EXHAUST FAN, RECTIFIER.
- B. Unless otherwise indicated or required by governing regulations, provide white signs with black lettering.
- C. Signs shall be attached with stainless-steel screws

### 2.6 LETTERING AND GRAPHICS

- A. Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NEC.
- B. Where identification is to be applied to surfaces that require finish, install identification after completion of painting.
- C. Comply with governing regulations and requests of governing authorities for identification of electrical work.

### 3.2 CONDUIT IDENTIFICATION

- A. Where electrical conduit is exposed in spaces with exposed mechanical piping that is identified by a color-coded method, apply color-coded identification on electrical conduit in manner similar to piping identification. Except as otherwise indicated, use white as coded color for conduit.

### 3.3 CABLE/CONDUCTOR IDENTIFICATION

- A. Apply cable conductor identification, including voltage, phase and feeder number, on each cable conductor in each box enclosure/cabinet where wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project's electrical work.

### 3.4 EQUIPMENT/SYSTEM IDENTIFICATION

- A. Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication-control-signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
  - 1. Panelboards, electrical cabinets and enclosures
  - 2. Access panel/doors to electrical facilities
  - 3. Major electrical switchgear.
- B. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with brass or stainless steel screws, except use adhesive where screws should not or cannot penetrate the substrate.
- C. Identification signs shall be black lettering on a white field to match the Districts' standard.

### 3.5 CIRCUIT IDENTIFICATION

- A. The neutral shall be white to match the requirements of Part 2.5 (B) in Section 16123. The 3-phase wires shall be identified at the switchgear, panelboards and motor control centers as Phases A, B, and C. At 277/480V, Phase A shall be brown, Phase B shall be orange, and Phase C shall be yellow. The neutral shall be gray.
- B. In addition to color coding all conductors, each conductor shall be identified in each pull box, manhole, panelboard, cable tray, or termination with circuit identification markers. This identification is applicable to all power, control, alarm, and instrumentation conductors and these markings shall be recorded on the Record Documents. Markers shall be slip-on PVC sleeve type as manufactured by Brady, Seton, or equal.
- C. Markers for other cabling shall be B-292 vinyl as manufactured by Brady, Seton, or equal.
- D. Exposed medium voltage conduits shall be labeled at 50-foot intervals with f-inch letters stating the voltage - example - "12,470 volts". Labels shall be vinyl plastic as manufactured by Brady, Seton, or equal.

### 3.6 AUTOMATIC EQUIPMENT WARNING SIGNS

- A. Permanent warning signs shall be mounted at all mechanical equipment that may be started automatically or from remote locations. Signs shall be in accordance with OSHA regulations and shall be suitable for exterior use. The warning signs shall be fastened with round head brass screws or bolts, located and mounted in a manner acceptable to the ENGINEER.
- B. Warning signs shall be 7 inches high by 10 inches wide, colored yellow and black, on not less than 18 gauge vitreous enameling stock. Sign shall read:

CAUTION  
THIS EQUIPMENT STARTS  
AUTOMATICALLY  
BY REMOTE CONTROL

### 3.7 HIGH VOLTAGE WARNING SIGNS

- A. Permanent and conspicuous warning signs shall be mounted on all equipment, doorways to equipment rooms, pull boxes, manholes, where the voltage exceeds 600 volts.

- B. Signs shall be in accordance with OSHA regulation, and shall be suitable for exterior use. The warning signs shall be fastened with round head brass screws or bolts, located and mounted in a manner acceptable to the ENGINEER.
- C. Signs shall be 7 inches high by 10 inches wide, colored red and white, on not less than 18 gauge vitreous enameling stock. Sign shall read:

WARNING  
HIGH VOLTAGE  
KEEP OUT

### 3.8 CONDUCTOR FASTENERS

- A. Glue-on type conductor fasteners shall not be used in any panels, panelboards, switchboards, switchgear, motor control centers, or other enclosures containing electrical devices and/or conductors.

- END OF SECTION -

**SECTION 16200  
CATHODIC PROTECTION**

**PART 1 - GENERAL**

1.1 DESCRIPTION

- A. This project involves the cathodic protection of the Well No. 22 steel casing and a polyethylene encased 12-inch ductile iron pipe related to the Well No. 22 Equipment and Site Improvements Project.
- B. This specification section outlines the materials, installation and testing requirements of the cathodic protection systems such as, but not limited to, the cathodic protection rectifier, deep anode groundbed, junction box, standard-potential magnesium anodes, structure connections, insulating flange kits and wiring for the corrosion protection of underground pipeline.

1.2 QUALITY ASSURANCE

- A. All cathodic protection installation work shall comply with NACE publication: SP0169 (2013 revision) "Control of External Corrosion on Underground and Submerged Metallic Piping Systems" and with RP0286 (latest revision) "Electrical Isolation of Cathodically Protected Pipelines".

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01300 – Submittals and Section 15000 – Piping, General.
- B. As-built drawings shall be submitted in accordance with the General Provisions.
- C. Submit manufacturer's catalog cuts for the following items for review by the ENGINEER:
  - 1. Cathodic Protection Rectifier
  - 2. Mixed Metal Oxide Anodes
  - 3. Deep Anode Hardware
  - 4. Junction Box
  - 5. Galvanic Anodes
  - 6. Terminal Boards
  - 7. Test Station Boxes
  - 8. Shunts
  - 9. Cable
  - 10. Insulating Flange Kits
  - 11. Thermoweld and/or Pin Brazing Equipment

1.4 GUARANTEE

- A. CONTRACTOR shall guarantee all materials and workmanship of items furnished under these specifications shall be free from defects for a period of one (1) year after final completion and acceptance of the entire contract work. The CONTRACTOR shall, at his own expense, repair or replace all defective materials or workmanship supplied by him that are found to be deficient with respect to any provisions of this specification.

## PART 2 - PRODUCT

### 2.2 MATERIALS

#### A. Cathodic Protection Rectifier

1. Cathodic protection transformer-rectifier shall be air cooled, constant DC voltage output with a DC output of 24 Volts/24 Amperes, as manufactured by Corpro or a CITY approved equal.
2. DC Output Ratings: Rectifiers shall be rated at 24 Volts/24 Amperes, or as close to this output as what can be reasonably manufactured. Rectifiers shall be capable of supplying continuous, full rated output at an ambient temperature of 45° C, in full sunlight with an expected life in excess of 30 years.
3. AC Input Ratings: Full rated DC output shall be obtainable with an AC input voltage at 5% below the nominal value. Continuous AC input voltage at 10% above the nominal value shall not damage the transformer, the diode bridge assembly, or exceed any component ratings.
4. Cooling: Cooling shall be by natural air convection. Rectifier enclosure shall be vented for natural air convection and shall be screened against insects, dust, and fitted with external louvers.
5. Transformer materials and construction shall be rated for Class "H" operation (180° C).
6. Other Options: Additional options that may be incorporated into the rectifier include: Communications filter, pre-wiring for a remote monitoring system, 115 Volt/15 Ampere GFCI convenience plug, and separate analog meters for DC Voltage and current output.
7. Electrical Panels: Electrical panels shall have a minimum thickness of 0.25" laminated phenolic, rated for Class "B" operation (105° C maximum).
8. Connection Hardware: All electrical hardware shall be copper or high conductivity brass, suitably sized, and finished with electrolysis nickel plating for superior corrosion resistance. All connections shall be tightly secured with lock washers and nuts torqued to manufacturer's recommended specifications. All electrical connections shall use the "double nut" method to ensure that any compression of the panel material will not affect the electrical conductivity of the connection.
9. Enclosure shall be stainless steel and sized to fit the rectifier needed.
10. Rating: The rectifier and enclosure must have a Lab Test certification, or a UL1012 listing.
11. Enclosures shall be equipped with a pad-lockable draw latch. Draw latch shall accommodate a 3/8-inch shackle padlock.
12. Meter shunts shall be panel-mounted Holloway type "SW" style, with an accuracy of 0.25%.
13. Rectifier shall be operated with 115/230 volt, single phase, 60 hertz AC input.

#### B. Mixed Metal Oxide Anodes

1. MMO M124 Anodes (Manufacturer: Corpro Inc., or approved equal) having the dimensions listed below:
  - a. Length: 48 inches, minimum.
  - b. Outside Diameter: 1.25 inches, minimum.
  - c. Weight: 27 pounds, minimum.
2. Anode wires shall be #8 AWG seven strand copper conductor with HALAR insulation. The cable connection to the anode shall be center connected with a cable factory bonded to the anode using a double compression crimp and sealed in a block of resin to provide maximum robustness and prevent water penetration with the copper conductor.
3. Anode hole surface box shall comprise 10 inch I.D. x 12 inch high concrete traffic boxes with cast iron covers, rated H-20, model G5 by Christy or approved equal. The cast iron cover shall be permanently marked "ANODE".

C. Deep Anode Hardware

1. Anode centralizers that secure the anode to the vent pipe shall be used. Each shall have two vent pipe clamps as shown in the project drawings.
2. Anode well casings shall be used per drilling requirements, if necessary.
3. Anode well sealant of "Portland Cement" shall be installed above the coke breeze as per the project drawings.
4. The top of the anode well sealant shall be completed to approximately two feet (2 ft.) below grade. A 2" schedule 80 PVC conduit will stub out above the top of the sealant and will route anode leads from the well to the adjacent anode junction box.
5. Plastic vent pipe shall be used from the bottom of deep anode groundbeds to the surface to dissipate and vent generated gasses from the anode groundbed. The material shall be plastic and chemically resistant to chloride gases. The diameter shall be 2-inch for deep wells. The vent pipe in the active column shall be slotted (AllVent™) as manufactured by Loresco International or approved equal. The vent pipe above the earth contact backfill shall be solid walled pipe. The plastic vent pipe shall extend above grade and the vent outlet shall be screened and installed in an inverted manner adjacent to the rectifier/junction box.

D. Junction Box

1. Terminal boards shall be mounted inside a NEMA 3R rated Junction Box. Junction boxes shall be post mounted below the rectifier with RGS conduit.
2. Electrical panels shall be 0.25" minimum thickness of laminated phenolic board. The panel fittings shall include compression cable terminals, copper bus bars and current measurement shunts rated 50mV/50A (0.001 ohm) manufactured by Holloway or approved equal.

E. Galvanic Anodes

1. The anodes at the test stations shall consist of 32lb. High Potential Magnesium anodes as manufactured by Corpro or approved equal.
2. Length 30 inches, diameter 8 inches.
3. Anode Ingot Composition

Aluminum	0.010% Max.
Manganese	0.50 - 1.3%
Copper	0.02% Max.
Nickel	0.001% Max.
Iron	0.03% Max.
Total Other Impurities	0.05 Each or 0.30% Max.
Magnesium	Balance
4. The anode lead wire shall be No. 12 AWG, seven stranded copper conductors with THHN insulation. The cable connection to the anode shall be cable factory bonded to the anode using a double compression crimp and sealed in a block of resin to provide maximum robustness and prevent water penetration to the copper conductor.
5. Prepackaged anode backfill shall have the following composition: 75% Gypsum, 20% Bentonite, 5% Sodium Sulfate.

2.3 TEST PANEL

- A. A phenolic test panel shall be used for making electrical connections between the pipeline and anodes, and for the cable terminations for the pipe leads and reference electrodes as shown on the drawings.
- B. Panel boards shall be 0.25" minimum thickness of laminated phenolic board. The panel fittings shall include compression cable terminals, copper bus bars and current measurement Holloway RS shunts or approved equal.

## 2.4 TEST STATIONBOXES

- A. Test station terminal boards shall be mounted inside a Christy G5 flush to grade traffic box with cast iron lid marked "CTS WATER".

## 2.5 CABLE

- A. Test cables shall be single conductor size #8 AWG, HMWPE insulated, High Molecular Weight Polyethylene jacketed cable suitable for direct burial.
- B. All cable conductor sizes and insulator colors shall be as indicated in the cathodic protection drawing details. All cables shall be free of splices unless specifically indicated in the drawings.

## 2.6 INSULATING FLANGEKITS

- A. The insulating materials shall be of the type designated by the manufacturer as suitable for the operating temperature and pressure of the applicable service. The insulating flange kits shall be installed by the pipefitters. The flange kits shall comprise the following:
  1. Insulating Gasket: All gaskets shall be full face type of minimum 1/8" thickness dielectric made of laminated G-10 with neoprene on each side of gasket.
  2. Insulating Sleeves and Washers: Insulating stud sleeves and washers shall be one-piece construction made of G-10 material with dielectric strength not less than 500 volts per mil, and compressive strength not less than 172.3 Mpa (25,000 psi).
  3. Steel Washers: Steel washers shall be 1/8" thick grade 316 stainless steel.
  4. Manufacturers: Products shall be manufactured by PSI, Central Plastics, APS or an approved equal.

## 2.7 THERMOWELDEQUIPMENT

- A. Manufactured by Continental or Erico. Materials used to be selected and used per manufacturer's instructions and guidelines.

## 2.8 PIN BRAZINGEQUIPMENT

- A. Structure connections (where required shall be pin brazed using "Safetrack" or BAC brazing guns and pins, coated with Carboline SplashZone coating.

## 2.9 CABLE IDENTIFICATIONTAGS

- A. All cables in test stations shall be identified as shown in the drawings. Labeling shall consist of 1-inch Dia. Brass I.D. tags nylon wire tied to each cable.

## 2.10 CABLE WARNINGTAPE

- A. All buried cables shall have plastic warning tape installed a minimum of 12 inches above the top of the cables for the entire buried length of the cables. The warning tape shall be at least three inches wide and shall be yellow with black lettering with the legend "CAUTION, CATHODIC PROTECTION CABLES BURIED BELOW" in three-inch high lettering printed at a minimum of seven-foot intervals along the entire buried length of the cable.

## 2.11 COPPER-COPPER SULFATE REFERENCEELECTRODES

- A. The permanent copper-copper sulfate (Cu/CuSO<sub>4</sub>) reference electrodes shall not be susceptible to chloride contamination and rated to deliver accurate potential measurements for up to 30 years.

- C. The reference electrode shall be composed of a copper element, which is immersed in a glass tube containing supersaturated copper sulfate solution.
- D. Each reference electrode shall be tested for electrical potential and resistance prior to shipping. The measurements obtained from these tests are recorded and included with each cell, and cells which do not meet or exceed established performance thresholds are rejected.
- E. The reference electrode shall provide an accuracy of  $\pm 5$  millivolts.
- F. The reference electrode shall be provided with #14 AWG HMWPE insulation. The lead wires shall be continuous without splicing.
- G. The copper-copper sulfate (Cu/CuSO<sub>4</sub>) reference electrode shall be model Permacell Plus-B as manufactured by Corpro or an approved equal.

## 2.12 PIPE BONDING CABLES

- A. All bonding cables shall be of the materials and quantity as shown in the drawings.
- B. Pipe must be bonded at all joints that are not welded. This applies across all appurtenances except for insulating joints.

## PART 3 - EXECUTION

### 3.1 RECTIFIER AND JUNCTION BOX

- A. Location: Install rectifier enclosure and junction box in locations as indicated in the cathodic protection design drawings. Place the enclosure to allow ready access to the side of the enclosure for testing and routine maintenance.
- B. Terminate all anode cables at the junction box and all structure and anode header cables at the rectifier in accordance with the cathodic protection drawings. The vent pipe shall be terminated adjacent to the rectifier/junction box location.
- C. Electrical Grounding: The rectifier shall be electrically grounded to a suitably sized ground rod in accordance with NEC and other applicable electrical codes.

### 3.2 DEEP ANODE GROUND BED

- A. Permits: The CONTRACTOR shall obtain well drilling permits required by all applicable City, County and/or State agencies.
- B. Field Location: Location of the anode wells are approximate. Exact anode well placement shall be determined and verified in the field by the CONTRACTOR's engineer and the CITY's representative if applicable.
- C. Anode Hole Drilling: The anode bore hole shall be 10 inches diameter and to the depth shown on the Drawings. Drilling shall be accomplished with rotary bit. Driller shall use standard techniques (i.e. trough and vacuum truck) to capture and contain the drilling fluids, mud and cuttings at the top of the hole. The driller shall select the type and consistency of drilling fluids to be consistent with soil characteristics. The drilling rig shall be leveled to provide a round, straight and plumb anode hole.
- D. Anode Installation: The anodes shall be centered in the hole and spaced as per the design drawings. The lead wires shall be pre-marked for the nominal anode depth. The final depth shall be recorded with the first anode in the hole (i.e. the bottom anode) identified as anode number one (1). The anode lead wires shall not be damaged during handling or lowering into the hole. Under no circumstances shall the anode

lead wires be clamped or pinched around another object while lowering. If the insulation for any anode lead wires is cut, broken, or nicked, the complete anode shall be rejected and shall be removed from the job site. The CONTRACTOR shall replace all damaged anodes at no additional expense to the CITY.

- E. Anode Column Backfill: The anode backfill shall be coke breeze slurried above-grade and then pumped into the hole after the anodes are installed. The backfill shall be pumped from the bottom of the hole up using a pipe that is the length of the anode hole. The pipe shall be removed from the hole after the installation is complete. Installation of the coke breeze backfill shall be uniform with no voids around the anodes.
- F. Inactive Column Backfill: Portland cement seal shall be installed into the anode hole after the backfill has settled.
- G. Precautions: The CONTRACTOR shall take all necessary precautions to avoid entrance of foreign matter into the hole, movement of soil strata, or collapsing of the hole during the progress of the work. Should movement of soil strata or collapse of the drilled hole interfere with proper completion of the anode groundbed, the CONTRACTOR will recover the wires and anodes and ream or re-drill the hole.
- H. Mud and Cuttings: Drilling mud, cuttings and other waste shall be disposed of onsite in a manner which complies with the rules and regulations of the State, City and County.

### 3.3 GACP ANODE BEDS

- A. Sacrificial anodes shall be installed in selected excavation sites in trenches horizontal to the piping in accordance to the cathodic protection design drawings.
- B. Specifically, the anode trench shall be of width and depth to properly accommodate the anodes.
- C. The anodes must never be lowered or suspended by their cables, anodes shall be lowered into the trenches using suitably sized ropes.
- D. The anodes must be thoroughly soaked with water as each anode is installed using a minimum of 10 gallons of fresh water per anode.
- E. After installing the anodes, the trench shall be backfilled to grade using stone and clod free native material.
- F. Any compaction at the excavation shall be in accordance with the standards and requirements of the permitting agency.

### 3.4 ANODE CABLES

- A. Unless specified in civil specifications, dig a 6 (or 12) - inch wide x 24- inch deep trench from the anode bed to the test station box location.
- B. Route the anode cables to at least 24" below grade.
- C. Leave slack in the cables at both ends and avoid damage to the cable during installation.

### 3.5 WIRE AND CABLE

- A. Depth: Install all underground wires and cables a minimum of 24 inches below final grade with a minimum separation of 6 inches from other underground structures.
- B. Backfill over wire: All buried cables shall have plastic warning tape installed a minimum of 12 inches above the top of the cables for the entire buried length of the cables.

### 3.6 TERMINAL PANELS

- A. Location: Install GACP test station enclosure in locations as indicated in the cathodic protection design drawings, generally immediately adjacent to the anode bed behind the curb to allow ready access for testing and routine maintenance.
- B. Terminate all cables at the test station panels in accordance with the cathodic protection drawings.

### 3.7 INSULATING FLANGE KITS

- A. This section applies to the installation of new or the repair/refitting of existing flange kits on below grade flange locations.
- B. Below Grade Insulating Flange Kits: There shall be pipe flanges with insulating flange kits installed as indicated in the drawings. These pipe flanges shall be dedicated solely to cathodic protection electrical isolation.
- C. The insulating flange kits shall be installed by the CONTRACTOR installing the pipeline, pipe fittings and pipe flanges.

### 3.8 CABLE IDENTIFICATION TAGS

- A. Brass identification tags shall consist of 1-inch Dia. tags nylon wire tied to each cable. Tags shall be marked/stamped with: “#P” (with a number indicating pipe size in inches), “REF” for reference electrode cables, and “A#” (with a number dedicated to each anode) for anode cables.

### 3.9 EXOTHERMIC WELDING

- A. Negative cable connections to specified buried piping shall be accomplished by exothermic welding. Connections shall be on the top of the pipe between the 11 and 1 o'clock position.
  1. Observe proper safety precautions, welding procedures, exothermic weld material selection, and surface preparation as recommended by the exothermic weld manufacturer.
  2. Ensure there is adequate ventilation in the area of the welding.
  3. Ensure that the structure wall thickness is of sufficient thickness that the exothermic weld process will not damage the integrity of the structure.
  4. Clean a 4-inch by 4-inch space on the structure surface to a bright, shiny, metallic surface free of all serious pits and flaws by use of a mechanical grinder or a file.
  5. Connect wire directly to the structure by use of exothermic weld kits in accordance with the kit manufacturer's instructions.
  6. Remove all weld slag from the weldment with a wire brush.
  7. Visually inspect the weld for size, material leakage, exposed conductor, porosity, color, and surface finish.
  8. Check and verify adherence of the bond to the substrate for mechanical integrity by pulling and applying steady tension on the cable while striking the side of the weld once with a 2-pound hammer with a shearing blow.
  9. Any welds that break loose or show signs of poor quality shall be removed and re-welded.
  10. If the portion of rejected welds is more than 5 percent or 3 during one work day the CONTRACTOR shall stop welding and thoroughly review the weld kit manufacturer's installation instructions and inspection guide to reduce the number of rejected welds.
  11. Install a weld cap over the weld.

12. Apply protective coating material to all exposed areas, welds, and conductors in accordance with the manufacturer's recommendations. The coating shall overlap the structure coating a minimum of 1 inch. Allow sufficient time to dry before back filling.
13. Allow sufficient slack in the lead wire to compensate for movement.
14. Pipe test wires shall be wrapped under and looped through itself to provide stress relief.
15. Protect wires from damage until final backfill and termination in junction box.

### 3.10 PIN BRAZING

- A. Method: Attach negative cables and bond cables to the structures by pin-brazing. Prior to pin brazing, measure the pipe wall thickness using an ultrasonic thickness gauge in the presence of the CITY to determine if the pipe wall thickness is suitable for pin brazing.
- B. Preparation: Clean and dry the structure surface to which the negative cable is to be attached.
  1. Use a grinding wheel to remove all dirt, coating, oxide and mill scale from the structure surface over an area approximately 3 inches square.
  2. Use a solvent to remove oil and grease, if necessary. Clean the surface to bright metal. Repeat preparation of an adjacent area for the test lead attachment.
  3. Remove approximately 1 inch of insulation from each end of the wires to be pin brazed, exposing clean, oxide-free copper.
- C. Brazing: Pin braze negative cables to structure as follows:
  1. Using the proper size pin and ferrule as recommended by the Safetrack operation manual. Load both pieces into the brazing gun.
  2. Press the brazing gun to the structure and pull trigger to begin brazing. The brazing gun must be held steadily during the brazing process.
  3. Remove brazing gun without pulling the trigger. Knock the shank off the brazing pin using a light tap from a hammer.
  4. Attach lugged wire lead to pin, and secure with locking nut.
  5. Apply Carboline SplashZone onto pin brazes below grade in a 1/8" to 1/4" thick layer, ensuring that all cracks and gaps are filled.

### 3.2 EARTHWORK

- A. All excavations, trenching, backfilling, compacting and regarding shall be in accordance with applicable contract civil specifications and drawings, with the project specifications and with local jurisdictional authority requirements.

### 3.3 TESTING AND RECORDKEEPING

- A. All testing shall be carried out by a NACE level CP-2 qualified engineer or higher under the supervision of a qualified (NACE CP Specialist or Corrosion PE) and experienced personnel employed by a company normally engaged in cathodic protection.
- B. Electrical Isolation: Insulating flanges shall be tested for correct operation prior to tape wrapping or coating and backfilling using a "Gas Electronics model 601 Isolation Flange Tester". The insulating flange tester shall be operated in accordance with the manufacturer's instructions. If the flange kit passes the isolation test, then it can be wrapped (or coated) and buried as applicable. If the insulating flange fails the test, then it shall be repaired or replaced by the CONTRACTOR and then retested to confirm proper operation. Records shall be retained and submitted to the district.

- C. Pipe Lead Wire Integrity Tests: After the pipes or fittings are buried, all new test and structure wires shall be tested for their integrity and electrical continuity with the pipeline. Any damaged or broken wires shall be replaced by the CONTRACTOR and retested. All records shall be retained and submitted to the CITY.
- D. Cathodic Protection Surveys: The following minimum tests shall be carried out for each new cathodic protection system installed:
  - 1. Visually inspect the installations for compliance with the cathodic protection design drawings and specifications.
  - 2. Record "Native" (as found) structure-to-electrolyte potentials for all pipes (at all test leads at the test station) and structures.
  - 3. For ICCP systems: terminate all cables at the appropriate terminals inside the junction box and rectifier. For GACP systems: connect the pipe structure wire to the panel board bus bar and record "ON" structure-to-electrolyte potentials at piping terminals in the junction box,
  - 4. For ICCP systems: Energize the rectifier and adjust current output with the taps. Adjust as needed depending on polarization characteristics and allow system to polarize for a minimum of 48 hours. For GACP systems: Leave the anodes connected for a minimum of 24 hours for the structures to polarize.
  - 5. Install current interrupters at the test stations (use GPS type interrupters to synchronize the interruption cycles of all rectifiers influencing the subject pipelines as needed) and carry out an On/Instant (Polarized) Off structure-to-electrolyte potential survey at all pipe terminals.
  - 6. Submit the commissioning report with tabulated data, conclusions and recommendations to the CITY.
  - 7. Submit as-built drawings to the CITY.
  - 8. The CONTRACTOR shall repair all deficiencies prior to final acceptance at no cost to the CITY.

#### 3.4 CLEANUP

- A. The CONTRACTOR shall be responsible for clean-up and removal of all debris, extra material, and equipment utilized for installation of the cathodic protection system.

- END OF SECTION -

**SECTION 16400**  
**SERVICE AND DISTRIBUTION**

**PART 1 – GENERAL**

1.1 DESCRIPTION

- A. Requirements specified in Section 16000 form a part of this Section. This Section outlines the electrical work for underground or overhead power service and power distribution.
- B. **Related Section:** Section 16902 – Electrical Controls
- C. **Power Service:** The underground or overhead service shall be complete and as shown on the Drawings. The service installation shall conform with the power company service requirements.
- D. **Distribution:** The power distribution system shall include equipment installations and underground or overhead wiring installations as shown on the Drawings.

1.2 SUBMITTALS

- A. Submit for the CITY's approval material lists, shop drawings, factory test reports, and technical data to the extent required in Section 16010.

**PART 2 – PRODUCTS**

2.1 GENERAL

- A. Provide all the equipment and materials, and complete all of the power service, power distribution and grounding installations as indicated, specified and required. Sizes of equipment shown on the Drawings and space allowed for the equipment are based on equipment manufactured by only one of the listed acceptable manufacturers. The manufacturers and models listed in this Section of the Specifications are acceptable providing they conform to the Specifications and that the equipment and materials provided fit properly in the available space. Refer to Section 16111 for conduits, Section 16123 for 600 Volt Class Cable, and Section 16195 for Electrical Identification.

2.2 SERVICE EQUIPMENT

- A. Provide the metal enclosed, service equipment as shown on the Drawings, specified in Section 16160 and in accordance with the power company service requirements. The low voltage equipment shall be manufactured by Square D, Cutler Hammer, General Electric, Siemens, Allen Bradley, or approved equal. Service equipment shall be part of the motor control center assembly as shown on the Drawings. All sections must meet VERNON POWER UTILITY requirements.
- B. Metering Section shall be full height, free standing and equipped with meter sockets, copper busses, main circuit breaker and ground fault protection as indicated. The meter sockets shall be provided for the power company self contained meter or meters that shall be connected to instrument transformers as required. Must meet VERNON POWER UTILITY requirements.
- C. Pull Section shall be totally metal enclosed, full height, free standing and equipped with copper busses and connectors for the underground service conductors. Must meet VERNON POWER UTILITY requirements.
- D. A main circuit breaker shall be used as a service disconnect in the service equipment as shown on the Drawings.
- E. Nameplates shall be provided for the service equipment. Refer to Section 16195 for nameplates.
- F. Double Hasp shall be attached on a gasketed hinged door of outdoor equipment for two padlocks.

- G. Grounding shall meet the requirements of Section 16170.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. Provide all the equipment installations and wiring installations including connections and interconnections for the power service and distribution as indicated, specified and required. Assure proper fits for all equipment and materials in the spaces shown on the Drawings.
- B. **Earthwork, Concrete and Painting:** The required work for excavations, backfills, concrete and painting shall be provided for the electrical installations.
1. Earthwork shall be performed for handholes, pull boxes, underground conduits, poles, guys, grounding, equipment foundations and supports as indicated and specified.
  2. Concrete shall be provided for electrical equipment foundations and supports, and conduit encasements as indicated and specified in Division 3.
  3. Painting shall be provided for all installations having unfinished surfaces as specified in. Field damaged factory finishes on equipment shall be touched-up with paint that is equal in quality and color to the original factory finish.
- C. **Handholes and Pull Boxes:** Precast concrete handholes and pull boxes shall be installed in excavations as shown on the Drawings and as required.
1. Accessories shall be installed, which include pull eyes and required hardware.
  2. Covers shall be installed on all handholes and pull boxes.
- D. **Service Equipment:** Install the metal enclosed service equipment and wiring as indicated, specified and required.
1. Equipment shall be installed level and securely attached to the concrete foundation with anchor bolts. The sections shall be joined together with bolts, washers and nuts to form a unit assembly.
  2. Wiring installations shall be complete and in accordance with the power company service requirements.
  3. Nameplates shall be laminated plastic and attached to clean surfaces of the metal enclosures with an adhesive or equal.
- E. **Grounding:** Install all the equipment, materials and wiring to complete the equipment, structural, lightning and system grounding installations as shown on the Drawings, specified and required.
- F. **Panelboards and Switchboards:** Install the metal enclosed panelboards and distribution switchboards as indicated, specified and required.
1. Equipment shall be installed level and securely attached to the concrete foundations, floors and walls with anchor bolts.
  2. Wiring installations shall be complete, including all connections.
  3. Nameplates shall be laminated plastic, and attached to clean surfaces of the metal enclosures with an adhesive.
- G. **Checking, Adjusting and Testing:** Provide all checking, adjusting and testing operations on equipment and complete installations as specified in Section 16100.

- END OF SECTION -

## SECTION 16429

### LOW-VOLTAGE DISTRIBUTION SWITCHBOARDS (GROUP MOUNTED)

#### PART 1 – GENERAL

##### 1.1 SCOPE

- A. The CONTRACTOR shall furnish and install, where indicated, a free-standing, dead-front type low-voltage distribution switchboard, utilizing group mounted circuit protective devices as specified herein, and as shown on the contract drawings.
- B. **Related Section:** Section 01300 – Submittals

##### 1.2 REFERENCES

- A. The low voltage distribution switchboards and all components shall be designed, manufactured and tested in accordance with the latest applicable following standards:
  - 1. NEMA PB-2
  - 2. UL Standard 891.

##### 1.3 SUBMITTALS

- A. **The following information shall be submitted to the ENGINEER for review:**
  - 1. Master drawing index
  - 2. Front view elevation
  - 3. Floor plan
  - 4. Top view
  - 5. Single line
  - 6. Schematic diagram
  - 7. Nameplate schedule
  - 8. Component list
  - 9. Conduit entry/exit locations
  - 10. Assembly ratings including:
    - a. Short-circuit rating
    - b. Continuous current
    - c. Voltage
  - 11. Major component ratings including:
    - a. Voltage
    - b. Continuous current
    - c. Interrupting ratings
  - 12. Cable terminal sizes.
  - 13. Busway connection
  - 14. Connection details between close-coupled assemblies
  - 15. Composite floor plan of close-coupled assemblies
  - 16. Key interlock scheme drawing and sequence of operations.

17. Calculation of flash protection boundary and require personal protective equipment

**B. Submit copies of the following information for record purposes:**

1. Final as-built drawings and information for items listed in Section 1.4
2. Wiring diagrams
3. Certified production test reports
4. Installation information
5. Seismic certification and equipment anchorage details

**C. The CONTRACTOR or the equipment manufacturer shall determine and submit the calculation to the CITY the arc Flash Protection Boundary (FPB) and the recommended Personal Protective Equipment (PPE).**

**1.4 QUALIFICATIONS**

- A. The manufacturer of the assembly shall be the manufacturer of the circuit protective devices within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the ENGINEER, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

**1.5 REGULATORY REQUIREMENTS**

- A. The low-voltage switchboard shall be UL labeled.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

**1.7 OPERATION AND MAINTENANCE MANUALS**

- A. Copies of the equipment operation and maintenance manuals shall be provided. Operation and maintenance manuals shall include the following information:
  1. Instruction books and/or leaflets
  2. Recommended renewal parts list
  3. Drawings and information required by section 1.04.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. Cutler-Hammer
- B. General Electric
- C. Engineer approved equal

## 2.2 RATINGS

- A. The assembly shall be rated to withstand mechanical forces exerted during short-circuit rating as indicated on the Plans.
- B. Voltage rating to be as indicated on the Plans.

## 2.3 CONSTRUCTION

- A. Switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide adequate ventilation within the enclosure.
- B. All sections of the switchboard shall be rear aligned with depth as shown on the drawings. All protective devices shall be group mounted. Devices shall be front removable and load connections front accessible enabling switchboard to be mounted against a wall.
- C. The assembly shall be provided with adequate lifting means.
- D. The switchboard shall be equal to Cutler-Hammer type Westinghouse Pow-R-Line C utilizing the components herein specified and as shown on the drawings.
- E. The switchboard shall be UL listed.
- F. The manufacturer shall determine and label the Flash Protection Boundary (FPB) and required Personal Protective Equipment (PPE).

## 2.4 BUS

- A. All bus bars shall be silver-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on NEMA standard current density of 1000 amps per square inch.
- B. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.
- C. A copper ground bus (minimum 1/4 x 2 inch), shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard.
- D. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with conical spring type washers.

## 2.5 WIRING/TERMINATIONS

- A. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturers wiring diagrams. Wiring diagrams shall contain terminal and wire numbers.
- B. Mechanical-type terminals shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size as indicated on the Plans.
- C. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the Plans.
- D. All control wire shall be type SIS, bundled and secured with nylon ties. Insulated locking spade terminals shall be provided for all control connections, except where saddle type terminals are provided integral to a device.

All current transformer secondary leads shall first be connected to conveniently accessible short-circuit terminal blocks before connecting to any other device. All groups of control wires leaving the switchboard shall be provided with terminals blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.

## 2.6 MOLDED CASE PROTECTIVE DEVICES

- A. Main and feeder protective devices shall be molded case circuit breakers with inverse time and instantaneous tripping characteristics and shall have ground fault protection where indicated, or as required by NEC.
- B. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make/quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy, and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
- C. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the Drawings.
- D. Where indicated on the Drawings, circuit breakers shall be UL listed for series application.
- E. Where indicated on the Drawings, circuit breakers shall be current limiting.
- F. Circuit breakers 400 ampere frame and below shall be thermal-magnetic trip units and inverse time-current characteristics. Circuit breakers 600 ampere through 1200 ampere frame shall be microprocessor-based RMS sensing trip units. Circuit breakers 1600-ampere through 2500-ampere frame shall be microprocessor-based RMS sensing trip units.
- G. On circuit breakers 800 amps and larger, a trip button and integral current reading display shall be provided
- H. Where indicated, provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
- I. Provide lamicoïd labels for feeder circuit breakers that provide a descriptive name, as identified on the Drawings, of the load being served. Include circuit number and circuit breaker trip rating.

## 2.7 ACCESSORIES

- A. Provide shunt trips, bell alarms and auxiliary switches as shown on the contract drawings.
- B. Circuit Breaker Energy Monitoring.
- C. Centralized Local Monitoring.
- D. Provide transient voltage surge suppression as specified in Section 16505 and indicated on the Plans.

## 2.8 MISCELLANEOUS DEVICES

- A. Key interlocks shall be provided as indicated on the Plans or required for safe equipment operation.
- B. Control power transformers with primary and secondary protection shall be provided, as indicated on the Plans, or as required for proper operation of the equipment.
- C. Each section of the switchboard shall be provided with a space heater, thermostatically controlled. Power for the space heaters shall be obtained from a control power transformer within the switchboard. Supply voltage shall be 120 volts AC.

## 2.0 ENCLOSURES

### A. Indoor NEMA 1 Enclosure

### B. Outdoor NEMA 3R Enclosure

1. Outdoor enclosure shall be non-walk-in and meet applicable NEMA 3R UL requirements.
2. Enclosure shall have flat roof sloping roof downward toward rear.
3. Outer sections shall be the same widths as indoor structures, except each end of the outdoor assembly shall have an end trim.
4. The enclosure shall be provided with bolt-on rear covers for each section.
5. Doors shall have provisions for padlocking.
6. Ventilating openings shall be provided complete with replaceable fiber glass air filters.
7. Provide space heaters thermostatically controlled for each structure with adequate wattage to prevent the accumulation of moisture.
8. Power for space heaters, lights and receptacles shall be obtained from a control power transformer within the switchboard. Supply voltage shall be 120 volts AC.

## 2.10 NAMEPLATES

- A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the Plans. Nameplates shall be laminated plastic, black characters on white background. Characters shall be 3/16-inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Furnish master nameplate giving switchboard designation, voltage ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.
- B. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

## 2.11 FINISH

- A. All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchboard shall be ANSI 61 light gray.

## PART 3 – EXECUTION

### 3.1 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
  1. The switchboard shall be completely assembled, wired, adjusted, and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment. The main circuits shall be given a dielectric test of 2200 volts for one (1) minute between live parts and ground, and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for one (1) minute between live parts and ground.
- B. The manufacturer shall provide certified copies of factory test reports.

### 3.2 INSTALLATION

- A. The CONTRACTOR shall install all equipment per the MANUFACTURER'S instructions, Contract Documents, and National Electrical Code.
- B. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to the floor without the use of floor sills provided the floor is level to 1/8 inch per 3-foot distance in any direction. All necessary hardware to secure the assembly in place shall be provided by the CONTRACTOR.

### 3.3 FIELD INSPECTION AND TESTS

- A. Provide the services of an authorized representative of the equipment manufacturer to make site visits to supervise the field testing and installation to be performed by the CONTRACTOR. The manufacturer's representative shall state in writing that the equipment has been correctly installed and tested.
- B. **Perform the following minimum tests and checks before energizing equipment:**
  - 1. Megger terminals and busses for grounds after disconnecting devices sensitive to megger voltage.
  - 2. Inspect all mechanical and electrical interlocks for proper operation.
- C. Perform any other tests recommended by the equipment manufacturer and other tests as described in this specification.
- D. The manufacturer's representative shall supply results of all factory and field tests in writing for submittal to the Engineer.
- E. The manufacturer shall supply test results to confirm that the assembly design has been tested to substantiate conformance with the applicable ANSI and NEMA Standards.
- F. Touch-up paint all chips and scratches with manufacturer supplied paint and leave remaining paint with CITY.
- G. The CONTRACTOR shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. Necessary field settings of devices, adjustments, and minor modifications to equipment to accomplish operational condition shall be carried out by the CONTRACTOR at no additional cost to the CITY.

-END OF SECTION -

**SECTION 16440  
DISCONNECT SWITCHES**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers electrical disconnecting switches.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents prior to installation.

**PART 2 – PRODUCTS**

2.1 DISCONNECT SWITCHES

- A. Disconnect switches shall be heavy-duty safety switches with a quick-make, quick-break operating mechanism, with full cover interlock, and indicator handle. The disconnect switches shall be furnished with fuses of the size indicated on the Plans. One set of spare fuses shall be furnished for each fused disconnect switch. Disconnect switches shall be NEMA type HD heavy duty construction, UL 98 listed.
- B. Enclosures shall be rated NEMA 12 for indoor use, and NEMA 3R for outdoor use, unless otherwise indicated on the Plans.
- C. Disconnect switch handle shall be padlockable.
- D. Disconnect switches in the corrosive areas as indicated on the Plans, shall be NEMA 4X, 304 stainless steel.
- E. Disconnect switches shall be as manufactured by Square D, Cutler Hammer, Allen-Bradley, General Electric, or equal.

**PART 3 - EXECUTION**

3.1 INSTALLATION

- A. Disconnect switches shall be installed as indicated on the Plans.
- B. Provide grounding per NEC, and Section 16170.

- END OF SECTION -

**SECTION 16461**  
**TRANSFORMERS - DRY TYPE**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers dry type transformers used for low voltage, single and three phase, power distribution and lighting.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents prior to installation.

1.3 QUALITY ASSURANCE

- A. ANSI C57.12.01, General Requirements for Dry-Type Distribution and Power Transformers
- B. NEMA ST 20, Dry-Type Transformers for General Applications
- C. UL 506, Standard for Specialty Transformers

**PART 2 – PRODUCTS**

2.1 DISTRIBUTION - LOW VOLTAGE LIGHTING AND POWER

- A. Transformers shall be premium high efficiency quiet type, and shall be installed where indicated on the Plans. The primary winding of the transformers shall have two 2-1/2 percent taps above, and below normal.
- B. The transformers shall have a BIL of 10 KV with a temperature class of 185 degrees C for transformers up to 25 KVA, and a temperature class of 220 degrees C for larger transformers.
- C. The sound level shall not exceed 44 dBA measured at 5 feet from the transformer after installation. Core and coil assemblies 30 KVA and larger, shall be mounted on rubber vibration isolators, designed to reduce harmonics generated noise.
- D. Transformers shall be types manufactured by Westinghouse, Hevi-Duty, or equal.

2.2 FERRO RESONANT ISOLATION TRANSFORMERS

- A. Ferro resonant isolation transformers shall be provided where indicated on the Plans. Regulation shall be +3 percent for an input range of +10 percent. Common mode noise rejection shall be better than 120 dB with transverse mode noise rejection better than 60 dB. Voltage spike attenuation shall be better than 250:1.
- B. Isolation transformers shall be as manufactured by Shape Magnetronics, Control Concepts, inc., or equal.

**PART 3 – EXECUTION**

3.1 INSTALLATION

- A. Transformers shall be installed as indicated on the Plans, and in accordance with the manufacturer's instructions and recommendations. CONTRACTOR shall provide painted metal wall brackets, when required.
- B. Grounding shall be provided per NEC, and Section 16170.

- END OF SECTION -

**SECTION 16470  
PANELBOARDS**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers electrical panelboards.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and the Contract Documents prior to installation.
- B. Panel layout with alphanumeric designation, branch circuit breaker sizes and types, AIC rating, bus sizes, and other characteristics.

1.3 QUALITY ASSURANCE

- A. NEMA PB-1, Panelboards
- B. NEC
- C. UL67, Panelboards

**PART 2 – PRODUCTS**

2.1 PANELBOARDS

- A. Dead-front panelboards, including lighting distribution and control panels, shall be furnished and installed as indicated on the Plans. Buses shall be copper. Mounting and type of enclosures shall be as indicated on the Plans. Where not indicated, indoor enclosures shall be NEMA 12 and outdoor enclosures shall be NEMA 4. The minimum interrupting capacity of any device shall be as indicated on the Plans.
- B. Protective devices shall be replaceable without disturbing adjacent units. Wire connectors shall be suitable for wire sizes indicated. Branch circuits shall be numbered as indicated on the Plans, and a complete typed circuit schedule shall be furnished under a transparent cover, and affixed to the panel. Phase busing shall be full height without reduction. Two hundred percent neutral bars shall be included on 120/208V, 3 phase, 4 wire panels only, and shall have suitable lug for each outgoing circuit requiring neutral connection. Spaces for future protective devices provided in lighting panels shall be bused for the maximum device that can be fitted into them.
- C. Panelboards shall be finished with a primer, rust resistant phosphate undercoat and two coats of oven baked enamel with finish ANSI grey. Doors shall not uncover any live parts, and shall be hinged and have latches that require no tool to operate. Panelboard doors shall be lockable. Lock and two keys shall be furnished.
- D. Each panelboard shall have, on the outside of the door, a lamicon nameplate with 3/4 inch letters as specified elsewhere in these Contract Documents.
- E. Panelboards shall be manufactured by Cutler Hammer, General Electric, or equal,
- F. Panelboards shall be service entrance rated where required, and as shown on the Plans.

### **PART 3 – EXECUTION**

#### 3.1 INSTALLATION

- A. Panelboards shall be installed as indicated on the plans and according to manufacturer's instructions.
- B. Provide grounding per NEC, and Section 16170.
- C. CONTRACTOR shall verify all NEC clearance requirements prior to installation.

- END OF SECTION -

**SECTION 16476**  
**LOW VOLTAGE CIRCUIT BREAKERS**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall furnish and install, low voltage circuit breakers, as indicated on the Drawings and specified herein.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents prior to installation.

1.3 QUALITY ASSURANCE

- A. The breaker manufacturer's facilities shall be ISO 9001 certified.

**PART 2 – PRODUCTS**

2.1 GENERAL

- A. Circuit breakers shall be manufactured by Cutler-Hammer, Allen-Bradley, General Electric, or equal.
- B. Circuit breaker frame, trip, short circuit, and interruption ratings shall be as indicated on the Drawings, except that they shall be coordinated with the ratings of the equipment actually furnished, and shall be modified where necessary to suit the equipment. Circuit breakers to be used in motor control centers shall be as indicated on the Drawings. Where no indication of type is given on the Drawings circuit breakers protecting motors shall be motor circuit protectors, and other circuit breakers shall be molded case type.
- C. Circuit breakers for mounting in motor control centers, or for separate mounting shall be of the air-break type, quick-make and quick-break, 600 volt, with number of poles as indicated on the Drawings.
- D. Each pole of the circuit breaker shall provide inverse time delay, and instantaneous circuit protection.
- E. The breakers shall be operated by a handle, and shall have a switching mechanism that is mechanically trip free from the handle, so that the contacts cannot be held closed against short circuits, and abnormal currents. Tripping due to overload, or short circuit shall be clearly indicated by the handle automatically assuming a position between the manual ON and OFF positions. Latch surfaces shall be ground and polished. Poles shall be constructed so that they open, close, and trip simultaneously.
- F. Breakers must be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be non-welding silver alloy. Arc extinction must be accomplished by means of arc chutes. The minimum interrupting ratings of the circuit breakers shall be at least equal to the available short circuit current at the line terminals.
- G. Circuit breakers shall conform to the applicable requirements of UL 489.
- H. Molded case circuit breakers shall be ambient temperature compensating that provides inverse time delay overload and instantaneous short circuit protection by means of a thermalmagnetic element. Compensation shall be accomplished by a secondary bi-metal that will allow the breaker to carry rated current between 25 degrees C and 50 degrees C with tripping characteristics that are approximately the same throughout this temperature range.

- I. On breakers with interchangeable, thermal, adjustable magnetic trip, the accessibility and position of the adjustment knob shall not be changed from those on the standard breaker.
- J. Unless mounted in a switchboard, or panelboard, circuit breakers shall be housed in a NEMA rated enclosure as described elsewhere in these specifications.
- K. Provide circuit breakers with shunt trip mechanisms where shown on the Drawings.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. Circuit breakers shall be installed as indicated on the Drawings and per manufacturer's instructions.

- END OF SECTION -

**SECTION 16477  
600 VOLT FUSES**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers the requirements for protective fusing on this project. The CONTRACTOR shall furnish and install fuses and fuse holders per the Drawings and equipment manufacturers recommendations.
- B. This specification includes the general requirements for various types of fuses whether they are shown on the Drawings or not. If fusing is required by codes or manufacturers recommendations, but not shown on the Drawings, this specification shall apply to the type of fusing provided by the CONTRACTOR.
- C. **Types of fuses specified in this section include the following:**
  - 1. Class L time-delay.
  - 2. Class L fast-acting.
  - 3. Class RK1 time-delay.
  - 4. Class RK1 and Class J current-limiting.
  - 5. Class RK5 time-delay.
  - 6. Class K5 time-delay, noncurrent-limiting.
  - 7. Class T current-limiting.

1.2 QUALITY ASSURANCE

- A. The fuse manufacturer's facilities shall be ISO 9001 certified.

1.3 CODES AND STANDARDS

- A. **UL Compliance and Labeling:** Comply with applicable provisions of UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide over-current protective devices which are UL-listed and labeled.
- B. **NEC Compliance:** Comply with NEC as applicable to construction and installation of fusible devices.
- C. **ANSI Compliance:** Comply with applicable requirements of ANSI C97.1 "Low-Voltage Cartridge Fuses 600 Volts or Less".

1.4 SUBMITTALS

- A. **Product Data:** Submit manufacturer's technical product data on fuses, including specifications, electrical characteristics, installation instructions, furnished specialties and accessories in accordance with Section 01300, Section 16000, and the Contract Documents. In addition, include voltages and current ratings, interrupting ratings, current limitation ratings, time-current trip characteristic curves, and mounting requirements.

1.5 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering fusible devices which may be incorporated in the work include, but are not limited to, the following: Bussmann, Gould-Shawmut, Reliance, or equal.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time-current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and constructed in accordance with published product information, and with industry standards and configurations.

### **2.2 CLASS L TIME-DELAY FUSES**

- A. Provide UL Class L time-delay fuses rated 600-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting transformers, motors, and circuit-breakers.

### **2.3 CLASS L FAST-ACTING FUSES**

- A. Provide UL Class L fast-acting fuses rated 600 volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting service entrances and main feeder circuit-breakers.

### **2.4 CLASS RK1 TIME-DELAY FUSES**

- A. Provide UL Class RK1 time-delay fuses rated 600-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting motors and circuit-breakers.

### **2.5 CLASS RK1 CURRENT-LIMITING FUSES**

- A. Provide UL Class RK1 current-limiting fuses rated 250-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting circuit-breakers.

### **2.6 CLASS J CURRENT LIMITING FUSES**

- A. Provide UL Class J current-limiting fuses rated 600-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating.

### **2.7 CLASS RK5 TIME-DELAY FUSES**

- A. Provide UL Class RK5 time-delay fuses rated 600-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting motors.

### **2.8 CLASS K5 ONE-TIME FUSES**

- A. Provide UL Class K5 one-time fuses rated 250-volts, 60 Hz, with 100,000 RMS symmetrical interrupting current rating for protecting non-inductive loads.

### **2.9 CLASS T FUSES**

- A. Provide UL Class T fuses rated 600-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protection of physically small devices.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. Fuse types and sizes shall be as indicated on the Plans. Fuses shall be installed in accordance with the National Electric Code (NEC) requirements and the manufacturer's written instructions.
- B. Install fuses in proper fuse holders.
- C. Where fuses are installed in the motor starters, fuses shall be sized to match the actual motor full load current.
- D. Where fuses are installed in disconnect switches at HVAC units, the fuse sizes shall be sized to meet the HVAC manufacturer's requirements.
- E. Fuses for control transformers shall be sized in accordance with the National Electrical Code.
- F. Fuses shall be installed with the labels clearly visible.

### **3.2 FIELD QUALITY CONTROL**

- A. Prior to energizing fusible devices, test devices for circuit continuity and for short-circuits.

### **3.3 SPARE PARTS**

- A. Furnish 3 spare fuses of each size and type.

-END OF SECTION -

**SECTION 16480**  
**MOTOR CONTROLLERS**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. A motor controller is any device or group of devices normally used to start and stop a motor by making and breaking the motor circuit current. The motor controller and devices that make up the motor controller shall be governed by items indicated on the Plans, or elsewhere within these specifications.
- B. **Types of motor controllers specified in this section include the following:**
  - 1. Combination.
  - 2. Fractional HP manual.
- C. This section applies to motor controllers rated 480 V and below.

1.2 CODE AND STANDARDS

- A. **Electrical Code Compliance:** Comply with applicable local electrical code requirements of the authority having jurisdiction and NEC Articles 220, 250, and 430, as applicable to installation, and construction of motor controllers.
- B. **NFPA Compliance:** Comply with applicable requirements of NFPA 70E, "Standard for Electrical Safety in the Workplace."
- C. **UL Compliance:** Comply with applicable requirements of UL 486A and B, and UL 508, pertaining to installation of motor controllers. Provide controllers and components which are UL-listed and labeled.
- D. **NEMA Compliance:** Comply with applicable requirements of NEMA Standard ICS 2, "Controllers, Contactors and Overload Relays" and Pub No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)," pertaining to motor controllers and enclosures.

1.3 MAINTENANCE DATA

- A. Submit maintenance data and parts list for each motor controller and component; including troubleshooting maintenance guide. Also, provide product data and shop drawings in a maintenance manual, in accordance with requirements of the Contract Documents.

1.4 SUBMITTALS

- A. **Product Data:** Submit manufacturer's data and installation instructions on motor controllers.
- B. **Shop Drawings:** Submit shop drawings of motor controllers showing accurately scaled equipment locations and spatial relationships to associated motors and equipment.
- C. **Wiring Diagrams:** Submit power and control wiring diagrams for motor controllers showing connections to electrical power panels, feeders, and equipment.
- D. Submittal documents shall be provided in accordance with Section 01300, Section 16000, and other requirements of the Contract Documents.

## PART 2 – PRODUCTS

### 2.1 GENERAL

- A. Except as otherwise indicated, provide motor controllers and ancillary components that comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation.

### 2.2 ELECTRONIC OVERLOAD RELAYS

- A. Electronic overload relays shall be provided with the motor starters. The overload relay shall be a 3-pole solid state device that monitors all 3 phases of the motor current. The unit shall detect overcurrent, phase current imbalance, phase loss, and trip after an adjustable time from 3 seconds to 30 seconds.
- B. The overload relays shall be field selectable to Class 10, 20 or 30, ambient temperature compensated, and shall have an LED trip indicator. The unit shall have a manual and automatic reset feature, and a normally closed contact for control.
- C. Each module shall provide individual trip indication and reset for each trip condition, visible without opening the motor control center compartment door. Provide a normally open auxiliary contact for remote trip indication.
- D. Solid state circuits shall be completely protected from damage arising from line transients and voltage spikes.
- E. Electronic Overload Relays shall be equipped with TCP/IP or CIP communication protocol.
- F. Electronic Overload Relays shall be as manufactured by Allen-Bradley, Cutler Hammer, or Engineer Approved Equal.

### 2.3 MAGNETIC MOTOR STARTERS

- A. Starters, Size 2 and larger, shall have arc quenchers on all load breaking contacts. Starters shall be suitable for the horsepower ratings specified. The CONTRACTOR shall verify the motor ratings, and coordinate the starter and overload trip ratings with the actual horsepower ratings of the motors installed. Extended overload reset buttons shall be mounted so as to be accessible for operation without opening the door of the enclosure.

Magnetic contactors shall be factory adjusted and shall be chatter free. Overload relays shall be electronic, as specified herein.

Starters shall be furnished complete with a 120-volt secondary control power transformer. Control circuit fuses shall be furnished both on the primary and secondary of the control circuit transformer. If there is no transformer, all live control power supply wires shall be fused.

- D. Starters shall be designed to operate in ambient temperatures up to 60<sup>0</sup> C.
- E. The minimum size starter shall be NEMA Size 1.
- F. Magnetic Motor Starters shall be manufactured by Allen-Bradley, Square D, Cutler Hammer, or Engineer Approved Equal.

### 2.4 MANUAL STARTERS

- A. Manual starters shall be rated for the motor load, and shall be equipped with built-in overloads.
- B. Manual starters shall be provided with enclosures as indicated on the Plans, lockable handles that clearly indicate ON, OFF, and TRIPPED positions, pilot light, and positive, quick-make, quick break mechanisms.

C. Manual Starters shall be manufactured by Allen-Bradley, Cutler Hammer, or Engineer Approved Equal

## 2.5 MOTOR PHASE FAILURE RELAY

A. The relay shall detect voltage values below an adjustable value, loss of phase, and phase reversal. The unit shall automatically de-energize the control circuits of the motors to be protected, when one or all three phase voltages drop below the set point. The unit shall have a nominal trip delay time of two seconds and a reset time of two seconds. The relay shall automatically reset upon restoration of the line voltage. Relays shall be MotorSaver, Time Mark Corporation, or Engineer Approved Equal.

## 2.6 MOTOR PROTECTION RELAY

A. **The motor protection relay shall be capable of the following as a minimum:**

1. Phase loss
2. Low voltage (adjustable)
3. Phase reversal
4. Phase unbalance

B. **The motor protection relay shall be equipped with the following as a minimum:**

1. Adjustable trip delay (2 to 20 seconds)
2. Automatic reset
3. Transient protection (2500 volts for 10 ms)

C. Motor protection relays shall be set during the project startup according to the individual motor characteristics and application parameters. The motor protection relays for the motors with variable frequency drives shall be set as to prevent low voltage tripping.

D. The motor protection relays shall be MotorSaver Model 350, Time Mark Model 264, or Engineer Approved Equal.

## 2.7 SOLID STATE REDUCED VOLTAGE STARTER

A. Furnish and install a solid-state reduced voltage starter (SSS) to provide motor soft start and soft stop, where indicated on the Plans. The starter shall be capable of operating with any standard NEMA design motor of the specified horsepower. The unit shall be self-contained, house the logic board, power switches, heat sinks, motor overload protection, control power transformer, and any applicable disconnect means in one enclosure.

B. Voltage rating to be 460V, 60Hz, 3 phase, +1- 20%.

C. Operating temperature shall be 0 degrees to 50 degrees C, 5 to 95% relative humidity, non-condensing. De-rate 33% for each 10 degrees C over 50 degrees C to a maximum of 70 degrees Celsius.

D. Built in overload protection shall shut down and disable the starter until reset.

E. There shall be three pairs of inverse parallel SCRs. Each SCR shall be rated to block 2.5 times the nominal line to line voltage. The SCRs shall be sized to handle locked rotor current: 6 times full load current for 10 seconds on a cold start at 50 degrees C.

F. The starter shall be installed as indicted on the Plans, and shall be supplied with properly sized input and bypass contactors, and controls as shown on the Plans.

- G. Adjustments and indicators shall be accessible from a digital keypad with LCD panel. Indications shall include control power on, motor on, motor starting, overload, motor on bypass, and current.
- H. Power poles and logic assemblies to be removable as one piece assemblies. One logic assembly shall work in any size unit of a given line voltage. The logic assembly shall be conformal coated. The gate drive circuit shall be optically coupled for noise immunity and long life. The logic assembly and SCRs shall be noise immune per NEMA showering arc test for solid-state contactors.
- I. The soft start unit shall be capable of voltage or current control. The voltage limit shall be adjustable from 30% to 80% of line voltage and the current control shall be adjustable from 200% to 600% of FLA. In the voltage control mode, the ramp time shall be adjustable from 1 to 30 seconds, and the unit shall have a soft stop feature, also.
- J. The soft start shall have dry contact, form C, outputs available for internal faults, bypass contactor control, and run status.
- K. Solid State reduced voltage starters shall be UL listed under UL508, and manufactured by Allen Bradley, Square D, Cutler Hammer, or Engineer Approved Equal.

### **PART 3 – EXECUTION**

- A. Install motor controllers in accordance with equipment manufacturer's written instructions, and with recognized industry practices. Comply with applicable requirements of NEC, UL, and NEMA standards, to insure that products fulfill requirements.
- B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.
- C. Install fuses, of sizes indicated, in each fusible disconnect switch, if any.
- D. Prior to energizing motor controller equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- E. Prior to energizing, check circuitry for electrical continuity, and for short-circuits.
- F. Check rotation of each motor for proper direction.
- G. Upon completion of installation of motor controller equipment and electrical circuitry, energize controller circuitry and demonstrate functioning of equipment in accordance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

-END OF SECTION -

**SECTION 16481**  
**MOTOR CONTROL CENTERS (MCC)**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall furnish and install, ready to use, motor control centers for use as indicated on the Plans and specified herein.
- B. Circuit breaker ratings, and modifications, shall be as indicated on the Plans.
- C. MCP ratings, and modification, shall be as indicated on the Plans.

1.2 SUBMITTALS

- A. The motor control centers shall meet the requirements of the latest edition of Standards for Industrial Control No. ICS published by the National Electrical Manufacturers Association. The following minimum information and drawings shall be submitted for review:
  - 1. Plan, front, side views and overall dimension of each motor control center.
  - 2. Weight.
  - 3. Internal wiring diagram of each plug-in unit.
  - 4. Internal wiring diagram of the motor control centers.
  - 5. External connection diagram showing the wiring to the external controls and devices associated with the motor control center.
  - 6. A one-line and a schematic diagram for each motor control center.
  - 7. Bill of material list and Manufacturers Product Data.
  - 8. Installation instructions.
  - 9. Calculation of flash protection boundary and recommended personal protective equipment
  - 10. Manufacturer's certification that the following items are capable of interrupting and/or withstanding the specified short circuit condition:
    - a. Bus bar bracing
    - b. Feeder tap units
    - c. Starter units
- B. Product information shall be submitted in accordance with Section 01300, Section 16000, and elsewhere in the Contract Documents.
- C. The CONTRACTOR or the equipment manufacturer shall determine and submit the calculation to the CITY of the arc Flash Protection Boundary (FPB) and the recommended Personal Protective Equipment (PPE).

**PART 2 – PRODUCTS**

2.1 MOTOR CONTROL CENTERS (MCC)

- A. The motor control center fabricator shall be the manufacturer of the major components therein, such as circuit breakers and starters. Engineered motor control centers shall be by the component and housing manufacturer. The manufacturer shall comply with equipment specifications contained elsewhere in these Contract Documents.

- B. Each component, as well as the complete assembly, shall be constructed and tested in accordance with latest NEMA Standards for Industrial Control. The type of construction of the control centers shall be NEMA Class 11, Type B. Lifting eyes shall be provided on each section to facilitate handling.
- C. Unit doors shall be mounted on the stationary structure and hinged on the side away from the vertical wireway. They shall be held closed with slotted thumbscrews.
- D. Unit doors shall have positive action linkage with disconnect operating mechanism. Mechanism shall be designed so that it can be locked in the OFF position with up to 3 padlocks. When the handle is not padlocked, it shall be possible to open the door by releasing the door interlock with a small tool. The control units shall be of the plug-in type. When doors are closed, the operating mechanism shall clearly indicate the ON or OFF position of the disconnect, and the door interlock mechanism shall engage. The disconnect operating mechanism shall be designed against inadvertent operation when the door is open. Each plug-in unit door shall be provided with a nameplate, specified elsewhere herein, that indicates the circuit number and circuit name. The nameplate shall be attached to the door with brass or stainless screws.
- E. It shall be possible to install up to 6 NEMA size one units in one vertical section. Units shall be completely enclosed with sheet steel. A small wireway shall be provided inside the unit, so all wiring can be laid in place without removing barriers or plates. Each vertical section that holds the units shall be rigidly formed of minimum 12 gauge, cold-rolled sheet steel. The vertical front-of-board-construction shall be supplied with minimum 20-inch depth.
- F. Continuous horizontal wiring troughs shall be provided at both top and bottom of each section. These troughs shall line up to form a continuous wireway for the full length of the MCC. A large continuous, full-height vertical wiring trough shall be provided in the right side of each section.
- G. All starter wiring, control, and power shall be terminated in terminal strips in this trough for size 2 and smaller starters. Size 3 and larger starters shall have control leads terminating on the terminal strips in the trough. Terminal strips shall be split-type to facilitate wiring connections without disconnecting factory or field conductors. Terminal strips shall be rated to accept conductor sizes as indicated on the Plans.
- H. Bus bars shall be silver plated copper, and shall be of the ampacity indicated on the Plans. Unit bus bar stabs shall insure high contact pressure. The vertical bus bars shall be effectively isolated from accidental contact by plastic insulating medium. Horizontal bus shall be silver-plated at every joint. The entire vertical bus shall be silver-plated copper.
- I. Bus bar supports shall be of high impact strength, non-carbonizing insulating material mounted on padded steel brackets and shall provide adequate dielectric strength and creepage distance. The bus structure shall be capable of withstanding short circuit current in accordance with NEMA standards, and as indicated on the Plans.
- J. Horizontal bus amperage rating shall be as indicated on the Plans.
- K. Each section shall be equipped with horizontal ground bus that shall be continuous across the MCC.
- L. The MCCs shall be supplied as indicated on the Plans, and as specified herein and in accordance with NEMA Standard Pub. IS 1.1, latest edition. The MCCs shall be enclosed in NEMA Type 1 gasketed industrial use enclosures, unless otherwise shown. NEMA 3R enclosures shall provide sufficient depth for air conditioning units to be mounted on the end of the structures. If the MCCs contain VFDs or Solid State Starters that require cooling, their respective sections shall be louvered top and bottom, and fans shall remove heat from within the sections.
- M. All metal surfaces and structural parts shall be given a phosphatizing, or equal, treatment prior to painting. The control centers shall then be given a gun-metal gray undercoat which is equal to zinc chromate. The exterior of the enclosure shall be finished in standard ANSI Grey.

- N. Spaces for future combination starters shall have all the hardware necessary so that a future plug-in control unit can be installed without having to modify the vertical sections. The number of spaces for future control units shall be as indicated on the Plans.
- O. Devices, such as, but not limited to, starters, circuit breaker, relays, timers, conductors, shall conform to other sections of these Contract Documents.
- P. Provide customer metering instruments, as indicated on the Plans. Unless otherwise indicated on the Plans, metering units shall be electronic, capable of displaying volts line-to-line and line to-neutral, and amps per phase.
- Q. The manufacturer shall determine and label the Flash Protection Boundary (FPB) and required Personal Protective Equipment (PPE).
- R. MCCs shall be as manufactured by Allen-Bradley, or Engineer Approved Equal.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. The MCCs shall be erected in accordance with the recommendations of the manufacturer and with the details specified herein.
- B. Cables larger than No. 6 AWG, which hang from their vertical connections, shall be supported within 2 feet of the connection.
- C. The motor overload relays shall be provided and sized based on the actual full load amperes of the motor connected to the starter. Motor overload relays shall be as manufactured by Allen-Bradley, Eaton, or Engineer Approved Equal
- D. The motor circuit protectors shall be adjusted to the lowest settings that do not cause false tripping.

#### **3.2 FIELD TESTS**

- A. MCCs shall be tested in accordance with Section 16000.

- END OF SECTION -

**SECTION 16482**  
**LOW-VOLTAGE VARIABLE FREQUENCY DRIVES**

**PART 1 – GENERAL**

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, testing, troubleshooting, training and incidentals as shown, specified, and required to furnish and install complete and operable variable frequency drives.

- B. Coordination: Coordinate speed control, starting and acceleration torque requirements with the driven equipment. Submit an acceptance letter from the driven equipment and motor manufacturers stating that each variable frequency drive (VFD), will fully meet all starting and operating requirements of the respective driven equipment/motor combination. CONTRACTOR shall be responsible for coordinating all VFD units with the driven equipment to obtain successful operation throughout the driven equipment speed range.

C. Related Sections:

1. Section 16000 General Requirements.
2. Section 16481, Motor Control Centers.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:

1. IEEE 519, Recommended Practice and Requirements for Harmonic Control in Electric Power Systems.
2. ISO 9000, Quality Management Systems, Fundamentals and Vocabulary.
3. ISO 9001, Quality Management Systems, Requirements.
4. ISO 9002, Quality Systems, Model for Quality Assurance in Production, Installation and Servicing.
5. NEMA ICS 2, Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
6. NEMA ICS 7, Industrial Control and Systems Adjustable-Speed Drives.
7. NEMA MG 1, Motor and Generators.
8. UL 489, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.
9. UL 508, Industrial Control Equipment.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:
  - a. Low-voltage variable frequency drive manufacturer shall have not less than five years of experience designing and regularly manufacturing and servicing substantially similar equipment to that required, and upon request, shall submit documentation of

not less than five installations in satisfactory operation for not less than five years each. Prototypes or newly introduced drive unit models will not be acceptable.

- b. Manufacturer shall be certified under ISO 9000, ISO 9001, or ISO 9002 for materials and equipment specified.
- c. Manufacturer shall maintain factory trained and authorized service facilities within 100 miles of this project.
- d. The manufacturer shall demonstrate, in writing, the Quality Assurance Program in use to certify key components. In-house manufacture of key components is desirable, and will be considered in evaluating acceptance.
- e. For all required factory tests, low-voltage variable frequency drive manufacturer shall use a factory test facility that has calibrated its testing apparatus in the previous twelve months, and is staffed by qualified, experienced technicians.
- f. Approved Manufacturers:
  - 1) Allen Bradley
  - 2) Eaton
  - 3) or Engineer Approved Equal.

**B. Component Supply and Compatibility:**

1. The VFD shall be 350 HP, 480V and equipped with a front end drive or active harmonic to meet the requirements of IEEE 519.
2. Drives specified under this Section employ a low switching frequency or pattern to minimize instantaneous rate of voltage change over time (dv/dt), and the adverse effects of potential bearing currents. Where alternate manufacturers are proposed, obtain manufacturer recommendations regarding bearing currents and provide equipment required at no additional cost.
3. Each low-voltage variable frequency drive shall be fully compatible with associated driven equipment and motors. Variable frequency drives shall be matched to specific load requirements for each system. Operation of variable frequency drive shall not overstress motor insulation.
4. To centralize responsibility and to ensure that all equipment is properly coordinated, variable drives specified under this Section shall be obtained from the Supplier of the associated driven equipment.
5. Similar components of drives associated with each system shall be products of a single manufacturer.

**C. Certifications:**

1. Certification of Compliance:
  - a. MANUFACTURER shall submit certification of compliance that the requirements of this Section shall be met by the MANUFACTURER. The certification shall be submitted on MANUFACTURER letterhead and shall be signed the person in charge of the product for this project. Certification by manufacturer's representatives shall not be acceptable without the signature of the manufacturer's person in charge.

- b. Certification shall be worded as follows:
  - 1) "[Insert MANUFACTURER'S name] proposes to supply [Insert MANUFACTURER'S VFD name and model number] VFDs as specified herein, including all reference sections specified, and to supply all testing and services as specified in this Section. We have examined the Contract Documents and have a clear understanding of the requirements insofar as they affect the proposed products. We certify that the products shall be as specified herein, and shall operate satisfactorily under the conditions described in the Contract Documents and that the products meet the requirements of the Contract Documents.

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Authorized Signature & Title

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Date

- c. List all exceptions, deviations or changes from the requirements of the Contract Documents.
- d. Provide justification for exceptions, variations, deviations, or changes. CITY will determine whether exceptions, deviations, and changes are acceptable. Exceptions, variations, deviations, and changes may result in rejection of submittals and/or products.
- e. Provide certification before submitting Shop Drawings for approval. Shop Drawings will not be reviewed prior to receipt of certification.
- f. Acceptance of certification shall not relieve responsibility for adequacy of all equipment and successful operation of equipment under all conditions specified herein.
- g. Submittal of certification shall not relieve equipment manufacturer, and Supplier of equipment to comply with Submittal requirements specified herein.

D. Tests:

- 1. Perform factory tests on each low-voltage variable frequency drive prior to shipping. Tests shall consist of simulating expected load to be driven by operating load through speed ranges specified for driven equipment, for minimum of two hours per drive unit.
- 2. Provide factory control and alarm tests on each drive unit by simulating each control signal and each alarm function to verify proper and correct drive unit action.
- 3. Perform specified tests in addition to standard factory tests typically performed.

E. Seismic Requirements: The Work shall comply with seismic requirements. Equipment manufacturer shall provide written certification of factory prototype test or shall use a shake table to show the completed assembly meets the seismic requirements for this project. Provide a seismic certificate stating the VFD unit has successfully passed the shake table test.

#### 1.4 SUBMITTALS

A. Action Submittals: Submit the following:

- 1. Shop Drawings:
  - a. Dimensional information and construction details of enclosures. Enclosure details shall consist of exterior and interior front door with nameplate legends, interior door front and rear views, and terminal block layout.
  - b. Three-line power and control wiring diagrams.
  - c. Wiring diagrams showing the interconnection of conductors to all devices with terminal assignments.
  - d. Functional description of system operation.

- e. VFD heat dissipation at full load, including heat rejection/cooling system.
  - f. Fabrication, assembly and installation drawings, and wiring diagrams. Wiring diagrams shall comply with NFPA 79, Annex "D" standards.
  - g. Complete list of components and catalogue identification.
  - h. List of in-house manufactured key components.
  - i. Complete description of schematic and wiring diagrams and functional operation.
2. Product Data:
    - a. Manufacturer's technical specifications, literature, illustrations, specifications and engineering data which indicate performance, dimensions, materials, size and weight.
  3. Testing Plans:
    - a. Not less than thirty days prior to source quality control testing, submit descriptions of proposed shop testing methods, procedures, apparatus, and limitations.
    - b. Not less than thirty days prior to field quality control testing, submit descriptions of proposed field testing methods, procedures, and apparatus.
- B. Informational Submittals: Submit the following:
1. Certificates:
    - a. Certification letters from low-voltage variable frequency drive manufacturer and motor manufacturer that the approved driven equipment has been reviewed and that variable frequency drive units and motors are compatible, and shall be provided in accordance with the Contract Documents and requirements of the driven equipment.
  2. Source Quality Control Submittals:
    - a. Within five days of completing source quality control tests and inspections, submit test results with indication of whether all criteria of the Contract Documents for the specified equipment were met.
  3. Field Quality Control Submittals:
    - a. Within five days of completing field quality control tests and inspections, submit test results with indication of whether all criteria of the Contract Documents for the specified equipment were met.
  4. Manufacturer Reports:
    - a. Within five days of each visit to the Site by manufacturer's representative, submit written report of reason for visit, problems encountered, solutions implemented, and remaining work.
  5. Qualifications Statements:
    - a. Manufacturer, when requested by ENGINEER.
- C. Closeout Submittals: Submit the following:
1. Operation and Maintenance Data:
    - a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, list of recommended spare parts, and spare parts ordering information.
    - b. Manuals shall include record drawings of control schematics, including point-to-point wiring diagrams.
    - c. Include a listing of all programmable drive parameters and their settings at Substantial Completion. Submit parameters as both printed pages in the operations and maintenance manual and in electronic format on compact disc that can be directly uploaded to the drive in event of drive replacement or repair.
    - d. Comply with Section 16000 General Requirements.

D. Maintenance Materials Submittals: Submit the following:

1. Spare Parts and Extra Stock Materials:

- a. Furnish, tag, and box for shipment and long-term storage spare parts and special tools for low-voltage variable frequency drives. Each set of spare parts and tools shall include manufacturer's recommended spare parts inventory for one year and include, at minimum, the following:

Item	Quantity
1) Transistor and diode modules with accessories	One per HP rating
2) Power supply module	One per HP rating
3) Fans	One per HP rating
4) Power fuses	One set of each size and type used
5) Control power fuses	Two sets of each size and type used
6) Pilot lights	Two per ten of each type used

- b. Furnish a list of recommended spare parts for an operating period of one year. Describe each part, the quantity recommended, and current unit price.
- c. Conform with Section 16000 General Requirements.

1.5 SHOP TESTS

- A. Each variable frequency drive (VFD) shall be tested at the manufacturer's facility.
- B. In addition to the manufacturer's standard tests, each VFD, including all instruments, controls, solid state components, systems, and internal and external equipment which are a part of the VFDs shall be assembled, tested and thoroughly checked for proper operation of all functions and features. Simulated signals and loads shall be employed that shall simulate actual signals and loads, if they are a part of the final installation and are not included in this Section.
- C. If the test results indicate that any VFD unit does not conform to specified and/or guaranteed performance, the unit shall be modified and retested, at no additional cost, until full compliance with specified and guaranteed performance can be demonstrated. CITY and/or ENGINEER shall be permitted to witness the retest.
- D. No equipment shall be shipped until approval of all test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver materials to the site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of the Work.
2. Conform with Section 16000 General Requirements.

B. Packing, Shipping, Handling, and Unloading:

1. Packing:
  - a. Inspect prior to packing to ensure that assemblies and components are complete and undamaged.
  - b. Protect mating connections.
  - c. Cover all openings into enclosures with-vapor inhibiting, water-repellent material.
  - d. Indoor containers shall be bolted to skids.
2. Upon delivery, check materials and equipment for evidence of water that may have entered equipment during transit.
3. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the site. CONTRACTOR shall notify ENGINEER of any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.
4. Handling:
  - a. Lift, roll or jack low-voltage variable frequency drive equipment into locations shown.
  - b. Variable frequency drives shall be equipped for handling required for installation. Handle equipment in accordance with manufacturer's requirements.

C. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all materials off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all electrical and electronic equipment, control panels, and like equipment and materials in heated buildings which have a concrete or wooden floor, a roof, and fully closed walls on all sides. Protect electrical and electronic equipment from contamination by dust, dirt and moisture. Maintain humidity at levels recommended by manufacturer for electric and electronic equipment.
3. Conform with Section 16000 General Requirements.

## **PART 2 – PRODUCTS**

### **2.1 EQUIPMENT PERFORMANCE**

A. System Performance:

1. Driven equipment to be controlled by a low-voltage variable frequency drive shall be provided with a customized variable frequency drive. Each drive unit shall include a variable frequency controller with associated controls for continuous speed adjustment and protection of the driven equipment. Output speed control of motor shall be continuous throughout speed range of two to 60 Hertz under variable torque load or constant torque as specified for the driven equipment.
2. Low-voltage variable frequency drives associated with each set of driven equipment shall be similar to each other.
3. Variable frequency drives shall be UL-listed or ETL-listed and designed, built, and tested in accordance with UL 489, NEMA ICS 2, NEMA ICS 7, and UL 508.

4. VFDs shall meet all requirements as outlined in the latest edition of IEEE 519 for total harmonic voltage and current distortion and as indicated in this Section. Individual or simultaneous operation of the VFDs shall not add more than three percent total harmonic voltage distortion while operating. Maximum allowable total harmonic current distortion limits for each VFD shall not exceed five percent as calculated and measured at the point of common coupling. The point of common coupling for all harmonic calculations and field measurements for both voltage and current distortion shall be defined as the nearest upstream motor control center or switchgear as applicable. A preliminary harmonic analysis must be submitted by the VFD manufacturer with Shop Drawings which includes all voltage and current harmonics up to the 99th harmonic; for this purpose cable lengths can be estimated on a conservative basis by the supplier. Compliance shall be verified with onsite field measurements of both the voltage and current harmonic distortion at the defined point of common coupling with and without the VFDs operating.

## 2.2 MANUFACTURERS

- A. Provide low-voltage variable frequency drives by one of the following:
  1. Approved motor control center manufacturer.

## 2.3 ENCLOSURE

- A. As indicated on the plans, VFDs shall be motor control center mounted.
- B. MCC section shall provide adequate cooling for components within and include positive ventilation.
- C. Include thermal magnetic circuit breaker. Circuit breakers shall be in accordance with UL 489. Switch handle shall be suitable for padlocking in the "open" position and be through-the-door type with handle height not exceeding six feet. Operation of switch shall be interlocked with door operation and shall remove the service supply from all internal components. Power devices shall be suitable for interrupting capacity of 65,000 RMS symmetrical amperes. Include current limiting semi-conductor fuses where required for protection of solid state components.
- D. MCC section shall include an operator interface for access to controller's digital keypad and display. Mount on the front of the MCC section.
- E. Equip with front with nameplates for identification of equipment and operating functions. Nameplates shall be in accordance with Section 26 05 53, Identification for Electrical Systems.
- F. Equip with e terminal blocks suitably labeled for all internal and remote wiring requirements, plus twenty percent spare.
- G. Conduit and cable entrances shall be from either top or bottom.

## 2.4 VARIABLE FREQUENCY CONTROLLER

- A. General:
  1. Variable frequency controller shall be microprocessor-based, pulse width modulated design, suitable for operation on a 480-volt 3 phase, 60 hertz supply. Controller shall produce an variable AC voltage/frequency output to vary speed of driven equipment. VFDs operating motors 50 horsepower and larger shall be of the clean power type (18 pulse type or active front end type).

2. VFD power assembly shall be of the diode bridge rectifier front-end type to minimize electrical noise generation, shall operate at not less than 95 percent power factor over the full operating range.
3. Provide 90 Deg C rated power and control terminals.
4. Controller switching frequency shall be adjustable and allow operation at 5,000 Hertz or less. Controller technology shall include a switching scheme that reduces the dv/dt of output supply.
5. Equip controller with a three-percent DC bus reactor or input line reactor.
6. Controller's solid state converter input section switching devices shall have 1600 volt PIV rating.
7. Overload rating of 110 percent variable torque, 150 percent constant torque for one minute.
8. RMS harmonic content of output current shall be less than five percent of fundamental current.
9. Able to withstand output terminal line-to-line short circuits without component failure.
10. VFD manufacturer shall acknowledge the approximate motor lead lengths shown on the plans. VFD manufacturer shall evaluate the application, include an appropriately sized output filter / long lead filter, determine switching frequency, etc. to accommodate the distance between the VFD and its motor. All components necessary for successful operation shall be provided and installed in each VFD's motor control center cubicle/section. VFD cable shall be used between the VFD and the motor.

## 2.5 VFD CABLE

### A. Variable Frequency Drive Symmetrical Type Cable:

1. Power Conductors: Three (3) annealed, tinned, stranded copper per ASTM B8, coated per ASTM B33.
2. Insulation: Black cross-linked polyethylene (XLPE) per UL44.
3. Ground: Three (3) symmetrically placed bare annealed Class B stranded copper conductors per ASTM B3 and B8 whose cross-section areas shall add to equal the cross-section area of the power conductor size. The conductors shall be in direct contact with the shield and may be tinned or untinned.
4. Shield: Overall annealed 5 mil bare copper tape shield, 50% overlap for 100% coverage OR overall tinned copper braided shield and aluminum polymer tape for 100% coverage.
5. Jacket: Polyvinyl Chloride (PVC), oil resistant, per UL1277.
6. Voltage insulation: 2000V.
7. Cable size shall be as indicated on the Drawings.
8. Splices: Splices in VFD cables shall not be permitted.
9. Connections and Termination: cable and shield terminations and connections shall be in complete accordance with VFD, motor and cable manufacturers published requirements.
10. Manufacturers: General Cable CVTC-VFD; Southwire type TC VFD cable; or equal.

### B. Operating Criteria:

1. Operating criteria shall be in accordance with the following:
  - a. Ambient temperature range of zero to 50 degrees C.
  - b. Operational humidity of up to 95 percent non-condensing.
  - c. Altitude up to 1500 feet above sea level.
  - d. Nominal voltage of 480-volts plus or minus ten percent, three-phase, three-wire. Include an under-voltage feature to allow trip-free operation down to 35 percent undervoltage.

- e. Nominal frequency of 60 Hertz plus or minus three Hertz.
- f. Input power factor of 95 percent displacement power factor at all operating speeds.
- g. Efficiency of 96 percent at full speed and full load.
- h. Frequency accuracy:  $\pm 0.5$  percent (at  $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ ).
- i. Frequency range: 3 to 67 hertz, selectable by switch to 120 hertz (Except where otherwise indicated).
- j. Volts per hertz ratio (V/HZ) adjustable for 3 to 60 hertz.
- k. For variable torque applications, overload capacity shall be one minute at 110 percent of continuous constant torque rated nameplate current. The inverter shall be designed to not be internally shutdown within the 110 percent overload operating range. For constant torque applications, overload capacity shall be one minute at 150 percent of continuous constant torque rated nameplate current. The inverter shall be designed to not be internally shutdown within the 150 percent overload operating range.
- l. Acceleration time: 1 to 3600 seconds adjustable.
- m. Dynamic braking: 12 percent standard.
- n. Ramp to stop: 1 to 3600 seconds adjustable.
- o. Nominal horsepower are indicated on the drawings, but the VFD shall be supplied with the necessary current ratings to properly operate the connected load. Coordinate with the approved manufacturer of the equipment / motor for required operating currents.

C. Features:

- 1. Controller shall have the following features:
  - a. Digital keypad and display module shall provide parameter setting, adjustments, and monitoring of control functions and faults. Display messages shall be in English.
  - b. Integral Ethernet communication port shall be used to connect the VFD to the plant control system for status/monitoring using AB CIP protocol, as shown. Communication port shall be included in the VFD electronics and shall be native to the drive. The use of signal converters or protocol bridges shall not be acceptable. Control of VFDs shall be via hardwired connections with the plant control system.
  - c. Independent acceleration/deceleration rates shall provide two to 600 seconds minimum. When called to stop, motor shall decelerate to minimum speed before stopping.
  - d. Power loss feature shall allow five cycle ride through capability for input supply interruptions.
  - e. Time delay automatic restart shall allow restart after controller fault conditions with programmable attempts.
  - f. Coasting motor restart shall allow controller to restart into a coasting motor without damage or tripping. Coasting motor restart feature shall allow switching from bypass mode to low-voltage variable frequency drive mode while operating, without shutdown.
  - g. Isolated control inputs and outputs.

D. Protection:

- 1. Controller shall have protective functions as follows:
  - a. Input line metal oxide varistor transient protection.
  - b. Electronic over-current trip instantaneous and inverse time overload protection with thermal memory retention.
  - c. Short circuit trip (hall-effect current transformer).
  - d. DC bus overvoltage trip.
  - e. DC bus fuses.
  - f. Over-temperature trip temperature protection.

- g. Current limit trip protection. Current limit circuitry shall automatically phase back voltage and frequency to decrease current to 110 percent of the drive rated capacity. This shall be programmable based on motor full load amps.
- h. Input line over- and under-voltage trip protection with automatic restart on voltage recovery.
- i. Momentary power failure trip (greater than ten milliseconds) with automatic restart.
- j. The drive units shall be able to withstand phase-to-phase and phase-to-ground shorts without damage to the drive unit.
- k. Ground fault trip protection.
- l. Fault trip conditions, except short time or momentary line voltage loss or line voltage momentary dip, shall lock out the control. Resetting of control after fault trip shall be manual by a door-mounted pushbutton.
- m. Auto restart shall be a standard feature of the drive as follows:
  - 1) Auto restart shall be enabled or disabled by programming or jumper selection.
  - 2) On auto restart selection, the microprocessor shall determine, in the event of a fault, if a restart should be attempted. A restart shall be attempted under the following conditions:
    - a) Undervoltage (UP): Every time as soon as voltage returns to a safe level. Fault relay shall not be activated.
    - b) Input Overvoltage (OPS): Every time as soon as voltage returns to a safe level. Fault relay shall be activated for the duration of the high voltage condition.
    - c) Overcurrent (OC): Five attempts in 30 seconds. After the fifth OC, the drive shall trip out and latch the fault relay.
- n. A restart shall not be attempted for any other type of fault and the drive shall trip out immediately, activate the fault relay, and make the information available on the display until the drive is reset by pressing the reset button or removing control power.
- o. An undervoltage condition of less than 30 ms duration shall not affect drive operation. If main power falls below 85 percent of rated voltage for longer than 30 ms while control power is retained, the drive shall forcibly decelerate the load in an attempt to force a higher bus voltage through regeneration to allow the drive to "ride through" the undervoltage condition for up to 70 additional milliseconds for a total "ride through" of up to 100 ms for very high inertia loads. The manufacturer shall provide an option which allows control power to be maintained for 100 ms in the event of a power failure. If the drive drops out, it shall automatically restart upon restoration of full rated voltage, as previously described.

## 2.6 OUTPUT / LONG LEAD FILTER

### A. General:

- 1. Provide output filter to prevent overstressing motor insulation system and to accommodate the approximate motor lead lengths shown on the plans.

### B. Features and Criteria:

- 1. Filter shall be three-phase, 600-volt class motor-protecting type consisting of suitable values of inductance, capacitance and resistance to form a damped, low pass filter.
- 2. Filter shall be low-loss type specifically designed to reduce voltage wave form dv/dt. Filter shall allow cable lengths at minimum exceeding actual application distances with waveform resulting in voltage spikes at motor terminal that are within NEMA MG 1 Part 31 voltage stress levels.

3. Filter shall be suitable for mounting within low-voltage variable frequency drive cubicle / section.

## 2.7 GENERAL CONTROLS

### A. General:

1. Equip each low-voltage variable frequency drive control system with relays, switches, fuses, indicating lights, and components required for a complete, functional system.
2. Variable frequency drive control shall be powered from a suitably sized and protected control power transformer. Transformer shall be sized to power motor space heaters, where applicable. Coordinate to obtain motor space heater wattages, if applicable. Motor controllers shall be provided with circuitry such that the motor space heater shall be energized when the motor is not energized
3. Variable frequency drive control shall include status indicators, controller, and system fault condition displays and operating controls. Provide status indicators and operating controls associated with drive control on front door of enclosure.
4. Control arrangement shall be such that variable frequency drive internal electronic supply voltage is isolated from field wiring.

### B. Control and Pilot Devices:

1. The front of each VFD compartment shall contain each equipment's operator devices and nameplates as substantially specified herein. Operator devices (pushbuttons, push-to-test LED pilot lights and switches) shall be heavy duty, 30.5mm, round, NEMA 4X non-corrosive type as manufactured by the approved variable frequency drive manufacturer. Use control relays and timing relays as manufactured by the approved variable frequency drive. Control/timing relay contacts shall be rated for 10A at 120VAC/24VDC.

### C. Wiring and Device Identification:

1. Provide control wiring and device identification for each low-voltage variable frequency drive:
  - a. Identify all control conductors with permanent type wire markers. Each wire shall be identified by a unique number and shall be attached to wire at each termination point.
  - b. Identify each control device with permanent type marker. Each device shall be identified by a unique number and shall be attached to each device.
  - c. Numbering system for each wire and control device shall be identified on wiring diagrams and shall reflect actual designations used in the Work.

## 2.8 VFDS INTEGRAL TO MOTOR CONTROL CENTERS

- A. General: The supplier of the motor control centers shall supply the integral VFDs as substantially specified herein. Each VFD shall be mounted in its own MCC cubicle containing all ancillary devices. The VFDs shall be factory wired and tested as a complete package, consisting of the VFD, logic control devices, operator interface devices, instruments and equipment as required for successful operation.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine conditions under which the Work will be installed and notify in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

### 3.2 INSTALLATION

- A. Install equipment in accordance with manufacturer's recommendations and instructions and in conformance with Laws and Regulations, and the Contract Documents.
- B. Unless otherwise shown or indicated, install equipment on a 4 inch thick (nominal) concrete pad. Pad shall extend approximately 3 inches on both sides and back and not more than 1 inch in front, with chamfering. Install support channels in concrete according to manufacturer's recommendations. Type 316 stainless steel anchor bolts shall be furnished in this Section.
- C. Install equipment with sufficient access and working space provided for ready and safe operation and maintenance.
- D. For installations against masonry walls, provide an insulation board, 1/4-inch minimum thickness, between equipment and wall for corrosion protection. Trim board neatly within outline of equipment.
- E. Install all terminations, lugs, and required appurtenances necessary to properly terminate power supplies.
- F. Install control wiring terminations and appurtenances necessary to complete installing control and monitoring devices.
- G. Immediately prior to Substantial Completion, replace all enclosure filters and frames provided under this Contract with new filters and frames, except expanded metal filter types. Immediately prior to Substantial Completion, clean expanded metal filters.

### 3.3 FIELD QUALITY CONTROL

#### A. Site Tests:

1. After installation, inspect, adjust, and test each low-voltage variable frequency drive at the Site. Testing and inspection shall be in accordance with manufacturer's recommendations and be performed by manufacturer's factory-trained representative. Through CONTRACTOR, manufacturer's factory-trained representative shall inform when equipment is correctly installed and ready to be energized. Do not energize equipment without permission.
2. Perform the following equipment inspection and testing and provide reports documenting procedures and results.
  - a. Verify all device settings and drive adjustments.
  - b. Inspect all mechanical and electrical interlocks and controls for proper operation.
  - c. Test each drive through specified speed ranges and loads for a minimum of two hours per drive unit.
  - d. Test each drive by using actual control signal for remote and local operation.
  - e. Test each drive alarm function.
  - f. Perform other tests recommended by equipment manufacturer.

#### B. Manufacturer Services:

1. Unloading and Installation: Manufacturer's factory-trained representative shall be present during unloading of equipment and installation at equipment's final location.

Representative shall train installing personnel in advance in the proper handling and rigging of equipment. Services by manufacturer's representative under this paragraph shall be at least one (1) eight-hour day at the Site.

2. Post-installation Check: Manufacturer's factory-trained representative shall check and approve the installed equipment before initial operation. Manufacturer shall calibrate, set and program low-voltage variable frequency drives provided. Services by manufacturer's representative under this paragraph shall be at least one (1) eight-hour day at the Site.
3. Manufacturer's factory-trained representative shall adjust the system to final settings as specified in Article 3.4 of this Section.
4. Manufacturer's factory-trained representative shall test the system as specified in Paragraph 3.3.A of this Section. Representative shall operate and test the system in presence of ENGINEER and verify that equipment is in conformance with the Contract Documents. Services by manufacturer's representative under this paragraph shall be at least one (1) eight-hour day at the Site.
5. Representative shall revisit the Site as often as necessary until all deficiencies are corrected, prior to readiness for final payment.
6. Provide services of manufacturer's factory-trained representatives to correct defective Work within 72 hours of notification by CITY during the correction period specified in the General Conditions as may be amended by the Supplementary Conditions.
7. Replacement parts or equipment provided during the correction period shall be equal to or better than original.
8. Training: Provide services of qualified factory trained specialists from manufacturer to instruct CITY's operations and maintenance personnel in recommended operation and maintenance of equipment. Training requirements, duration of instruction, and other qualifications shall be in accordance with Section 16000 General Requirements.

### 3.4 ADJUSTING

- A. Immediately prior to Substantial Completion, when testing is acceptably completed and low-voltage variable frequency drives are operating, manufacturer's representative shall return to the Site and make final adjustments as required to each variable frequency drive furnished under this Section.

### 3.5 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative shall certify in writing that each VFD has been installed, adjusted, tested and functions in accordance with the manufacturer's recommendations and the Contract Documents. Certification shall bear the typewritten name and signature of the person responsible for the work. Certification shall list each VFD, shall state each VFD has passed all tests, is in conformance with the Contract Documents and is ready to be placed into operation.
- B. Provide four (4) copies of the manufacturer's representative's certification.

-END OF SECTION-

**SECTION 16500**  
**LIGHTING**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install lighting fixtures.

1.2 QUALITY ASSURANCE

A. **Reference Standards:**

1. National Electrical Code (NEC)
2. UL Standard #844, Luminaires for Use in Hazardous (Classified) Locations
3. UL Standard #924, Emergency Lighting and Power Equipment
4. UL Standard #1598, Luminaires
5. Illuminating Engineering Society (IES)
6. All applicable local lighting ordinances

B. **Miscellaneous:**

1. Lamps are identified for each luminaire in the Lighting Fixture Schedule on the Plans.
2. Lighting fixtures and electrical components:
  - a. UL labeled, complete with lamps.
  - b. Rated for area classification as indicated.
3. Location of lighting fixtures on Plans are intended to be used as a guide.
  - a. Field conditions may affect actual locations.
  - b. Coordinate with other trades to avoid conflicts in mounting of fixtures and other equipment.
4. The quality standard is established by the fixture listed in the Lighting Fixture Schedule.
  - a. This quality standard includes, but is not necessarily limited to construction features, materials of construction, finish, and photometrics.

1.3 SUBMITTALS

A. **The following shall be submitted to the ENGINEER for review:**

1. Acknowledgment that products submitted meet requirements of standards referenced.
2. Manufacturer's technical information on products to be used including photometric performance curves for the fixture and ballast data.
3. Acknowledgment that products submitted are UL or ETL listed.
4. When general data sheets constitute part of the submittal, identify the products to be used on this project.
5. Manufacturer's installation instructions.
6. Identification of fixtures by Lighting Fixture Schedule.
7. UL nameplate data (Voltage, wattage, etc.).
8. Finishes, colors, and mounting type.
9. Pole, fixture, and accessories.
10. Pole wind loading.

- B. CONTRACTOR shall submit shop drawings, manufacturer's data sheets, and a complete wiring diagram detailing all connections to the electrical system in accordance with Section 16000, and other requirements of the Contract Documents.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Lamps shall be manufactured by RAB, General Electric, North American/Phillips, Sylvania, or equal.
- B. Lighting fixtures shall be provided as indicated on the Lighting Fixture Schedule on the Plans.
- C. Lighting ballasts shall be manufactured by General Electric, Advance, Jefferson, Universal, Bodine, Lithonia, or equal.
- D. Light poles shall be as indicated on the Plans. Include base template, anchor bolts, cadmium-plated hardware and pole grounding lug, handhole, anchor base and bolt covers. Pole foundations shall be as indicated on the Plans.

### **2.2 MATERIALS**

#### **A. General:**

- 1. Lamps:
  - a. See lighting fixtures specified on Electrical Plans for wattage, voltage and number required.
- 2. All Fixtures:
  - a. There shall be no live parts normally exposed to contact.
  - b. When intended for use in wet area, mark fixtures "suitable for wet locations."
  - c. When intended for use in damp areas, mark fixtures: "suitable for damp locations" or "suitable for wet locations."
  - d. In wet or damp area, install fixtures so that water cannot enter or accumulate in the wiring compartment, lampholder, or other electrical parts.
  - e. Gasket seals: Urethane foam
  - f. Diffusers: UV stabilized acrylic plastic
- 3. Underground wiring:
  - a. Provide all wiring runs with separate green grounding conductor.
  - b. Ground all pole bases.
- 4. Pole wiring from base to ballast:
  - a. No. 12 type XHHW.
  - b. Each phase shall be protected by a 30A, 600V, type Tron waterproof fuseholder, Bussman "Limitron" type fuse, size rating 3-times load current.

#### **B. Compact Fluorescent and Fluorescent Lamps:**

- 1. Rapid start
- 2. Cool white (F32T8141 K-85CRI and F96T12I41 K-70CRIIHO/ES)

#### **C. LED Lamps:**

- 1. Bulb finish: Clear
- 2. Any burning position

- D. Furnish a minimum of 2 lamps, or ten percent spare lamps of each type and wattage, whichever is greater.

## 2.3 FIXTURES

### A. Compact Fluorescent and LED Lighting Fixtures:

1. Ballast:
  - a. Rapid start, high power factor type
  - b. CBM/ETL certified
  - c. Sound rating A
  - d. Two internal automatic-resetting thermal switch devices for coil and capacitor
2. Internal wiring: AWM, TFN or THHN
3. Channel and end plates: 22 GA steel
4. Steel door frame and socket track: 20 GA steel
5. Channel cover: 24 GA steel
6. Emergency ballast:
  - a. Integral rechargeable nickel-cadmium battery, battery charger, and automatic transfer circuitry.
  - b. Charging indicator light.
  - c. Test Switch.
  - d. Provide a minimum of 900 lumen output for 90 minutes upon loss of normal power.
  - e. Mounted integral to the fixture.
  - f. UL 924 listed.
7. Provide fixtures with emergency ballasts with permanent caution labels warning that the fixture is fed from an unswitched source.
  - a. Provide emergency ballast also with a similar caution label.

### B. HID Lighting Fixtures:

1. Ballasts for high pressure sodium lighting fixtures:
  - a. Type: Regulating
  - b. Ballast design center variance: Maximum 5 percent from rated lamp wattage.
  - c. Lamp wattage regulation spread at the lamp voltage: Maximum 10 percent for +/-10 percent line voltage variation.
  - d. Ballast primary current during starting not to exceed normal operating current.
  - e. Lamp current crest factor: Maximum 1.8 for +/-10 percent line voltage variation at any lamp voltage, from nominal through life.
  - f. Power factor shall not drop below 90 percent for +/-10 percent line voltage variations at any lamp voltage, from nominal through life.
  - g. Capacitor variance: Tolerance of +/-6 percent which will not cause more than a +/-8 percent variation in regulation throughout rated lamp life for nominal line voltage.
  - h. Capable of operation with an open circuit condition for a maximum of 6 months without significant loss of ballast or starting circuitry life.
2. Ballasts for metal halide mercury vapor lighting fixtures:
  - a. Type: Auto-regulator
  - b. Voltage input range: +/-10 percent
  - c. Lamp regulation spread: 20 percent maximum
  - d. Power factor: 90 to 95 percent
  - e. Input voltage dip (4sec.): 40 to 50 percent
  - f. Crest factor of lamp current: 1.6 to 2.0
3. Ballasts for exterior HID lamps:
  - a. UL approved
  - b. High power factor designed for -20 Deg F temperature starting

4. Fixtures for non-hazardous locations:
  - a. Type: Industrial low bay
  - b. Ballast housing: Die-cast
  - c. Filter: Activated charcoal
  - d. Refractor: UV stabilized molded acrylic

## 2.4 MISCELLANEOUS ELECTRIC DEVICES

### A. **Photoelectric Control Units shall meet the following requirements:**

1. Cadmium sulfide photocell
2. Aluminum weatherproof enclosure
3. 30 amp rated contacts
4. 120-volt AC power
5. The Photoelectric control unit shall be Tork Model 2100, or equal.

### B. **Motion Sensors shall meet the following requirements:**

1. 110 degrees field of view, 60 foot range
2. Adjustable time setting from 15 seconds to 15 minutes
3. Operating temperature of -20 to + 130 degrees F.
4. Complete outdoor, weather proof sensor with complete mounting hardware
5. UL listed
6. The motion sensor(s) shall be manufactured by Leviton Model 50500-H or equal.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install lamps in all luminaires.
- B. Replace all failed fluorescent, incandescent, metal halide, mercury vapor and high pressure sodium lamps with new lamps prior to final acceptance by CITY.
- C. Surface and flush mounted fixtures shall be solidly connected to a junction box. Suspended fixtures shall be hung utilizing pendant mounting or stainless steel chains and hooks. Each suspended fixture, shall be electrically connected by a length of Type SO flexible cord. 3 conductor No. 14 AWG, minimum, with a twist-lock receptacle mounted in an individual junction box. Plugs and receptacles shall be as manufactured by Hubbell, General Electric Company, or equal.
- D. Provide mounting brackets and/or structural mounting support for fixtures. 1. Do not support fixture from conduit system. 2. Do not support fixture from outlet boxes.
- E. Install with approved mounting hardware following manufacturer's recommendations.
- F. Pole mounted fixtures shall be mounted on steel or aluminum poles as indicated on the Plans. All metal poles shall be bonded to the facility ground system. Poles shall have adequate handholes and weatherproof receptacles where indicated.
- G. All anchor bolts and nuts shall be stainless steel. CONTRACTOR shall paint all steel poles with aluminum paint or other color in accordance with these Contract Documents.

- H. Fixture mounting heights and locations indicated on the Plans are approximate and are subject to revision in the field where necessary to avoid conflicts and obstructions.

3.2 ADJUSTING AND CLEANING

- A. Wipe all lighting fixture reflectors, lenses, lamps, and trims clean after installation and prior to acceptance of Project by CITY.

-END OF SECTION -

**SECTION 16611**  
**STATIC UNINTERRUPTIBLE POWER SUPPLY**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers the requirements for uninterruptible power supplies (UPSs) to be provided as shown on the Plans.

1.2 SUBMITTALS

- A. Products shall be submitted in accordance with Section 01300, Section 16000, and the Contract Documents prior to installation.

1.3 REFERENCES

- A. National Electrical Code (NEC) Article 250

**PART 2 – PRODUCTS**

2.1 GENERAL REQUIREMENTS

- A. The UPS equipment shall be manufactured by Powerware, or equal.
- B. The UPS shall be sized for a minimum of 30 minutes of backup power for its rated load. The rated load shall be equal to or greater than the connected load.
- C. The UPS shall be a line-interactive type, consisting of a ferroresonant or linear transformer, battery charger, batteries, inverter, and microprocessor control. The batteries shall be maintenance free, premium type.
- D. The UPS shall pass lightning and surge protection ANSI/IEEE C62.41 standards, Category A and B. The UPS shall be UL 1449 listed.
- E. The output waveform shall be a pure sine-wave with less than 5% total harmonic distortion on the inverter.
- F. The UPS shall have a digital display for load-dependent runtime, volts in, volts out, battery voltage, percent loading, and alarm codes.
- G. The UPS shall operate between 0 and 40 degrees C, at a minimum of 95% efficiency on-line.

**PART 3 – EXECUTION**

3.1 INSTALLATION

- A. Install the UPS equipment in accordance with the manufacturers' recommendations.
- B. The UPS shall be provided with a 2 year parts and factory service warranty.

- END OF SECTION -

**SECTION 16902**  
**ELECTRICAL CONTROLS, RELAYS, AND ALARMS**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

A. **This Section includes the following:**

1. Pushbutton and Selector Switches
2. Relays
3. Alarms
4. Intrinsic Safety Barriers
5. Wireways
6. Watthour Transducers
7. Elapsed Time Meters and Time Clods

1.2 RELATED WORK

A. **Related Sections:**

1. Section 01300 – Submittals
2. Section 16000 – General Electrical Requirements
3. Section 16160 – Enclosures

1.3 REFERENCES

- A. **NEMA ICS 1:** Industrial Control and Systems General Requirements.
- B. **NEMA ICS 2:** Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600V.
- C. **NEMA ICS 6:** Industrial Control and Systems: Enclosures.
- D. **NEMA ST 1:** Specialty Transformers (Except General-Purpose Type).

1.4 SUBMITTALS

- A. **Data:** a complete list of equipment and material including manufacturer's descriptive data and technical literature, performance charts, catalog cuts and installation instructions, spare parts data for each different item of equipment specified. The data shall include a complete Bill of Materials.
- B. **Drawings:** containing complete wiring and schematic diagrams, control diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout, anchorage, support and appurtenances of equipment and equipment relationship to other parts of the work including clearances for maintenance and operations.
- C. Submit shop drawings in accordance with the Contract Documents, and NEMA ICS 1 specifications indicating control panel layouts, wiring connections and diagrams, dimensions, support points.

## 1.5 PROJECT RECORD DOCUMENTS

- A. Submit record documents in accordance with the Contract Documents.
- B. Accurately record actual locations of control equipment. Revise diagrams included in Drawings to reflect actual control device connections.

## 1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation data in accordance with the Contract Documents.
- B. Include instructions for adjusting and resetting time delay relays, timers, and counters.
- C. Submit maintenance data in accordance with the Contract Documents.
- D. Include recommended preventative maintenance procedures and materials.

## **PART 2 – PRODUCTS**

### 2.1 PUSHBUTTONS AND SELECTOR SWITCHES

- A. Pushbuttons, pilot lights and selector switches shall be of the full size, heavy-duty industrial, oil tight, 120 volt, with interchangeable pilot lights, plug-in construction, double break silver contacts, chrome plated lock rings, with modular contacts, and NEMA rating equal to that of the enclosure on which devices are installed. All components shall be flush mounted on front of panel, unless otherwise noted.
- B. Provide individual legend plates for indication of switch, pushbutton, and light function (e.g., Open, Closed, Hand-Off-Auto). A list shall be submitted for review and approval
- C. Pilot lights shall be high intensity LED type. Pilot lights shall have clear lenses and LED lamps colored as shown on the Plans. Common, remote push-to-test circuitry shall be provided for each control panel to simultaneously test all indicating lights on the panel using a single pushbutton when there are 10 or more lights on the panel. Control panels with less than 10 lights shall utilize individual push-to-test lights and control circuitry.
- D. Pushbuttons shall be maintained or momentary as required and as shown on the Drawings. Provide extended head pushbutton for all stop functions, mushroom head for emergency stop functions, and flush head pushbuttons for all other functions. Where indicated on the Drawings pushbuttons shall be illuminated type. Provide locking mechanism for all lock out functions. Selector switches shall have black knob operator, be maintained contact type unless noted otherwise, number and arrangement as required to perform intended functions specified but not less than one double pole, double throw, double break contact per switch. Contact rating shall be compatible with AC or DC throughput current of devices simultaneously operated by the switch contact but not less than 10 amperes resistive at 120 volts AC or DC continuous.
- E. Potentiometers shall be provided with operators and resistive elements of the type and quantity indicated on the Drawings and as required with legend plates indicating percent of span.
- F. The above devices shall be manufactured by Allen Bradley, General Electric, or equal.

### 2.2 RELAYS

- A. Timing relays shall be heavy duty, 120V A.C., 10 amps, solid state design, poles as required per application, -10 degrees C to +60 degrees C, have timing repeatability of  $\pm 2.0\%$  of setting, and be UL listed. The range shall be determined from the control descriptions and or schematic drawings. Provide mounting accessories, as required. The timing relays shall be manufactured by Allen Bradley, Cutler Hammer, or equal.

- B. Control relays shall be of the plug-in socket base type with dust-proof plastic enclosures, with silver-cadmium oxide contacts rated 120-V ac, 10 amperes, with contact arrangement and operating coils of the proper voltage as required by the control circuit sequence. Relays shall have indicating lamp to show energized state. Each relay shall have a minimum of two double pole, double throw contacts, or as required. Control relays shall be Allen Bradley, Cutler Hammer, or equal.
- C. Alternating relays shall be UL listed, 120 VAC, with contacts rated for 10 amperes at 120 VAC, life expectancy of 100,000 operations, load indicating LEDs, and switch for load locking and load selecting options. Alternating relays shall be manufactured by TimeMark models 261, 271, and 471, and Diversified Electronics model ARA for duplex, triplex, and quadplex alternators.

## 2.3 ALARMS

- A. Audible alarms shall be UL listed, 120 VAC, with solid state circuitry, vibrating horn, non-metallic corrosion resistant housing, with required mounting hardware, suitable for outdoor use capable of producing 100 dB at 10 feet. The audible alarm shall be manufactured by Federal Signal model 350, Edwards model 870-EX, or equal.
- B. Beacons for interior and/or exterior locations shall be rated NEMA 4X, flashing type (90 times per minute, minimum) with a red lens. Beacons shall be as manufactured by Federal Signal, Model 225XL, or equal.

## 2.4 INTRINSIC SAFETY BARRIERS

- A. Intrinsic safety barriers shall permit connection of devices located in a hazardous area to other devices located in a safe area. Intrinsic safety barriers shall be EMC compliant, 10 to 35 V dc, 35 mA output current, hazardous area terminals identified by blue labels, terminals accommodating conductors up to 12 AWG, ambient temperature rating of -20 to +60°C. The intrinsic safety barriers shall be manufactured by Allen-Bradley Bulletin 937, or equal.

## 2.5 WIREWAYS

- A. Wireways shall be PVC, snap-in slot design, with non-slip cover. Safe area wireways shall be light gray and marked "Safe Area Wiring." Hazardous area wireways shall be intrinsic blue and marked "Hazardous Area Wiring." The wireways shall be manufactured by Panduit Corporation, or equal.

## 2.6 WATTHOUR TRANSDUCERS

- A. Watthour transducers for active or reactive power shall be DIN rail and surface mount, single phase or three phase with balanced or unbalanced load, electrically isolated input and output signals, 4 to 20 mA output signal, 0-10 mA to 0-10 A input current, 0-10 V to 0-600 VAC input voltage, 16-500 Hz selectable frequency. The watthour transducers shall be manufactured by Sineax model PQ502, or equal.

## 2.7 ELAPSED TIME METERS AND TIME CLOCKS

- A. Elapsed time meters shall be self-powered, non-reset, solid state counter which provides silent, accurate and noise immune operation. Elapsed time meters shall require no external power, five year minimum battery life, 120 VAC power, accessories for panel mounting, nameplate below LCD display reading "HOURS", liquid crystal display with 6 digits approximately 2 inches high with 50,000 hour minimum display life and indication of sufficient battery power. The elapsed time meters shall be manufactured by Durant, Automatic Timing and Controls a Division of Sycon Corp., or equal.
- B. Time clocks shall be microprocessor based, have 24 hour time control, up to 24 operations per day, programmable from panel face keys, skip-a-day feature allowing schedule to be skipped for one to seven days, SPDT switch contact rated at 15 amps at 120 V AC, with battery carryover to maintain time and program during power outage for 275 hours. The time clocks shall be manufactured by Tork, Paragon Electric Company, or equal.

### **PART 3 – EXECUTION**

#### 3.1 INSTALLATION

- A. Fasteners shall be type 304 stainless steel.
- B. Install devices in strict accordance with NEC requirements and per manufacturers recommendation.
- C. Coordinate with other trades as necessary during installation of these devices.

#### 3.2 ACCEPTANCE

- A. All installations are subject to evaluation in accordance with NEC requirements and manufacturers recommendations. CONTRACTOR shall remove the unacceptable work and correct work at no charge to CITY.

- END OF SECTION -

**SECTION 16903**  
**PROGRAMMABLE LOGIC CONTROLLERS**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. This section covers the programmable logic controller (PLC) used for control and monitoring, as indicated on Plans.
- B. System control logic and human-machine interface (HMI) programming and software shall be provided by the CONTRACTOR'S programmer. The PLC system hardware, including, but not limited to, the PLC operation, OIT, power supplies, and internal wiring, shall be Factory tested and certified operational as a system, prior to shipment to the job site. The Factory testing shall be witnessed by the ENGINEER's representative.
- C. Provide software support and debugging time for one qualified instrument technician for a period of thirty (30) days after start-up of the equipment under PLC control to assist the CITY'S integration team.

1.2 SUBMITTALS

A. **Submittals shall include the following:**

- 1. Manufacturers data on electrical characteristics, capabilities and physical properties including:
  - a. Catalog cut sheets for all control panel components
  - b. Control panel layout drawings with Bill of Materials
  - c. Elementary diagrams
  - d. Point-to-point wiring diagrams
  - e. Interconnection diagrams
  - f. Heating/cooling calculations
  - g. Catalog cut-sheets for all items mounted in the control panel
  - h. Seismic calculations
  - i. Electronic Copies
- 2. Wiring diagrams showing connections to all devices; input and output (I/O), analog and discrete. The wiring diagrams shall indicate point to point wire numbers, terminal block numbers, and space for the I/O address point to be used in the PLC programs. I/O addresses will be provided by the CONTRACTOR'S programmer.
- 3. PLC and OIT application software. The Rockwell Automation RSLogix 5000 and Factory/Talk View Application software shall effect all requirements specified in these Specifications. The software shall be fully documented. It shall include annotated ladder diagram with rung and address comments. PLC and OIT application software submitted shall include the following, as a minimum: 1) Electronic copy of PLC application source code (.acd files) software complete with annotated rung comments. The electronic copy shall be installed on a DVD or USB Flash Drive. 2) Electronic copy of OIT application software source code (.apa files) including all control and alarm displays. The electronic copy shall be installed on a DVD or USB Flash Drive.

1.3 MANUFACTURERS

- A. PLC hardware shall be manufactured by Allen Bradley CompactLogix or ControlLogix processor.

**PART 2 – PRODUCTS**

2.1 PROGRAMMABLE LOGIC CONTROLLER

- A. PLCs shall be furnished with hardware and software necessary to monitor and control equipment, as listed in the Specifications, and shown on the Plans. Each field input and output shown as an I/O Point shall be

connected as per manufacturer's recommendations. Additionally, the CONTRACTOR shall provide the hardware, software, and installation necessary for connecting additional future equipment as indicated on the Plans. The type of field input and output shall be defined as follows:

1. Analog inputs and outputs (4-20 mA DC).
2. Discrete inputs (dry contact).
3. Discrete outputs (24 VDC, form "C" relay)
4. Key-in switch on control panel CP-1

- B. The ladder logic control programs shall reside in the PLCs. The program shall consist of software relay and attendant logic control. Control loop and logic flow diagrams shown on the Plans, or Control Descriptions listed herein, shall be fully implemented.

## 2.2 INPUT/OUTPUT MODULES

- A. I/O modules for local I/O rack shall match processor – CompactLogix I/O. For remote I/O shall be FlexLogix I/O modules. Other types of remote I/O modules require ControlNet and the NRSD has standardized on Ethernet. Each analog input, analog output and digital input shall be fused. All spare I/O should be wired to field terminal blocks. See Table at end of this section.
- B. Flex Logix analog and digital I/O modules should be powered from separate redundant power supplies. The power supply should be sized based on the number of modules and other devices being powered. Compact Logix local I/O racks each need its own power supply.
- C. The I/O rack system shall be field expandable to the maximum I/O capacity of the CPU, without modifications of the processor. Blank, or empty slots shall have covers, or filler plates installed.

## 2.3 ETHERNET CABLE SELECTION

- A. For cable runs less than 300 feet, use copper cables. For anything greater than 300 feet, use fiber-optic cables. Ethernet switches shall be Cisco IE4000 series. When fiber-optic cables are used, a patch panel needs to be installed, preferably in the control panel.

## 2.4 CONTROL PANEL SIZING

- A. Verify that the conduit window in the panel is adequate for the number and size of the conduits terminated at the panel.

## 2.5 CONTROL PANEL SPACING

- A. Verify that there is adequate clearance around the control panel for maintenance.

## 2.6 HMI SELECTION

- A. Minimum 8 GB Ram, multi-touch display minimum 17" diagonal, NEMA 4X SS Bezel, processor 4 cores 1.91 GHz minimum, minimum 500 GB SSD, 2 Ethernet ports, fan-less. Windows 10 Professional embedded software is not acceptable.

## 2.7 TERMINAL BLOCKS

- A. For control panels with minimal external conductors, terminal blocks shall be Square D Class 9080, Type KCB-1; Allen-Bradley Cat. No. 1492-CD3; or approved equal. For control panels with large amounts of external conductors, compact terminal blocks are acceptable. The compact terminal blocks shall be Allen-Bradley 1492-J4, or equal.

## 2.8 UPS

- A. UPS shall be Allen-Bradley 1609 Series, i.e., 1609-U500NH or approved equal.
- 2.10 POWER FAILURE RELAY
- A. Power Failure Relay shall continuously monitor the 480 volts 3-phase 60 Hz power at the low voltage switchboard. Power monitor has one output relay with one form-C contact. The unit shall be a Time Mark Corp Model A257B Catalog Number 98A00445-03 with 8 pin octal socket for DIN rail mounting Agastat Part Number BDS08SS or equal.
- 2.13 POWER FAILURE SHUTDOWN AUXILIARY TIMING RELAY
- A. True power off delay timing relay with 24 Vac/dc coil and one form-C time delayed contact, adjustable time delay range of 0.1 to 600 seconds. One time delay relay for each VFC. The unit shall be Idec Part number GT3F-1AD24 with 8 pin octal socket for DIN rail mounting Agastat Part Number BDS08SS or equal.
- 2.14 CONTROL (AUXILIARY) RELAYS
- A. General purpose industrial relay, plug-in type with screw terminals. 120 Vac or 24Vdc coils as required by the drawings. Each relay shall have at least two form-C contacts rated 10 A at 120 Vac, and shall be equipped with an indicator lamp. The unit shall be Allen Bradley 700 series or equal. Relays in the MCC shall be Allen Bradly heavy duty series or approved equal.
- 2.15 STORAGE AND DOWNLOADING OF PLC PROGRAMS
- A. The PLC shall be programmable through a Network Port, connected to a personal computer through a standard cable. The PLC programming software shall be provided with the user's manuals, original diskettes, and licensing agreement for registration by the CONTRACTOR. Cables, adapters, connectors, or other hardware required to connect to the PLC shall be provided by the CONTRACTOR.
- B. The PLC programming software shall enable the user to write the PLC program on-line or off-line. The software shall include utilities to manage PLC program files, document and print the programs, configure the programming environment, monitor and force the PLC addresses while on-line, and configure the PLC memory and addressing structure.

**TABLE FOR PLC COMPONENTS**

	<b>CompactLogix Non-Redundant System (Notes 1 and 3)</b>
Processor	1769-L33ER
Redundancy Module	-
Processor Ethernet Module	-
I/O Ethernet Module (Remote I/O)	1794-AENT
Chassis	-
Chassis Power Supply	Note 1
Local Digital Input	1769-IQ16
Local Digital Output	1769-OB16
Local Analog Input	1769-IF8
Local Analog Output	1769-OF4
Remote Digital Input	1794-IB16 (Note 2)
Remote Digital Output	1794-OB8 (Note 2)
Remote Analog Input	1794-IE8 (Note 2)
Remote Analog Output	1794-OE4 (Note 2)
Terminal Base	1794-TB3 (for remote I/O)

Notes:

- Each local rack, including the processor chassis, requires its own power supply (1769-PA2 or 1769-PA4).
- I/O modules should be powered from redundant power supplies (1606-XL series).

3. Specify appropriate end caps.

### **PART 3 – EXECUTION**

#### 3.1 INSTALLATION

- A. PLC shall be installed as indicated on the plans and according to the manufacturer's instructions.

#### 3.2 START UP AND TESTING

- A. Upon completion of the installation, start-up shall be performed by a factory-trained manufacturer representative. Operating and maintenance instruction books shall be supplied upon delivery of the unit and procedures explained to operating personnel.
- B. The PLC program and I/O shall be thoroughly tested. Each input and output signal shall be tested for correct indication and control function. The CONTRACTOR shall assist in the demonstration of the operation of the PLC control logic with simulated inputs, before the entire system is started, and run in automatic mode.

#### 3.3 TRAINING

- A. Provide four (4) hours of training on the control system hardware. Instruction shall include a description of the control system hardware, hardware operation, and troubleshooting.

#### 3.4 SPARES

- A. Furnish a minimum of one (1) spare I/O module of each type and one (1) power supply module of each size and type used.
- B. Furnish twelve (12) fuses of each type and size, used in the power supply and I/O modules.

- END OF SECTION -

**SECTION 16950  
ELECTRICAL TESTING**

**PART 1 – GENERAL**

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall provide testing as specified herein.

1.2 REFERENCES

A. **The following is a list of standards which may be referenced in this section:**

1. American Society for Testing and Materials (ASTM):
  - a. D665 - 19, Standard Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water.
  - b. D877 / D877M - 19, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
  - c. D923 - 15, Standard Practices for Sampling Electrical Insulating Liquids.
  - d. D924 - 15, Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids.
  - e. D971 - 20, Standard Test Method for Interfacial Tension of Insulating Liquids Against Water by the Ring Method.
  - f. D974 - 14, Standard Test Method for Acid and Base Number by Color-Indicator Titration.
  - g. D1298 - 12b(2017), Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
  - h. D1500 - 12(2017), Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale).
  - i. D1524 - 15, Standard Test Method for Visual Examination of Used Electrical Insulating Liquids in the Field.
  - j. D1533 - 20, Standard Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration.
  - k. D1816 - 12(2019), Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes.
2. Institute of Electrical and Electronics Engineers (IEEE):
  - a. 43-2013, Recommended Practice for Testing Insulation Resistance of Electric Machinery.
  - b. 48-2020, Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500kV.
  - c. 81-2012, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
  - d. 95-2012, Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) with High Direct Voltage.
  - e. 400-2012, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and Above.
  - f. 450-2020, Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications.
  - g. C2-2017, 2017 National Electrical Safety Code (NESC).
  - h. C37.20.1-2015, Standard for Metal-Enclosed Low-Voltage (1000 Vac and below, 3200 Vdc and below) Power Circuit Breaker Switchgear.
  - i. C37.20.2-2015, Standard for Metal-Clad Switchgear.
  - j. C37.20.3-2013, Standard for Metal-Enclosed Interrupter Switchgear (1 kV-38 kV).

- k. C62.33-2016, Standard for Test Methods and Performance Values for Metal-Oxide Varistor Surge Protective Components.
- 3. National Electrical Manufacturers Association (NEMA):
  - a. AB 4-2017, Guideline for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications.
  - b. PB 2-2011, Deadfront Distribution Switchboards.
  - c. WC 7, Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
  - d. WC 8, Ethylene-Propylene-Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- 5. International Electrical Testing Association (NETA) 2017: Acceptance Testing Specifications (ATS) for Electrical Power Distribution Equipment and Systems.
- 6. National Fire Protection Association (NFPA):
  - a. 70, National Electrical Code (NEC), 2020.
  - b. 70E, Standard for Electrical Safety in the Workplace, 2018.

### 1.3 SUBMITTALS

- A. Products shall be submitted for review in accordance with the Contract Documents, Section -1300, and Section 16000.
- B. **Administrative Submittals:** Submit 30 days prior to performing inspections or tests:
  - 1. Schedule for performing inspection and tests
    - a. Include notification dates for special inspections.
  - 2. List of references to be used for each test.
  - 3. Sample copy of equipment and materials inspection form(s).
  - 4. Sample copy of individual device test form.
  - 5. Sample copy of individual system test form.
- C. **Quality Control Submittals:** Submit within 14 days after completion of test:
  - 1. Test or inspection reports and certificates for each electrical item tested.
- D. **Contract Closeout Submittals:**
  - 1. In accordance with Operation & Maintenance requirements specified elsewhere.
  - 2. After test of inspection reports and certificates have been reviewed by ENGINEER and returned, insert a copy of each in operation and maintenance manual.

### 1.4 QUALITY ASSURANCE

- A. **Testing Firm Qualifications:**
  - 1. Independent V party organization functioning as an unbiased testing authority.
  - 2. Professionally independent of manufacturers, suppliers, and installers, of electrical equipment and systems being tested.
  - 3. Employer of engineers and technicians regularly engaged in testing and inspecting of electrical equipment, installations, and systems.
  - 4. Supervising engineer accredited as Certified Electrical Test Technologist by National Institute for Certification of Engineering Technologists (NICET), or International Electrical Testing Association and having a minimum of 5 years testing experience on similar projects.

5. Technicians certified by NICET or NETA.
  6. Assistants and apprentices assigned to project at ratio not to exceed two certified to one non-certified assistant or apprentice.
  7. Registered Professional Engineer to provide comprehensive project report outlining services performed, results of such services, recommendations, actions taken, and opinions.
  8. Recognized as a Nationally Recognized Testing Laboratory (NRTL) in accordance with OSHA 29 CFR 1910.7.
- B. Test equipment shall have an operating accuracy equal to, or greater than, requirements established by NETA ATS. Test instrument calibration shall be in accordance with NETA ATS.

#### 1.5 SEQUENCING AND SCHEDULING

- A. Perform inspection and electrical tests after equipment has been installed and certified by equipment manufacturer's representative.
- B. Perform tests with apparatus de-energized whenever feasible.
- C. **Inspection and electrical tests on energized equipment are to be:**
  1. Scheduled with CITY and ENGINEER prior to de-energization.
  2. Minimized to avoid extended period of interruption to the operating equipment.
- D. Notify CITY and ENGINEER at least 72 hours prior to performing tests on energized electrical equipment

### PART 2 – PRODUCTS (NOT USED)

### PART 3 – EXECUTION

#### 3.1 GENERAL

- A. Tests specified in this section are to be performed in accordance with the requirements of manufacturer's minimum recommendations, as identified herein, and as detailed in specific equipment specifications.
- B. **Tests and inspection shall establish that:**
  1. Electrical equipment is operational within industry and manufacturer's tolerances.
  2. Installation operates as designed and intended by the equipment manufacturer.
  3. Equipment is suitable for energization.
  4. Installation conforms to requirements of Contract Documents and NFPA 70, NFPA 70E, and IEEE C2.
- C. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer's recommendations.
- D. Adjust mechanisms and moving parts for free mechanical movement.
- E. Adjust adjustable relays and sensors to correspond to operating conditions, or as recommended by manufacturer.
- F. Verify nameplate data for conformance to Contract Documents.
- G. Realign and shim any improperly aligned equipment to a plumb, level condition.
- H. Properly anchor electrical equipment found to be inadequately anchored.

- I. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench to manufacturer's recommendations, or as otherwise specified.
  - J. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.
  - K. Provide proper lubrication to applicable moving parts.
  - L. Inform CITY of working clearances not in accordance with NFPA 70.
  - M. **Investigate and repair or replace:**
    - 1. Electrical items that fail tests.
    - 2. Active components not operating in accordance with manufacturer's instructions.
    - 3. Damaged electrical equipment.
- 3.2 ELECTRICAL ENCLOSURES:
- A. Remove foreign material and moisture from enclosure interior.
  - B. Vacuum and wipe clean enclosure interior.
  - C. Remove corrosion found on metal surfaces.
  - D. Repair or replace, as determined by CITY, door and panel sections having dented surfaces.
  - E. Repair or replace, as determined by CITY, poor fitting doors and panel sections.
  - F. Repair or replace improperly operating latching, locking, or interlocking devices.
  - G. Replace missing or damaged hardware.
  - H. **Finish:**
    - 1. Provide matching paint and touch up scratches and blemishes.
    - 2. If required due to extensive damage, as determined by CITY, refinish the entire assembly.
  - I. Replace fuses and circuit breakers that do not conform to size and type required by the Contract Documents.
  - J. Grout, caulk, or seal around the base of enclosures to prevent the entrance of moisture, dust, and rodents.
- 3.3 DRY TYPE TRANSFORMERS
- A. **Visual and Mechanical inspection:**
    - 1. Physical and insulator damage.
    - 2. Proper winding connections.
    - 3. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.
    - 4. Defective wiring.
    - 5. Removal of shipping brackets, fixtures, or bracing.
    - 7. Free and properly installed resilient mounts.
    - 8. Cleanliness and improper blockage of ventilation passages.
    - 9. Verify that tap-changer is set at correct ratio for rated output voltage under normal operating conditions.

10. Verify proper secondary voltage phase-to-phase and phase-to-ground after energization and prior to loading.

**B. Electrical Tests:**

1. Insulation Resistance Tests:
  - a. Applied megohmmeter DC voltage in accordance with NETA ATS, Table 100.5 for each:
    - 1) Winding-to-winding.
    - 2) Winding-to-ground.
  - b. 10-minute test duration with resistances tabulated at 30 seconds, 1 minute, and 10 minutes.
  - c. Results temperature corrected in accordance with NETA ATS, Table 100.14.
  - d. Temperature corrected insulation resistance values equal to, or greater than, ohmic values established by manufacturer.
  - e. Insulation resistance test results to compare within 1 percent of adjacent windings.
2. Perform tests and adjustments for fans, controls, and alarm functions as suggested by manufacturer.

3.4 LOW VOLTAGE CABLES, 600 VOLTS MAXIMUM

**A. Visual and Mechanical Inspection:**

1. Inspect each individual exposed power cable No. 4 AWG and larger for:
  - a. Physical damage.
  - b. Proper connections in accordance with Single-Line Diagram.
  - c. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.
  - d. Color coding conformance with NFPA 70 or specifications.
  - e. Proper circuit identification.
2. Mechanical Connections For:
  - a. Proper lug type for conductor material.
  - b. Proper lug installation.
  - c. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.
3. Shielded Instrumentation Cables (IC) for
  - a. Proper shield grounding.
  - b. Proper terminations.
  - c. Proper circuit identification.
4. Control Cables For:
  - a. Proper termination.
  - b. Proper circuit identification.
5. Cables Terminated Through Window Type CTs: Verify that neutrals and grounds are terminated for correct operation of protective devices.

**B. Electrical Tests:**

1. Insulation Resistance Tests:
  - a. Applied megohmmeter DC voltage in accordance with NETA ATS, Table 100.1.
  - b. Phase-to-phase and phase-to-ground for 1 minute on each pole.
  - c. Insulation resistance values equal to, or greater than ohmic values established by manufacturer or listed in NETA ATS, Table 100.1.
2. Contact Resistance Tests:
  - a. Contact resistance in microhms across each switch blade and fuse holder, 30 amps and larger.
  - b. Investigate deviation of 50 percent or more from adjacent poles or similar switches.

### 3.5 MOLDED CASE CIRCUIT BREAKERS

A. **General:** Inspection and testing limited to circuit breakers rated 200 amperes and larger.

B. **Visual and Mechanical Inspection:**

1. Proper mounting.
2. Proper conductor size.
3. Feeder designation according to nameplate and one-line diagram.
4. Cracked casings.
5. Connection bolt torque level in accordance with NETA ATS, Table 100.1.
6. Operate frame size and trip setting with circuit breaker schedules or single-line diagram.
7. Compare frame size and trip setting with circuit breaker schedules or single-line diagram.
8. Verify that terminals are suitable for 75 degrees C rated insulated conductors.

C. **Electrical Tests:**

1. Insulation Resistance Tests:
  - a. Utilize 1,000-volt DC megohmmeter for 480 and 600-volt circuit breakers.
  - b. Pole-to-pole and pole-to-ground with breaker contacts opened for 1 minute.
  - c. Pole-to-pole and pole-to-ground with breaker contacts closed for 1 minute.
  - d. Test values to comply with NETA ATS, Table 100.1.
2. Contact Resistance Tests:
  - a. Contact resistance in microhms across each pole.
  - b. Investigate deviation of 50 percent or more from adjacent poles and similar breakers.
3. Primary Current Injection Test to Verify:
  - a. Long-time minimum pickup and delay.
  - b. Short-time pickup and delay.
  - c. Ground fault pickup and delay.
  - d. Instantaneous pickup by run-up or pulse method.
  - e. Trip characteristics of adjustable trip breakers shall be within manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - f. Trip times shall be within limits established by NEMA AB 4, Table 3.
  - g. Instantaneous pickup value shall be within values established by NEMA AB 4, Table 4.

### 3.6 INSTRUMENT TRANSFORMERS

A. **Visual and Mechanical Inspection:**

1. Visually Check Current, Potential, and Control Transformers For:
  - a. Cracked insulation.
  - b. Broken leads or defective wiring.
  - c. Proper connections
  - d. Adequate clearances between primary and secondary circuit wiring.
2. Verify Mechanically That:
  - a. Grounding and bonding connections have good contact.
  - b. Withdrawal mechanism and grounding operation, when applicable, operate properly.
3. Insulation resistance measurement on instrument transformer shall not be less than that shown in NETA ATS, Table 7.2.1.1.

### 3.7 METERING

#### A. **Visual and Mechanical Inspection:**

1. Verify meter connections in accordance with appropriate diagrams.
2. Verify meter multipliers.
3. Verify that meter types and scales conform to Contract Documents.
4. Check calibration of meters at cardinal points.
5. Check calibration of electrical transducers.

### 3.8 GROUNDING SYSTEMS

#### A. **Visual and Mechanical Inspection:**

1. Equipment and circuit grounds in motor control centers and panelboards assemblies for proper connection and tightness.
2. Ground bus connections in motor control centers and panelboards assemblies for proper termination and tightness.
3. Effective transformer core and equipment grounding.
4. Accessible connections to grounding electrodes for proper fit and tightness.
5. Accessible exothermic-weld grounding connections to verify that molds were fully filled and proper bonding was obtained.

### 3.9 AC INDUCTION MOTORS

A. **General:** Inspection and testing limited to motors rated 10 hp and larger.

#### B. **Visual and Mechanical Inspection:**

1. Proper electrical and grounding connections.
2. Shaft alignment.
3. Blockage of ventilating air passageways.
4. Operate Motor and Check for:
  - a. Excessive mechanical and electrical noise.
  - b. Overheating.
  - c. Correct rotation.
  - d. Check vibration detectors, resistance temperature detectors, or motor inherent protectors for function ability and proper operation.
  - e. Excessive vibration.
5. Check operation of space heaters.

#### C. **Electrical Tests:**

1. Insulation Resistance Tests:
  - a. In accordance with ANSWEEE 43:
    - 1) Motors above 200 hp for 10-minute duration with resistances tabulated at 30 seconds, 1 minute, and 10 minutes.
    - 2) Motors 200 hp and less for 1-minute duration with resistances tabulated at 30 and 60 seconds.
2. Insulation resistance values equal to, or greater than, ohmic values established by manufacturers.
3. Calculate polarization index ratios for motors above 200 hp. Investigate index ratios less than 1.5 for Class A insulation and 2.0 for Class B insulation.

4. Insulation resistance test on insulated bearings in accordance with manufacturer's instructions.
5. Measure running current and voltage, and evaluate relative to load conditions and nameplate full-load amperes.
6. Verify proper operation of motor moisture and winding temperature protection, and other ancillary devices.

### 3.10 MOTOR CONTROL CENTERS AND MOTOR CONTROLLERS

#### A. **Visual and Mechanical Inspection:**

1. Proper barrier and shutter installation and operation.
2. Proper operation of indicating and monitoring devices.
3. Proper overload protection for each motor.
4. Improper blockage of air cooling passages.
5. Proper operation of drawout elements.
6. Integrity and contamination of insulation system.
7. Check door and device interlocking system by:
  - a. Closure attempt of device when door is in OFF or OPEN position.
  - b. Opening attempt of door when device is in ON or CLOSED position.
8. Check nameplates for proper identification of:
  - a. Equipment title and tag number with latest Single-Line Diagram.
  - b. Pushbuttons.
  - c. Control switches.
  - d. Pilot lights.
  - e. Control relays.
  - f. Circuit breakers.
  - g. Indicating meters.
9. Verify that fuse and circuit breaker sizes and types conform to Contract Documents.
10. Verify that current and potential transformer ratios conform to Contract Documents.
11. Check bus connections for high resistance by low resistance ohmmeter and calibrated torque wrench applied to bolted joints:
  - a. Ohmic value to be zero.
  - b. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.
12. Check operation and sequencing of electrical and mechanical interlock systems by:
  - a. Closure attempt for locked open devices.
  - b. Opening attempt for locked closed devices.
13. Verify performance of each control device and feature furnished as part of the motor control center or motor controller.
14. Control Wiring:
  - a. Compare wiring to local and remote control, and protective devices with elementary diagrams.
  - b. Check for proper conductor lacing and bundling.
  - c. Check for proper conductor identification.
  - d. Check for proper conductor lugs and connections.
15. Exercise active components.
16. Inspect contactors for:
  - a. Correct mechanical operations.
  - b. Correct contact gap, wipe, alignment, and pressure.
  - c. Correct torque of all connections.

17. Compare overload rating with full-load current for proper size.
18. Compare fuse, motor protector, and circuit breaker with motor characteristics for proper size.
19. Perform phasing check on double-ended motor control centers to ensure proper bus phasing from each source.

**B. Electrical Tests:**

1. Insulation Resistance Tests:
  - a. Applied megohmmeter DC voltage in accordance with NETA ATS, Table 100.1.
  - b. Bus section phase-to-phase and phase-to-ground for 1 minute on each phase.
  - c. Contactor phase-to-ground and across open contacts for 1 minute on each phase.
  - d. Starter section phase-to-phase and phase-to-ground on each phase with starter contacts closed and protective devices open.
  - e. Test values to comply with NETA ATS, Table 10.01.
2. Overpotential Tests:
  - a. Maximum applied AC or DC voltage in accordance with manufacturer's published values. If not available, in accordance with NETA ATS, Table 11.
  - b. Phase-to-phase and phase-to-ground for 1 minute for each phase of each bus section.
  - c. Test results evaluated on pass/fail basis.
3. Current Injection Through Overload Unit at 300 Percent of Motor Full-Load Current and Monitor Trip Time:
  - a. Trip time in accordance with manufacturer's published data.
  - b. Investigate values in excess of 120 seconds.
4. Control Wiring Tests:
  - a. Apply secondary voltage to control power and potential circuits.
  - b. Check voltage levels at each point on terminal boards and each device terminal.
  - c. Insulation resistance test at 1,000 volts DC on control wiring except that connected to solid state components.
    - 1) Insulation resistance to be 1 megohm minimum.
5. Operational test by initiating control devices to affect proper operation.

**3.11 LOW VOLTAGE SURGE ARRESTORS**

**A. Visual and Mechanical Inspection:**

1. Adequate clearances between arrestors and enclosures.
2. Ground connections to ground bus.

**B. Electrical Tests:**

1. Varistor Type Arrestors:
  - a. Clamping voltage test.
  - b. Rated RMS voltage test.
  - c. Rated DC voltage test.
  - d. Varistor arrester test values in accordance with IEEE C62.33, Sections 4.4 and 4.7.

- END OF SECTION -

**SECTION 16951  
SHORT CIRCUIT AND COORDINATION REPORT**

**PART 1 – GENERAL**

1.1 DESCRIPTION

**A. General:**

1. Prepare a short circuit analysis and protective device coordination study for the project electrical power source and distribution system.
2. The short circuit and coordination study report shall provide an evaluation of the electrical power system with the model numbers and settings of the protective devices.
3. Provide Arc Flash Warning labels, signed and dated, in accordance with NEC 110.16 and NFPA 70E.

**B. Scope:**

1. Perform and provide a complete short circuit analysis with equipment interrupting or withstand rating evaluation and a protective device coordination study for the electrical power distribution system serving the facility.
2. Include all portions of the electrical power distribution system from the utility primary service drop through and including motor loads 2 HP and greater, loads 5 KVA and larger, and protective devices 50 amperes and larger.
3. Electrical equipment bus impedance shall be assumed to be zero. Short circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each project power source or power distribution equipment including switchgear, switchboard, motor control center, and branch circuit panelboards.
4. A protective device coordination study shall be performed to determine proper selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated voltage and current transformers, and circuit breaker trip characteristics and settings.
5. The coordination study shall include all voltage classes of equipment from the utility's closest upstream protective device to existing and new equipment including switchgear, switchboards, motor control centers, and 120 volt panelboards main circuit protection.
6. Panelboard branch circuit devices need not be considered. The phase overcurrent and ground-fault protection shall be included, settings for the adjustable protective devices, and electrical metering and monitoring devices.
7. An equipment evaluation study shall be performed to determine the adequacy of existing or proposed electrical equipment by tabulating and comparing the short circuit ratings with the available fault currents.
8. Problem areas or inadequacies in the proposed equipment shall be identified in the report.

1.2 REFERENCES

- A. This section contains references to the following documents and they are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
IEEE 141	Recommended Practice for Electrical Power Distribution for Industrial Plants

<u>Reference</u>	<u>Title</u>
IEEE 242	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

### 1.3 SUBMITTAL SCHEDULE

- A. The report shall be submitted with the major electrical distribution equipment, and switchgear detailed product submittal.
- B. The ENGINEER-reviewed report shall be corrected, revised, and resubmitted as required. The report will be reviewed along with the electrical distribution and switchgear product submittal.
- C. The CONTRACTOR shall distribute the ENGINEER accepted report to the major electrical distribution equipment and switchgear manufacturers before the electrical distribution equipment and switchgear is manufactured.
- D. Provide an electronic copy, on USB flash drive, of the protective device coordination study results as generated by the study software.
- E. The report specified herein shall be provided in accordance with Contract Documents.

## PART 2 – PRODUCTS

### 2.1 REPORT

- A. The report shall be sealed and signed by the responsible electrical engineer, summarize the short circuit analysis, protective device coordination study, potential problem issues, conclusions, and recommendations that may affect the integrity of the project power distribution system. As a minimum, the report shall include the following.
  - 1. The equipment manufacturer's information used to prepare the study.
  - 2. Assumptions made during the study.
  - 3. Voltage drop of all branch and feeder circuits.
  - 4. Short circuit calculations listing short circuit levels at each bus.
  - 5. Simplified single line diagrams generated by the study software.
  - 6. Coordination study time-current curves including the instrument transformer ratios, model numbers of the protective relays, relay settings, and trip unit settings associated with each breaker.
  - 7. Comparison of short circuit duties of each bus to the withstand and interrupting capacity of the equipment protecting that bus.
  - 8. Data used as input to the report including cable impedance, source impedance, equipment ratings, equipment time-current curves etc.
  - 9. Arc Flash warning labels.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Provide the short circuit analysis and the coordination study for the electrical power distribution system using SKM System Analysis, Inc. Power Tools, or equal.
- B. The studies shall be performed in accordance with IEEE Standards 141 and 242 and shall utilize the ANSI; method of short circuit analysis in accordance with ANSI C37.010.
- C. The studies shall be performed using actual equipment data for the new equipment. The analysis and study shall use the equipment and protective device data provided by the electrical distribution equipment manufacturer for the project.

### 3.2 SHORT CIRCUIT ANALYSIS

#### A. The short circuit analysis and report shall include the following:

1. One-Line Diagram:
  - a. Location and function of each protective device in the system, such as relays, direct-acting trips, fuses, etc.
  - b. Type designation, current rating, range or adjustment, manufacturer's style and catalog number for all protective devices.
  - c. Power, voltage ratings, impedance, primary and secondary connections of all transformers.
  - d. Type, manufacturer, and ratio of all instrument transformers energizing each relay.
  - e. Sources of short circuit currents such as utility ties, generators, synchronous motors, and induction motors.
2. Impedance Diagram:
  - a. Available MVA or impedance from the power utility company.
  - b. Local generated capacity impedance.
  - c. Bus impedance.
  - d. Transformer and/or reactor impedance.
  - e. Cable impedance.
  - f. Equipment impedance.
  - g. System voltages.
  - h. Grounding scheme (resistance grounding, solid grounding, or no grounding).
3. Calculations:
  - a. Determine the paths and situations where short circuit currents are the greatest.
  - b. Assume bolted faults and calculate the 3-Phase and line-to-ground short circuits of each case.
  - c. Calculate the maximum and minimum fault currents.

### 3.3 PROTECTIVE DEVICE COORDINATION STUDY

#### A. The time-current characteristics of the specified and indicated protective devices shall be plotted on 5-cycle, log-log graph paper with a maximum of eight protective devices per plot. The coordination study time-current plots shall, at a minimum, include the following:

1. Time-current for each protective relay or fuse showing graphically that the settings will provide protection and selectivity within industry standards. Each curve shall be identified, and the tap and time settings shall be specified.
2. Time-current curves for each device shall be positioned to provide for maximum selectivity to minimize system disturbances during fault clearing. Reasonable coordination intervals and separation of characteristic curves shall be maintained.
3. Where selectivity cannot be achieved, the report shall indicate the cause and recommend alternative solutions. Time-current curves and points for cable and equipment damage and symmetrical and asymmetrical fault currents.
4. Circuit interrupting device operating and interrupting times.
5. Indicate maximum fault values on the graph.
6. Sketch of bus and breaker arrangement.

### 3.4 STUDY FIRM

- A. The report for the short circuit analysis and protective device coordination study indicating results shall be performed, stamped, and signed by an Electrical Engineer registered in the State where the Project is located.
- B. The CONTRACTOR shall provide the ENGINEER with submittal information for the electrical products used for the Project.

- C. The engineer performing the study must visit the project site after equipment is installed and modify the study as required, and resubmit the study. Also, they shall adjust all settings as required in the report and place all warning labels as needed.

- END OF SECTION -



**SECTION 17000**  
**GENERAL INSTRUMENTATION**

**PART 1 – GENERAL**

1.1 SCOPE

- A. The CONTRACTOR shall furnish and install, ready for use, the complete instrumentation and control systems as indicated on the Plans and in each of these Contract Documents. These documents include descriptions of functional operation and performance, as well as standards, but do not necessarily enumerate detailed specifications for all components and devices which are necessary. However, all components and devices shall be furnished and installed as required to provide complete and operable systems for accomplishing the functions and meeting the performance set forth hereinafter. The CONTRACTOR shall also be responsible for field calibrating the provided instruments based on the design requirements and project documents.

1.2 GENERAL PROVISIONS

- A. Each instrumentation and control system specified shall be separate and distinct and shall be the responsibility of a single manufacturer for the design, construction and furnishing of the desired control hardware, mechanical drawings, interconnection drawings, control piping layout drawings, control conduit layout drawings, internal drawings, installation and start-up supervision and/or calibration of the control equipment. The responsible manufacturer as described in the preceding sentence shall hereinafter be referred to as the "Instrumentation Supplier" and shall bear the responsibility for furnishing a fully complete system operating in a satisfactory manner.
- B. The instrumentation and control systems shall be furnished and installed by the CONTRACTOR complete and ready to operate, including all necessary interconnections and connections to sources of electrical power, air, water, drains and vents, with all required valves, switches and accessories as specified or as recommended for best operation by the manufacturer of the equipment furnished.
- C. All necessary mounting panels, stands, hangers and brackets shall be furnished and installed and shall comply with the relevant sections of these Contract Documents.
- D. In general, overall system accuracy shall be within plus or minus one percent of the actual process parameter being controlled (flow, temperature, etc.), unless otherwise specified.
- E. Where two or more manufacturers are concerned in furnishing Equipment for a single instrumentation and control system, the CONTRACTOR shall supply the Instrumentation Supplier with such information and drawings from other manufacturers, as are needed to fit their equipment into the control and instrumentation system panels.
- F. All equipment with interconnects shall be shown together on one coordinated drawing.
- G. All equipment to be furnished shall be coordinated, and submittals for the equipment shall be provide in accordance with Section 16000, and as required elsewhere in the Contract Documents.
- H. The CONTRACTOR shall provide factory-trained personnel to supervise and perform the installation and calibration of the control and instrumentation equipment, until this equipment has been field-tested by the CONTRACTOR, and the results of these tests have been reviewed by the ENGINEER.
  - 1. In addition, factory bench-test data shall be submitted to show that the Manufacturer's proposed equipment has been tested in the specified arrangement and found to achieve specified accuracy.

### 1.3 SUBMITTALS

- A. The CONTRACTOR shall coordinate the work specified, and shown on the Plans, such that a complete instrumentation and control system for the facility will be provided, and will be supported by accurate shop and record drawings.
- B. The CONTRACTOR shall be responsible for providing the submittal documents prepared by subcontractors, and ensuring the accuracy and completeness of the documents, prior to delivery to the ENGINEER.
- C. The CONTRACTOR shall ensure that that the electrical, pneumatic, and hydraulic interface between the instruments and the process equipment is clearly shown in the shop drawing submittal.
- D. The following shall be submitted to the ENGINEER and returned, reviewed to the CONTRACTOR before fabrication is started:
  - 1. Layout drawings of system showing wiring, piping, valves, switches, and control units in schematic form. This includes individual loop drawings and total integrated system
  - 2. Shop drawings of panels or enclosures showing size, arrangement, color, and nameplates.
  - 3. Bill of material and catalog data on all equipment, wiring, conduit, tubing, and such other accessories as are needed to properly operate the instrumentation and control system. Data sheets shall show:
    - a. Component functional description used herein and on the Plans.
    - b. Manufacturer's model number or other product designation.
    - c. Project tag number used herein and on the Plans.
    - d. Project System or Loop of which the component is a part.
    - e. Project location or assembly at which the component is to be installed.
    - f. Input and output characteristics.
    - g. Scale range and units (if any) and multiplier (if any).
    - h. Requirements for electric supply (if any). Requirements for air supply (if any).
    - j. Materials of component parts to be in contact with, or otherwise exposed to, process media.
    - k. Special requirements or features.
  - 4. Wiring diagrams of all electrical work including conduits and piping diagrams of pneumatic/hydraulic systems.
  - 5. Upon acceptance, CONTRACTOR shall submit a minimum of 4 sets of "as built" drawings of the instrumentation and control systems, along with manuals for the installation, operation and maintenance of the equipment. Each set shall include installation, operating, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the CITY with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.
  - 6. A complete index shall appear in the front of each bound submittal volume. A separate technical brochure or bulletin shall be included with each instrument data sheet. The data sheets shall be indexed in the submittal by Systems or Loops, as a separate group for each System or Loop. If, within a single System or Loop, a single instrument is employed more than once, one data sheet with one brochure or bulletin may cover all identical uses of that instrument in that System. Each brochure or bulletin shall include a list of tag numbers for which it applies. System groups shall be separated by labeled tags.
  - 7. Drawings showing both schematic and wiring diagrams for control circuits: Complete details on the circuit interrelationship of all devices within and outside each Control Board shall be submitted first, using schematic control diagrams. Subsequent to return of this first submittal by the ENGINEER, piping and wiring diagrams shall be prepared and submitted for review by the ENGINEER; the diagrams shall consist of component layout drawings to scale, showing numbered terminals on components together with the unique number of the wire to be connected to each terminal. Piping and wiring diagrams shall show terminal assignments from all primary measurement devices, such as

flowmeters, and to all final control devices, such as samplers, pumps, valves and chemical feeders. The CONTRACTOR shall furnish all necessary equipment suppliers shop drawings to facilitate inclusion of this information by the Instrumentation Supplier.

8. Assembly and Construction Drawings for each Control Board and for other special enclosed assemblies for field installation. These drawings shall include dimensions, identification of all components, surface preparation and finish data, nameplates, and the like. These drawings also shall include enough other details, including prototype photographs, to define exactly the style and overall appearance of the assembly; a finish treatment sample shall be included.
  9. Installation, Mounting, and Anchoring Details for all components and assemblies to be field-mounted, including conduit connection or entry details.
- E. The CONTRACTOR and suppliers are cautioned regarding the review and compliance with the total Contract Documents. Typical examples are control relays, timers, enclosures, and nameplates. These particular items are sometimes furnished and installed by an instrument supplier. However, they are specified in DIVISION 16 of these Contract Documents.

## **PART 2 – PRODUCTS**

### **2.1 CONTROL AND INSTRUMENTATION DEVICES**

- A. Control mechanisms shall be standard devices constructed of corrosion-resistant materials, enclosed in a dust-proof case and mounted as specified in the individual application. Instruments to be mounted outdoors or in basements shall be in weatherproof cases. Corrosion resistant cases shall be furnished where required. Cases shall be finished in manufacturers standard colors except as otherwise specified. All instrument wires or cables shall be enclosed and not exposed or within reach of the public.
- B. Each meter, indicator, totalizer, controller, recorder or other device shall have an identifying engraved laminated plastic nameplate. This includes all primary elements, such as flow meters. The nameplate shall be mounted on the case so that it will identify the equipment as specified on the drawings. Brass or stainless steel mounting screws shall be used.
- C. Each receiver and each transmitter shall have an individual cutout, switch and fuse to disconnect the receiver from all sources of power.
- D. Straightening vanes, pressure snubbers, or other required accessories, shall be furnished and installed if necessary to meet the accuracy requirements in these Contract Documents.

### **2.2 INTERCOMPONENT WIRING AND TUBING**

- A. Intercomponent wiring shall be run in conduit. Minimum permissible signal wiring insulation voltage is 600 volts, with the exception of special cable as required by the manufacturer and accepted by the ENGINEER.

### **2.3 POWER SUPPLIES**

- A. Regulated do power supplies for instrument loops shall be designed and arranged so that loss of one supply does not affect more than one instrument loop or system. Power supplies shall be suitable for an input voltage variation of plus or minus 10 percent, and the supply output shall be fused or short circuit protected. Output voltage regulation shall be as required by the instrumentation equipment being supplied. Multi-loop, or multi-system power supplies, will be acceptable if backup power supply units are provided which will automatically supply the load upon failure of the primary supply. The backup supply systems shall be designed so that either the primary or backup supply can be removed, repaired, and returned to service without disrupting the instrument system operation.
- B. The power distribution from multi-loop supplies shall be selectively fused such that a fault in one instrument

loop will be isolated from the other loops being fed from the same supply. Fuses shall be clearly labeled and located for easy access. Multi-loop supply systems shall be oversized for an additional 10 percent future load. Failure of a multi-loop supply shall be indicated on the respective instrument panel or enclosure.

### **PART 3 – EXECUTION**

#### **3.1 TRAINING**

- A. The CONTRACTOR shall provide training of personnel in the operation and maintenance of the furnished control systems.
- B. Training shall be provided as required elsewhere in the Contract Documents, but shall consist of at least eight hours, in a single, or multiple sessions, to accommodate the personnel schedules.
- C. The CONTRACTOR shall coordinate with the ENGINEER, and the CITY, to schedule the training sessions at least 5 working days in advance.

- END OF SECTION -

**SECTION 17100  
CONTROL SYSTEMS INTEGRATION**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall be responsible for providing all labor, materials, and incidentals as indicated, specified and required to furnish, install, calibrate, adjust, test, document, start-up and train for a complete, integrated and functionally operational Instrumentation and Control System as is intended by these Contract Documents. The CONTRACTOR shall be responsible for any subcontractors or integrators he may hire in order to complete the system as specified.
- B. **THE CITY OF VERNON WILL BE PROVIDING THEIR OWN I&C INTEGRATOR TO INTEGRATE AND PROGRAM THE PROPOSED UPGRADES WITHIN THE CITY'S EXISTING SCADA SYSTEM.**
- C. **THE PUMP STATION CONTROL PANEL HMI SHALL DISPLAY ALL THE ALARMS INDICATED ON THE PROCESS AND INFORMATION DRAWINGS.**
- D. Unless specified otherwise herein, the requirements of Division 16 – Electrical & Division 17 – Instrumentation apply to this Section.
- E. **Related work elsewhere:**
  - 1. P&ID Drawings
  - 2. 17000 – General Instrumentation Section
  - 3. 17500 – Control Strategy
  - 4. 17520 – Local Control Panels

1.2 QUALITY ASSURANCE

- A. The CONTRACTOR shall be familiar with the specified PLC and control hardware and shall be able to document a minimum of 3 years of experience in programming projects of similar size and complexity in scope to this project.

**PART 2 – PRODUCTS**

**PART 3 – EXECUTION**

3.1 CONTROL SYSTEM

- A. The CONTRACTOR shall provide the integration and programming of the following:
  - 1. Field instruments and equipment as specified in the project documents within Pump Station Control Panel.
  - 2. Pump Station Control Panel's Human Machine Interface (HMI) display.

3.2 SCADA/OIT

- A. The Vernon Well No. 22 shall be monitored and controlled by the Pump Station Control Panel PLC. In addition, the station shall also be monitored and controlled via a City's Supervisory Control and Data Acquisition (SCADA) system. The communication between the PLC and SCADA network shall utilize the existing DSL Modem. The SCADA and OIT shall allow the operator to make process changes such as starting and stopping of equipment and opening and closing of valves as well as adjust control set points. The District's Integrator will be responsible for providing the integration and programming of the PLC and the

Control Systems Integration

CITY's existing SCADA system.

### 3.3 SYSTEM SECURITY

- A. A password protected security system shall provide up to 3-levels of access to view and make changes to the operation of the pump system.
  - 1. Level 1: Is allowed to view system screens / no changes allowed
  - 2. Level 2: Is allowed to view system screens / can change operator level set points and in/out service set points / cannot change station set- up parameters or locks on the pump run bit values
  - 3. Level 3: Unlimited access

### 3.4 FACTORY TESTING

- A. See Section 17000 – General Instrumentation

### 3.5 INSTALLATION AND FINAL ACCEPTANCE

- A. See Section 17000 – General Instrumentation
- B: The CONTRACTOR shall provide a minimum of three (3) days for control system operation and SCADA training.

- END OF SECTION -

**SECTION 17500  
CONTROL STRATEGY**

**PART 1 – GENERAL**

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish a complete and functional control system as described below. This shall include fabrication, programming and commissioning of the PLC, equipment, and instrumentation located at the site in accordance with the requirements of the Contract Documents.
- B. **THE MOTOR CONTROL PANEL HMI SHALL DISPLAY ALL THE ALARMS INDICATES ON THE PROCESS AND INFORMATION DRAWINGS.**
- C. The requirements of Division 16 – Electrical & Division 17 –Instrumentation apply to this Section unless specified otherwise herein.
- D. Related work elsewhere:
  - 1. P&ID Drawings
- E. This section includes the general system overview and description of logic for each piece of equipment being controlled by the Process PLCs. Other sections of Division 17 shall supplement this Section as necessary.
- F. The intent of this section is to provide guidance to the CONTRACTOR in the programmable logic function for various I/O signals indicated on the Drawings. The control and monitoring functions described herein cover the basic logic to be performed with each I/O signal. These control descriptions are not intended to cover every possible scenario or describe every possible timer, delays, interlock, safety shutdown, etc. that may be necessary for a complete operational system.
- G. The primary function of these control descriptions is to provide the CONTRACTOR with information that cannot be indicated in electrical schematic diagrams such as logic performed by PLC's and/or operator interface software. A brief description of signals to be provided to/from control panels and equipment has also been provided herein. It is also the intent of this section to list the minimum control, monitoring and alarm functions to be displayed on the HMI and SCADA screens.
- H. An attempt has been made on the Drawings and in these Specifications to describe system logic and functionality as well as show signals, interlocks, and devices necessary for proper operation of the control and monitoring systems. However, if a particular signal, device, sensor, interposing control relay, signal converter, control logic, interlock (hardware or software), etc., is required to meet the intent or operational requirements and is not indicated, the CONTRACTOR shall furnish and install this piece of equipment with no extra compensation.
- I. The CONTRACTOR shall include a minimum of forty (40) hours of programming/operator interface configuration time for modifications or changes in the system logic or operator interface screens as requested by the CITY or ENGINEER. This additional programming and/or configuration time will take place only after the system has been programmed and tested for proper operation as described herein.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

3.1 SYSTEM DESCRIPTION

- A. The Vernon Well No. 22 Station (herein referred to as Station) will be monitored and controlled by the Station's PLC Panel (here in referred to as PLC).

### 3.2 VERNON WELL NO. 22 PUMP STATION

- B. The CITY has stated that the Station is designed to operate to maintain pressure within the distribution system. In addition to the pressure control, the station shall also be capable of operating off flow and level control. The Station is designed to operate automatically, or based on the operator's inputs. The Station can either be turned On/Off locally through the pump's Hand-Off-Auto (HOA) switch or remotely when the pumps HOA switch is in auto and the operator calls the pump to maintain a system setpoints through the HMI/CITY SCADA system.
- C. In either Hand or Auto Mode, two hard-wired interlocks will be provided preventing the Well 22 pump from operating. These two hard-wired interlocks will be the high temperature sensor in the motor and the emergency stop button located next to the pump pedestal. The level transducer (LT-02180) and the high pressure switch (PSH-02151) shall be "soft" interlocks that stop pump operation in the alarm state. These soft interlocks shall be provided to stop the pump from dead heading or running below the intended operations level. To prevent damage to the pump, an operator adjustable time delay shall also be installed to prevent the Well 22 pump from excessive cycling when a run condition is triggered.
- D. The PLC shall record the instantaneous flow rate at an operator adjustable time frame and record the flow totalizer pulse reading from the discharge flow meter FIT-02140. The CONTRACTOR shall program a totalizer reset button to reset the total flow reading on the HMI Display.
- E. Modes of Station Operation in Auto
  1. The "Pressure Control Mode" uses the well pump discharge pressure transmitter as the primary feedback for control and monitors the system discharge pressure, discharge flow rate and the groundwater level for proper operating conditions. When a start command is issued either from the HMI or the Central SCADA system, the local control panel system will continuously monitor and compare the system discharge pressure to the high and low pressure setpoints entered by the operator. If the system discharge pressure decreases below the low pressure set point for time delay T seconds, the well pump will be called to run. The well pump will operate at full speed until the discharge pressure in the well increases the operating pressure set point for stop. The pump operation can be stopped if a stop command is issued from the HMI or from the Central SCADA system or the HOA Selector Switch position is changed.
  2. The "Level Control Mode" uses the well groundwater level transducer as the primary feedback for control and monitors the pump discharge pressure, system discharge pressure and the discharge flow rate for proper operating conditions. When a start command is issued either from the HMI or from the Central SCADA system, the well pump will ramp-up and operate at full speed until the water level in the well decreases to the operator level set point, at which time, the control logic will be initiated to vary the speed of the pump to maintain the water level at the set point. If the water level decreases further, the pump speed will be reduced. If the water level rises, the pump speed will be increased. Pump operation will continue until a stop command is issued from the HMI or from the Central SCADA system or the HOA Selector Switch position is changed.
  3. The "Flow Control Mode" uses the discharge flow meter as the primary feedback for control and monitors the well discharge pressures, system discharge pressure and the groundwater level for proper operation conditions. When a start command is issued either from the HMI or from the Central SCADA system, the well pump will operate at full speed. Pump operation will continue until a stop command is issued from the HMI or from the Central SCADA System or the HOA Selector Switch position is changed.

- F. The PLC shall also indicate when the following alarms have been triggered:

Signals to/from Equipment to Main PLC (see P&ID)

SCADA & HMI Control and Set Points:

<b>Equipment/Instrument</b>	<b>Recommended Set Point</b>	<b>Allowable Range</b>
Well #22 Pump (PMP-02100) Run (YC-02100)	N/A	On/Off
Well #22 Pump (PMP-02100) % Speed (SC-02100)	N/A	0 – 100 %
Well #22 Flow Meter (FE-02140) GPM (FIR-02140)	2,100 gpm	0 – 3000 gpm
Well #22 Pump Pressure (PIT-02150) Pressure (PIR-02150)	70 psi	0 – 150 psi
Well #22 System Pressure (PIT-02152) Pressure (PIR-02152)	70 psi	0 – 150 psi
Well #22 Level (LIT-02180) Level (LIR-02180)	130 psi	0 – 200 psi
Well #22 Pump-to-Waste Valve (V-02123) Open/Close (ZO-02123)(ZC-02123)	N/A	Open/Close

SCADA and HMI Display Only:

<b>Equipment/Instrument</b>	<b>SCADA and HMI Display</b>
Well #22 Pump (PMP-02100) HOA Position (HS-02100)	Hand/Off/Auto
Well #22 Pump (PMP-02100) Speed Reference (SI-02100)	Pump Speed (RPM)
Well #22 Pump (PMP-02100) Running (YI-02100)	Running
Well #22 Flow Meter (FE-02140) Total Flow (FQIR-02140)	Flow Total
Well #22 Pump Pressure (PIT-02150) High Pressure (PIH-02150)	High PSI Reading
Well #22 Pump Pressure (PIT-02150) Low Pressure (PIL-02150)	Low PSI Reading
Well #22 System Pressure (PIT-02152) High Pressure (PIH-02152)	High PSI Reading

Equipment/Instrument	SCADA and HMI Display
Well #22 System Pressure (PIT-02150) Low Pressure (PIL-02152)	Low PSI Reading
Well #22 Flush Water Supply (FE-02141) GPM (FIR-02141)	GPM
Well #22 Flush Water Supply (FE-02141) Total Flow (FQIR-02141)	Flow Total
Well #22 Pump-to-Waste Valve (V-02123) Valve Opened (ZIO-02123)	Position Indicate Open
Well #22 Pump-to-Waste Valve (V-02123) Valve Closed (ZIO-02123)	Position Indicate Closed

SCADA and HMI Alarm Display:

Equipment/Instrument	SCADA and HMI Alarm Display
Well #22 Pump (PMP-02100) VFD Fail (YI-02100) (YA-02100)	VFD Fail
Well #22 Pump (PMP-02100) High Temperature Indicator (TIH-02100) (TAH-02100)	High Motor Temp. Fail
Well #22 Pump Pressure (PIT-02150) High Pressure (PIH-02150)(YA-02150B)	High PSI Reading
Well #22 Pump Pressure (PIT-02150) Low Pressure (PIL-02150) (YA-02150A)	Low PSI Reading
Well #22 System Pressure (PIT-02152) High Pressure (PIH-02152) (YA-02152B)	High PSI Reading
Well #22 System Pressure (PIT-02150) Low Pressure (PIL-02152) (YA-02152A)	Low PSI Reading

### 3.3 CHLORINE INJECTION SYSTEM

- A. The CONTRACTOR shall ensure that the power and controls are furnished and installed for a chlorine injection system skid. The PLC shall be provided with sufficient space to integrate the system controls. The bid plans show a chlorine injection system and the associated communication signals the CONTRACTOR shall include in the bid.
- B. The CITY intends to operate the chlorine injection system to maintaining chlorine residual in the finished water based on the well pump output rate. Due to the variance in well output rate associated with VFD operation, the chemical injection pumps will need to be throttled to ensure that the system is receiving the correct amount of chlorine. Since the CITY asked for the removal of the onsite chlorine analyzers that would allow for water quality analysis and the parts per million (ppm) of chlorine that the CITY would like to inject is unknown, the pump run speed will need to be an operator adjustable value of the total flow. The chlorine injection system will receive the "RUN" command after an operator adjustable time delay once the system has completed the "pump-

to-waste” period. The pump operating speed is a function of the well pump speed and the CITY dosing requirements.

The required dosage and the solution strength shall be input by CITY operations staff based on the required disinfection criteria. The speed control inputs (SC-02101 & SC-02102) will act as a manual overrides.

In the event of the chlorine storage tank low level alarm (LIL-02181) being received by the PLC, a “soft” interlock will stop operation of the chemical injection pumps to avoid damaging the system. The alarm will notify CITY operations staff.

Signals to/from Equipment to Main PLC via Manufacturer’s Control Panel (See P&ID)

SCADA and HMI Control and Set Points:

<b>Equipment/Instrument</b>	<b>Recommended Set Point</b>	<b>Allowable Range</b>
Chlorine Injection Pump # 1 (PMP-02101) Run (YC-02101)	N/A	On/Off
Chlorine Injection Pump # 1 (PMP-02101) % Speed (SC-02101)	N/A	0 – 100 %
Chlorine Injection Pump # 2 (PMP-02102) Run (YC-02102)	N/A	On/Off
Chlorine Injection Pump # 2 (PMP-02102) % Speed (SC-02102)	N/A	0 – 100 %

SCADA and HMI Display Only:

<b>Equipment/Instrument</b>	<b>SCADA and HMI Display</b>
Chlorine Injection Pump # 1 (PMP-02101) Running (YI-02101)	Running
Chlorine Injection Pump # 2 (PMP-02102) Running (YI-02102)	Running
Chlorine Tank Level (LIT-02181) Level (LIR-02181)	Tank Level (Feet)

SCADA and HMI Alarm Display:

<b>Equipment/Instrument</b>	<b>SCADA and HMI Alarm Display</b>
Chlorine Injection Pump # 1 (PMP-02101) Fail (YI-02101)	General Fail Alarm
Chlorine Injection Pump # 2 (PMP-02102) Fail (YI-02102)	General Fail Alarm
Chlorine Tank Level (LIT-02181) Low Level (LIL-02181)	Low Tank Level

### 3.4 FACTORY TESTING

- A. The control software program shall be factory tested prior to installation at the jobsite to verify all I/O function as required herein.

### 3.5 FIELD TESTING

- A. The programmer shall visit the site as required to test the program to verify the program functions as required herein. Minimum site visit shall be two (2) times. Any program flaws shall be debugged and corrected to ensure compliance with these requirements.
- B. The ENGINEER shall be notified of such testing a minimum of one (1) week in advance and shall, at his option, be present to witness the functionality of the program.

- END OF SECTION -

**SECTION 17510  
FIELD INSTRUMENTS**

**PART 1 – GENERAL**

**1.1 REQUIREMENT**

- A. This section includes the general requirements for furnishing and installing the field instruments as indicated on the Drawings and specified in this Division of these specifications. Other instrumentation and control sections of this Division shall supplement this Section as necessary. These specifications shall not apply to instrumentation to be provided by process equipment vendors as part of the process systems or equipment already approved by the ENGINEER.
- B. The CONTRACTOR shall be responsible for all field instruments indicated in the Contract Documents.
- C. The CONTRACTOR shall provide all labor, materials, and incidentals as indicated, specified and required to furnish, install, calibrate, adjust, test, document, start-up and train for each field instrument furnished.
- D. Labor, materials, apparatus, and components essential to the complete functioning of field instruments described and indicated herein, or which may be reasonably implied as essential, whether mentioned in the Contract Documents or not, shall be furnished and installed by the CONTRACTOR. In case of doubt as to the work intended, or in the event of need for explanation thereof, the CONTRACTOR shall refer to the ENGINEER for supplemental instructions.
- E. For purposes of clarity and legibility, the Drawings are diagrammatic only. Construction Documents are not intended to show every fitting, junction, or component nor every difficulty that may be encountered during installation or coordination with different equipment manufacturers. The CONTRACTOR shall refer to related data in all Contract Documents and shall verify this information on site.

**1.2 SUBMITTALS**

- A. Submittals shall be furnished in accordance with Sections 01300 - Submittals.
  - 1. Descriptive Data: Submit copies of complete descriptive literature, performance data, physical dimensions, power and signal connections for each field instrument to be furnished. Provide name of manufacturer, style, and complete model number. Listing items "as specified" without both make and model or type designation is not acceptable.
  - 2. Component Data Sheets: Submit a component data sheet for each piece of instrumentation equipment similar to an ISA S20 form. Include equipment tag number, manufacturer's model number, location of service, materials of construction, size and scale range, calibrated range, set points, optional accessories and any other useful information.
  - 3. Submit drawings and bill of materials for any sun shields that may be required. Drawings must clearly indicate how the sun shield will be fabricated and mounted.

**1.3 OPERATING AND MAINTENANCE MANUALS**

- A. Installation requirements and procedures.
- B. Complete instructions regarding the operation and maintenance of equipment involved. Instructions and documentation not related to the equipment furnished must be removed or crossed out. O&M manuals must be individually tailored to the project and equipment as furnished.
- C. Bill of Materials, component data sheets, descriptive literature, product specification sheets, wiring diagrams and calibration procedures. O&M manuals must be individually tailored to the project and equipment as furnished.

- D. Complete nomenclature of replaceable parts, part numbers, current cost, name and address of nearest vendor of replacement parts. Information on equipment or components not related to equipment furnished must be removed or crossed out. O&M manuals must be individually tailored to the project and equipment as furnished
- E. Provide a copy of all instrument calibration reports.
- F. Refer to Specification Section 17000 for additional requirements.

#### 1.4 QUALITY ASSURANCE

- A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacture of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the CONTRACTOR from responsibility for the proper installation and functioning of the work.
- B. The manufacturer shall provide a 2-year equipment warranty.

#### 1.5 COORDINATION

- A. The CONTRACTOR shall coordinate with all other equipment manufacturers to ensure proper installation and operation of the field instruments.
- B. The CONTRACTOR shall coordinate with all other trades to avoid conflicts and interferences. No extra compensation will be allowed for changes made necessary due to conflicts between various equipment.
- C. Any discrepancies noted in these contract documents or discrepancies between Drawings and actual field conditions shall be promptly brought to the ENGINEER for a decision. No extra compensation will be allowed for changes made by the CONTRACTOR without ENGINEER's consent.

#### 1.6 IDENTIFICATION TAGS (See also Section 16195 – Electrical Identifications)

### **PART 2 – PRODUCTS**

- A. Provide instrumentation as noted on the Equipment List.

#### 2.0 ELECTRO-MAGNETIC FLOWMETERS

##### A. General:

1. Magnetic flowmeter shall be for potable water application.
2. Magnetic flowmeters systems shall be of the low frequency electromagnetic induction type and produce a DC pulsed signal directly proportional to and linear with the liquid flow rate. Complete zero stability shall be an inherent characteristic of the flowmeter system. Each magnetic flowmeter system shall include a metering tube, signal cable, transmitter and flowmeter grounding rings.
3. Magnetic flowmeters and electronics shall be manufactured at facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.
4. Flowmeters that are to be located on a submerged pipe shall be designed to operate in such conditions. Flowmeter display shall be located above water level and a connection cable of appropriate length shall be provided to allow connection to display location.

##### B. Metering Tube:

1. Constructed of stainless steel with 150 lb. carbon or stainless steel ANSI B16.5 Class 150 flanged connection.
2. Utilize a minimum of 2 bullet-nosed, self-cleaning electrodes.
3. The liner shall be non-conductive and in conformance with the Manufacturer's recommended service.

4. Electrodes constructed of materials that are in conformance with the Manufacturer's recommendation for the meter's intended service.
  5. Meter housing rated for accidental submergence.
  6. Two stainless steel grounding rings shall be furnished and installed in accordance with the manufacturer's bore and material recommendation for the meter's intended service. Installation shall be per flowmeter manufacturer's recommendations. Unless otherwise indicated, flowmeter grounding shall consist of a 3/4" x 10-foot copper clad ground rod bonded to the grounding rings with a No.6 bare copper conductor.
- C. Transmitter: The transmitter shall be mounted on the flow tube or remotely where indicated on the Drawings. The interconnecting cable shall be furnished by the flowmeter manufacturer of sufficient length to avoid splicing. Transmitters shall be housed in NEMA 4X enclosures suitable for mounting outdoors. The transmitter shall produce an electrically isolated 4-20mA DC output into a minimum load of 800 ohms linear to flow and a dry-contact, field adjustable, pulsed output for remote totalization.
- D. Performance Requirements:
1. Measuring Range: 0.33 to 33 ft/s
  2. Calibrated Range: 1.0 to 33 ft/s
  3. Time Constant: 0.01 to 100 seconds.
  4. Accuracy:  $\pm 0.2$  percent of flow rate from 10 to 100 percent of full range over 1 ft. per second at 0 x D inlet run.
  5. Repeatability: 0.1 percent of full scale.
  6. Isolation: either galvanic or optic.
  7. Empty pipe detection: The flow transmitter shall display "Empty Pipe" when the metering tube is not completely full.
  8. Power consumption: 30 watts max
  9. Power supply: 24 VDC
  10. Communication Protocol: 4-20 mA and Digital Pulse Output Signals. 1 Pulse = 1000 Gallons.
  11. Coating and Lining Material: Pearl-gray polyurethane coated with polyurethane with NSF Certification
- E. Factory Testing: Each flowmeter shall be hydraulically calibrated at a facility that is traceable to the National Institute of Testing Standards using a 3 -point (minimum) test. The calibrations procedures shall conform to the requirements of MIL-STD-45662A. A real-time computer generated printout of the actual calibration data indicated apparent and actual flows for each flow test shall be submitted to the ENGINEER with final project documentation.
- F. Acceptable Manufactures:
1. Rosemount
  2. Or Engineer Approved Equal
- 2.1 LEVEL TRANSMITTER – PRESSURE TYPE
- A. Signal Output
1. 4-20 mA DC 2 wire twisted pair grounded shield cable
  2. FM and CSA explosion-proof and intrinsically safe
  3. Unit meets EMI/RFI for Mil-Std 461/462 Rev. E
  4. Response time: < 4ms

- B. Accuracy
    - 1. Static Accuracy: 0.25% FSO BFSL
    - 2. 1-year Stability: 0.20% FSO
    - 3. Error Band: 0.90% BFSL FSO
  - C. Temperature
    - 1. Temp. Compensation: +32 °F to +176 °F
    - 2. Process temp.: +32 °F to +176 °F
    - 3. Storage temp: -4 °F to +176 °F
  - D. Electrical Connection and Protection
    - 1. Vented, watertight, polyurethane-jacketed cable, 40 feet standard
    - 2. 8-30 VDC unregulated power
    - 3. Unit is FM explosion-proof and FM intrinsic safe.
  - E. Material
    - 1. Wetted Parts: 316L Stainless Steel Pressure Connection and Sensor
    - 2. Case: 316L Stainless Steel, explosion-resistant
    - 3. Cable: Polyurethane-jacketed cable
    - 4. Cable: As Required (Provided by MF'R)
  - F. Agency Approval Options
    - 1. Explosion-proof rated Class I, II, III, Division I, Groups A, B, C, D, E, F, G.
    - 2. NFS-61 Certified
  - G. Ranges
    - 1. 0-500 psi
  - H. Acceptable Manufacturers/Model:
    - 1. Druck PTX 1230
    - 2. Or Engineer Approved Equal
- 2.2 LEVEL FLOATS
- A. Float switches are designed for accurate liquid level control in many applications including potable water or sewage environments. The float switch can be utilized to signify specific water levels or for direct alarm actuation. Float switches shall be used to sense liquid level in a wet well, basin or other applications as indicated on the Drawings. Floats shall be constructed of a durable polypropylene material outside and have a solid polyurethane foam interior or 316 stainless steel. It shall be leak proof, shock proof, and impact resistant. Resistant to sewage and wastewater application and shall be for use with intrinsically safe circuits.
  - B. The switch contact configuration shall be normally open (N.O.) or normally closed (N.C.) as required to perform the proper operation as intended in these Contract documents. The float switch shall be single pole, double throw (SPDT).
  - C. The float switch assembly shall be mechanical, include a stainless steel cable and cable weight or a 1" schedule 80 PVC fastened to the wet well/basin wall with 316 stainless steel anchors and clamps as indicated on the Drawings. Floats shall be installed such that the mechanical switch activation takes place at the liquid level as indicated or directed by the ENGINEER at time of construction. Float switch cables shall be secured to a cable or PVC pipe with weather-resistant, UV rated tie-wraps.

- D. Acceptable Manufacturers:
  - 1. Conery SPDT switches
  - 2. Or Engineer Approved Equal

## 2.3 PRESSURE GAUGES

- A. Pressure gages shall have the following features as a minimum:
  - 1. Housing: Molded Fiberglass Reinforced Thermoplastic
  - 2. Silicone Oil Filled
  - 3. Range: As Indicated Elsewhere Or As Directed By The Engineer.
  - 4. Proof Pressure: 150 Percent Of Range Psi Minimum
  - 5. Accuracy: One Percent Of Full Scale
  - 6. Wetted Material: 316 Stainless Steel
  - 7. Dial/Pointer: Stainless Steel Or Aluminum
  - 8. Service: Liquid, Gas, Or Vapors As Indicated On The Drawings
  - 9. Process Connection: 1/4" NPT Male
  - 10. Calibration: Micro-Adjustment Screw
  - 11. Accessories: Test Cock, Female Outlets And An Isolation Ball Valve
  - 12. Blow-out Back: Each pressure gauge shall be equipped with a molded fiberglass reinforced thermoplastic back that shall be hinged for safety (will not become a projectile).
- B. An isolation ball valve shall be furnished and installed on each pressure gauge for ease of removal without disruption of service. The valve shall be sized as required for the process connection.
- C. A diaphragm seal shall be furnished and installed to isolate each pressure gauge installed with a process connection other than potable water or clean air.
- D. A pulsation dampener shall be provided for each pressure gauge
- E. The CONTRACTOR shall furnish and install all mounting hardware and support structures necessary for proper operation in accordance with the manufacturer's recommendations and the Contract Documents. Materials used for support structures shall be suitable for the environment in which it is installed (corrosive - stainless steel, non-corrosive - galvanized steel; unless indicated otherwise).
- F. Acceptable Manufacturers:
  - 1. US Gauge (Ametek)
  - 2. Ashcroft
  - 3. Winters
  - 4. Or Engineer Approved Equal

## 2.4 PRESSURE SWITCHES

- A. The pressure switch shall single set point or double set points with adjustable deadband with SPDT switches for operation for increasing or decreasing pressure. Switches shall have NEMA 4X enclosures; SS wetted parts, and Buna-N diaphragm seal.
- B. Pressure Switch Requirements:
  - 1. Contact Rating: 15A @ 120/ 240 VAC
  - 2. Switch: SPDT
  - 3. Range: 0 – 100 psi

4. Deadband: adjustable; 3 – 24 psi
  5. Enclosure: NEMA 4 X
- C. Acceptable Manufacturers:
1. Ashcroft
  2. Endress & Hauser
  3. Or Engineer Approved Equal
- 2.5 PRESSURE TRANSMITTER
- A. The pressure transmitter shall measure the pressure in the process line in which it is installed and shall transmit a 4-20 mA output for process control. The unit shall include an LCD display for local readings.
- B. Requirements:
1. Accuracy:  $\pm 1\%$  down to 10:1
  2. Display: 4-character LCD
  3. Output: 4-20 mA
  4. Range: 0-100 PSIG
  5. Overpressure: Up to 2000 psi (one side)
  6. Sensing Element: 316 SS diaphragm
  7. Wetted Material: 316 SS
  8. Process Connection:  $\frac{1}{4}$ " or  $\frac{1}{2}$ " NPT
  9. Power: 12 – 45 VDC
  10. Enclosure: NEMA 4X
- C. Acceptable Manufacturers:
1. Rosemount
  2. Or Engineer Approved Equal

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. The CONTRACTOR shall furnish and install all mounting hardware and support structures for the instrumentation and the logic unit as required for proper operation in accordance with the manufacturer's recommendations and the Contract Documents. Materials used for support structures shall be suitable for the environment in which it is installed (corrosive – PVC, Fiberglass or stainless steel, non-corrosive – stainless steel; unless indicated otherwise).
- B. Inspect each instrument and piece of equipment for defects, damage and correct operation before installation. Inspect work area and work involving other trades to verify readiness for installation.
- C. Field instruments shall be installed per manufacturer's requirements. Verify that all mounting, process and electrical connections are secure and tight before operating instrument.
- D. Install field instrument identification tag as described above.
- E. The CONTRACTOR shall verify process connection type and location. All instruments must be rated for the process and application.
- F. Field instruments installed in hazardous (classified) locations shall be installed in approved enclosures or electrically connected through an intrinsically safe barrier and shall meet all other requirements of NFPA 70 Articles 500-503.

- G. Furnish and install sun shields for all instruments installed outdoors in direct sunlight.
- H. Refer to Section 17000 for additional installation supervision, calibration, testing and start-up requirements.

- END OF SECTION -

**SECTION 17520  
LOCAL CONTROL PANELS**

**PART 1 – GENERAL**

1.1 REQUIREMENT

- A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies, and shall perform all labor as required to install a complete and fully functional Pump Station Control Panel as indicated on the Drawings and as specified herein or in other Sections of the Specifications. Pump Station Control Panel shall be designed to provide the control strategy as specified in the project documents.
- B. This specification does not apply to manufacturer supplied control equipment which is part of an integrated “package”. However, this equipment shall generally conform to the specifications here-in, when applicable.
- C. **The CONTRACTOR shall review all shop drawings and provide comments to the ENGINEER, on all manufacturer supplied control equipment submittals. The CONTRACTOR shall review the submittals to insure conformance and compatibility with all other control and instrumentation components on the project, including manufacturer to manufacture equipment and communication.**
- D. This section includes the furnishing, configuration and programming of Programmable Logic Controllers (PLC), Operator Interface Terminals (OIT), power supplies, interconnecting cables and all associated components for control and monitoring of equipment as indicated on the Drawings and as specified herein.
- E. PLC and OIT programming shall be provided by the CONTRACTOR. The CONTRACTOR shall coordinate the installation and wiring of the CONTROL PANELS, and make provisions for on-site start-up and testing of the CONTROL PANELS.
- F. The CONTROL PANELS shall be programmed and configured to allow for monitoring and control by the CITY’s Supervisory Control and Data Acquisition (SCADA) as indicated in this Division and as indicated on the Drawings. System design and installation shall conform to NEMA ICS 1.1.

1.2 RELATED WORK AND CONSTRUCTION STANDARDS

- A. Division 17, Instrumentation Specifications
- B. Each Control Panel shall be constructed by a UL 508A recognized panel assembler. All control panel components shall be UL Listed or UL Recognized under the category "Industrial Control Equipment".

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Sections 01300 - Submittals.
- B. Manufacturer's catalog cut sheets indicating electrical characteristics, capabilities and physical attributes for each Control Panel component including PLC/CPU, power supplies, I/O modules, special interface modules or devices, module racks, operator's interface, interconnecting cables and any other equipment related to the Control Panel.
- C. Wiring Diagrams showing connections to all devices; input and output, analog and discrete. The wiring diagrams shall indicate the I/O address point to be used in the PLC program. System interconnection diagram indicating all major networked components and indicating each connection port.
- D. A tabular list will be required for all discrete and analog I/O which will include:
  - 1. Rack number, module number, module I/O point number.

2. Name of each I/O field device.
  3. Instrument tag number of the I/O device located in the contract documents.
  4. Electrical characteristics of I/O signal.
  5. PLC internal address.
- E. I/O being monitored and controlled with each Operator Interface.
- F. Component layout drawing for each Control Panel enclosure.
- 1.4 OPERATING AND MAINTENANCE MANUALS
- A. Installation requirements and procedures.
- B. Complete instructions regarding the operation and maintenance of equipment involved. Instructions and documentation not related to the equipment furnished must be removed or crossed out. O&M manuals must be individually tailored to the project and equipment as furnished
- C. Bill of Materials, component data sheets, descriptive literature, product specification sheets, wiring diagrams and calibration procedures. O&M manuals must be individually tailored to the project and equipment as furnished
- D. Complete nomenclature of replaceable parts, part numbers, current cost, name and address of nearest vendor of replacement parts. Information on equipment or components not related to equipment furnished must be removed or crossed out. O&M manuals must be individually tailored to the project and equipment as furnished
- E. Refer to Specification Section 17000 for additional requirements.
- 1.5 QUALITY ASSURANCE
- A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacture of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the CONTRACTOR from responsibility for the proper installation and functioning of the work.
- B. The UL508 manufacture shall provide a 2-year equipment warranty.
- C. Equipment shall be designed and installed to conform to Drawings, Specifications, engineering data, related equipment furnished by other suppliers and recommendations of the component manufacturers.
- D. Comply with the following Codes and Standards:
1. NEMA (Testing Standards BU 1.3.03 or 1.3.04)
  2. UL listing and labeling for materials.
  3. NFPA-70
  4. UL 508A

## PART 2 – PRODUCTS

### 2.1 GENERAL

- A. The CONTRACTOR shall furnish the Pump Station Control Panel to satisfy the functional requirements specified in the relevant mechanical equipment, and Instrumentation & Control specification sections and as indicated on the Drawings. All components shall be UL labeled or provided with proper ground fault protection as required by UL 508A.
- B. Pump Station Control Panel enclosures shall be steel or fiberglass, NEMA 12 with hinged lockable doors. Freestanding enclosures shall have a 3-point latching handle. Outdoor enclosures with panel mounted devices shall contain a white interior swing panel (dead-front) with NEMA 12 rated view window as required to maintain visibility of the OIT, indicators and switches while not exposing the PLC and/or terminal blocks.
- C. Pump Station Control Panel enclosures shall be supplied with fans and heating systems sufficient to keep the interior space within the enclosure at a temperature of between 50 and 95 F based on an operating ambient exterior temperature of between 32 and 115 F.
- D. Identification of panel-mounted devices, conductors, and electrical components shall meet the requirements specified herein.

### 2.2 PROGRAMMABLE LOGIC CONTROLLERS (PLC)

- A. General:
  - 1. The PLC shall be furnished with hardware, software installation, operation and maintenance manuals necessary to monitor and control equipment, as listed in the Specifications, and as indicated on the Drawings. Each field input and output shown as an I/O point shall be connected as per the manufacturer's requirements and recommendations.
  - 2. The PLC programming software used to program PLCs shall be the latest version or release from the manufacturer. The CONTRACTOR is responsible for the cost to register or purchase and maintain proper licensing and registration with the manufacturer. The PLC programming software shall enable the user to write the PLC program in on-line or off-line modes. The software shall include utilities to manage PLC program files, document and print the programs, configure the programming environment, monitor and force the PLC addresses while on-line, and configure the PLC memory and addressing structure.
  - 3. The CONTRACTOR shall provide the programming software licensing to the CITY as part of this project.
  - 4. Cables, adapters, connectors, and other hardware required to render the PLC completely operational shall be provided and installed. Special programming and/or configuration cables shall be provided by the CONTRACTOR for completion of his work and shall remain the property of the CONTRACTOR.
  - 5. The processor shall be programmable using conventional ladder-type logic and shall include the following minimum functions:
    - a. Real Time Clock
    - b. Data Comparators
    - c. Standard Relays
    - d. On-delay and Off-delay Timers
    - e. Counters
    - f. Master Control Relays
    - g. Transitional or One-shot Outputs
    - h. PID Loop Control
    - i. Floating point math

5. Each PLC shall contain the necessary hardware and software as required to implement the control schemes as indicated in the Contract Documents. The ladder logic programs shall reside in the PLC processors. Every program rung shall be documented with a control description. The CONTRACTOR shall provide copies of the fully documented PLC programs on CD to the CITY at the completion of the project. PLC Programs can be password protected, however, the password shall be provided to the CITY upon execution of a Confidentiality and Release of Liability Agreement between the CONTRACTOR and the CITY. The CONTRACTOR shall also provide the CITY with the PLC programming software with registration under the CITY's name.
6. Pre-Approved PLC Hardware
  - a. Modicon M340 with Ethernet Processor

B. Central Processing Unit:

1. The PLC CPU shall be a microprocessor based industrial controller with a temperature rating of 0 to 60 degrees C and a humidity rating of 0 to 95 percent non-condensing, minimum. Memory (RAM) shall be sized as required for all system logic and control functions with a minimum of 50 percent spare capacity. RAM shall be protected by lithium battery backup for at least one year, and capacitor storage for up to two weeks.
2. Each CPU shall be provided with internal fault analysis with a fail-safe mode and output for remote failure alarming. Diagnostic codes shall be made available on the Plant Computer through the programming software to further aid in the troubleshooting process.
3. Two communication ports shall be provided. One port shall be utilized for a peer-to-peer network connection (Ethernet) while the other may be used for connection to other peripheral devices.

C. I/O Expansion Modules:

1. Discrete input modules shall be plug-in, rack style modules or built-in to the PLC CPU that sense voltage input and shall have LED indicators for each point displaying the status of the field contact. Maximum 16 points per module. Provide a minimum of 10 percent spare points wired to terminal blocks.
2. Discrete output modules shall be plug-in, rack style modules or built-in to the PLC CPU with a source voltage output or relay output having a current rating of 1.5A at 120 VAC, minimum. Outputs shall have LED indicators for each output status. Each output shall drive an interposing relay with DPDT contacts rated 10A at 120 VAC. Maximum 16 points per module. Provide a minimum of 10 percent spare points complete, wired to interposing relays and terminal blocks.
3. Analog input modules shall be plug-in, rack style modules that will accept 4-20mA DC signals. Input circuitry shall provide differential input (no common) to prevent loop grounding problems. Analog to digital conversion shall have 12 bit resolution or greater. Maximum 8 points per module. Provide a minimum of 10 percent spare points wired to terminal blocks. Analog inputs terminals shall be provided to allow loop-power and analog sourced devices for each analog input.
4. Analog output modules shall be plug-in, rack style modules which transmit isolated linear 4-20mA DC signals to field devices. Loop power for analog outputs shall be provided by regulated power supplies each capable of driving a 0-600 Ohm load. Digital to analog conversion shall have 12 bit resolution or greater. Maximum 4 points per module. Provide a minimum of 10 percent spare points wired to terminal blocks.

## 2.3 OPERATOR INTERFACE TERMINALS (OITs)

A. General:

1. The OIT shall be furnished with hardware, software installation, operation and maintenance manuals necessary to monitor and control equipment, as listed in the Specifications, and as indicated on the Drawings.

2. The OIT shall be powered from a UPS backed 120VAC power supply or from the redundant 24VDC power supply in the Control Panel.
3. The OIT programming software used to program OITs shall be the latest version or release from the manufacturer. The CONTRACTOR is responsible for the cost to purchase and maintain proper licensing and registration with the manufacturer. The software shall include utilities to manage OIT program files, document and print the programs, configure the programming environment, monitor and test OIT programs when off-line.
4. The CONTRACTOR shall provide the programming software to the CITY as part of this project. The CONTRACTOR shall ensure that the CITY is registered as the owner of the software.
5. Cables, adapters, connectors, and other hardware required to render the OIT completely operational shall be provided and installed. Special programming and/or configuration cables shall be provided by the CONTRACTOR for completion of his work and shall remain the property of the CONTRACTOR.
6. The OIT shall be fully programmable and shall meet the following minimum requirements:
  - a. On-board Real Time Clock
  - b. Real-time Trending
  - c. Object-Oriented Display
  - d. 17-inch Minimum TFT Color display (CONTROL PANELs only)
  - e. (2) Ethernet, RS-485 and RS-232 serial communication ports
  - f. USB port and drivers for printing alarm page and screen dumps
  - g. Touchscreen operation
  - h. Fanless
  - i. Windows 10 Professional Embedded OS NOT acceptable.
  - j. Quad-core processor, 1.91GHz minimum
  - k. Minimum of 500 GB SSD
  - l. Minimum of 8 GB RAM compact flash or smart media card for data storage
7. Pre-Approved OIT Hardware
  - a. 17" Advantech PPC-3170-3S52

#### 2.4 TERMINAL BLOCKS

- A. Each Control Panel shall be provided with identified terminal strips for the connection of all external conductors. There shall be sufficient terminal blocks for all external connections plus an additional 25 percent spare for future use. Terminal blocks shall be identified in accordance with approved shop drawings. Terminal blocks shall be individual, stacking, compression type, 600VAC, 30A minimum, suitable for wire sizes No. 10 - No. 18. A printed terminal block label shall be affixed to each terminal block for identification.
- B. Each field-mounted device deriving power from the Control Panel shall be individually circuit-protected with a knife-blade or plug-in fused terminal block and blown fuse indicator or miniature circuit breaker.
- C. Terminal blocks for analog inputs shall include 24VDC+, 24VDC-, Analog Signal +, Analog Signal -, and shield ground terminals for each analog input. The 24VDC+ shall be individually circuit-protected per 2.4-B.

#### 2.3 OPERATOR DEVICES

- A. Pushbuttons, selector switches, and pilot lights shall be of the heavy-duty, oil-tight type, 30mm in size. Miniature style devices are not acceptable.
- B. Pilot lights shall be push-to-test, LED style with LED and lens color as indicated on the Drawings.
- C. START buttons shall have green cap and STOP buttons shall have red caps. All other button caps and selector switch operator handles shall be black.

- D. Selector switches shall have the number of positions as indicated on the Drawings or as required to perform the intended function. Provide the number of 120VAC, 10A contacts as indicated on the Drawings or as required to perform the intended function.
- E. Provide an engraved legend plate or provide laminated plastic nameplates as specified elsewhere for each device.
- F. The operator devices shall have a NEMA rating equal to or more stringent than the control panel in which it is mounted.
- G. Acceptable manufacturers:
  1. Cutler-Hammer 10250 series
  2. Square D 9001SK series
  3. Or Engineer Approved Equal

#### 2.4 CONTROL RELAYS

- A. Relays shall be DPDT (minimum) plug-in type utilizing rectangular blades with an indicating LED, and sockets with screw-type terminals and hold-down clips. Operating coil voltage shall be as required or indicated on the Drawings.
- B. Contacts shall be rated 10 Amps at 120 VAC. Contact material shall be silver-cadmium oxide except for signal switching circuits that shall be gold plated or other noble metal.
- C. Control relays shall be rated for heavy duty use, Allen Bradley Bulletin 700 series, Square D 8501 Type X, or Engineer Approved equal.

#### 2.5 TIMING RELAYS

- A. Time delay relays shall be a combination on-delay and off-delay (selectable) with adjustable timing range from 1 sec to 10 hours. The timing relays shall include an LED indicator that is illuminated when the relay is timing out. Operating coil voltage rating shall be as indicated on the Drawings with DPDT, 120VAC, 10 amp rated contracts. Provide sockets with screw-type terminals and hold-down clips.
- B. Reset Timers: Reset timers shall be synchronous motor driven with a solenoid-operated clutch. The timing relays shall include an LED indicator that is illuminated when the relay is timing out. Voltage rating shall be as indicated on the Drawings with 120VAC, 10 amp rated contacts, and timing range as required or indicated on the Drawings.
- C. Acceptable manufacturers:
  1. ATC
  2. Or Engineer Approved Equal

#### 2.6 SIGNAL CONDITIONERS

- A. Current-to-current converter/isolators shall be 4-20 mA input, 4-20 mA output. The CONTRACTOR shall utilize signal isolators where necessary to boost or isolate signals for proper operation.
- B. Pulse-to-current converters shall convert a square wave pulsed frequency to a proportional 4-20mA output and shall operate on 120 VAC.
- C. Acceptable manufacturers:
  1. Acromag

2. Moore Industries
3. AGM
4. Or Engineer Approved Equal

## 2.7 AUXILIARY POWER SUPPLIES

- A. Power supplies shall be DIN-rail mounted and be of the solid-state circuitry type UL-1950 and CSA-1402C certified. Input power shall be 120VAC, +/- percent 10, output voltage shall be as indicated on the Drawings or as required for proper operation of connected loads.
- B. Power supplies shall be sized for 200% of the total connected load.
- C. Line regulation shall be within +/- 0.05 percent with a 10 percent line change. Load regulation shall be within +/- 0.05 percent with a 50 percent load change. Output ripple shall not exceed 0.2 percent peak-to-peak:- Transient response shall be less than 50 microseconds for a 50 percent load change.
- D. Power supplies shall be fully rated with an efficiency of at least 60 percent for a temperature range of 0 - 60°C or be oversized appropriately. Power supplies shall produce EMI/RR noise levels within the requirements of FCC Docket 20780.
- E. Power supplies shall contain internal short circuit and overload protection. Output fusing shall be supplied on the positive terminal.
- F. Acceptable manufacturers:
  1. Rhino
  2. Sola
  3. IDEC
  4. Phoenix Contact
  5. Or Engineer Approved Equal

## 2.8 UNINTERRUPTIBLE POWER SUPPLY (UPS)

- A. The UPS shall be on-line, with automatic bypass switching upon failure, and with automatic bypass switching for maintenance. The UPS shall include built-in surge protection, rectifier/battery charger, batteries, inverter, static transfer switch, and solid-state controls to provide a true sine-wave output.
- B. Input power 120VAC, +/-10%, 60Hz.
- C. Output power shall be 120VAC +/- 5% 60Hz with a harmonic distribution at less than 5% (voltage).
- D. All RTU panels shall be supplied with a 1000 KVA minimum UPS unit. Actual KVA rating of each UPS shall be as required to operate all loads being served for a minimum of 20 minutes without input power. KVA in-rush rating shall not be less than 150% of connected load's in-rush current. UPS load calculations must be submitted with the UPS for approval.
- E. Switching response time shall be less than 4 milliseconds.
- F. Batteries shall be sealed, no maintenance type, designed for 5 years minimum service.
- G. Indicators shall include: On-line or bypass operation, input power failure, UPS fault, UPS battery low.
- H. The UPS shall be provided with dry contacts that close upon operation on battery power. These contacts shall be wired into a digital input on the PLC so as to provide notification that the panel is operating on battery power.

- I. Acceptable manufacturers:
  - 1. APC – Smart UPS
  - 2. Or Engineer Approved Equal
- 2.9 ETHERNET ROUTER/ SWITCH
  - A. The Ethernet router shall be an industrial 8-port Managed Ethernet Switch w/ the required fiber-optic port.
  - B. The Ethernet Switch shall be a managed switch and shall be a Layer 2, Ethernet Switch w/ multi-slots for fiber-optic and Ethernet connections. Number of fiber optic connections and Ethernet ports shall be sufficient to network the process areas as indicated in the Contract Documents.
  - C. Acceptable Manufacturer:
    - 1. Cisco Industrial Ethernet 4000 Series
    - 2. Or Engineer Approved Equal
- 2.10 FIBER OPTIC PATCH PANEL
  - A. The Pump Station Control Panel shall be supplied with a Single-Panel Housing Fiber Optic Patch Panel.
  - B. Fiber Optic Patch Panel shall be a single panel housing with LC multimode inserts (Corning Model Number SPH-01P)
  - C. Fiber Optic Patch Panel shall contain CCH Pigtailed splice cassettes to enable faster field splicing and easy modular management of connectorization within the housing (Corning Model Number CCH-CS12-E4-P00QE)
  - D. The fiber optic patch panel shall connect to the control panels managed Ethernet switch utilizing fiber optic patch cable (LC/LC Connectors Multimode L-COM FODBIFLC-01)
- 2.11 SPARE PARTS
  - A. Provide one control and one timing relay of each type utilized.
  - B. Provide one spare power supply of each size and type utilized.
  - C. Provide (3) spare fuses of each size and type utilized.
  - D. Refer to related specification sections for additional spare parts required.

### **PART 3 – EXECUTION**

- 3.1 FABRICATION
  - A. CONTROL PANEL's shall contain components as indicated on the Drawings.
  - B. Where AC and DC signals must intercept each other, cross wires at 90° angles. Route AC and DC signals in separate wireways. Provide blank wireways for field wiring by the CONTRACTOR.
  - C. All internal wiring shall be contained in plastic raceways or troughs having removable covers. Wiring to door-mounted devices shall be extra flexible and anchored to doors using wire anchors cemented in place. Exposed terminals of door-mounted devices shall be guarded to prevent accidental contact with energized terminals.
  - D. Minimum control panel conductor size for power shall be No.12 AWG. Minimum conductor size for control wiring shall be No. 14 unless protected by a 10A overcurrent protective device or smaller, in which case it can

be No.16 AWG (in PLC and operator interface cabinets only). Analog signal cables shall be 600V, No.16 AWG twisted shielded pair.

- E. Wire markers shall be heat shrinkable, be a minimum of 3/8-inches in length and placed as near as possible to the end of the wire.
- F. Identification of panel-mounted devices control equipment enclosure shall be engraved laminated plastic with black letters on white background. Use minimum 3/16-inch letters for identifying individual panel components. Use minimum 3/8-inch letters for identifying control equipment enclosure.
- G. CONTROL PANEL enclosure doors that contain 120VAC devices shall be bonded to the enclosure grounding lug.
- H. Each PLC I/O point connected to an external device shall be terminated at terminal blocks.
- I. All analog signals shall be individually fused at the terminal block. See additional requirements as specified elsewhere in these specifications.

### 3.2 INSTALLATION

- A. CONTROL PANEL(s) shall be installed by the CONTRACTOR, where and as indicated on the drawings.
- B. All front accessible panel-mounted devices shall be mounted a minimum of 42-inches above finished floor elevation.
- C. CONTROL PANEL(s) shall be stored in an indoor, dry location at the jobsite to protect from condensation, damage, and the effects of weather.
- D. CONTROL PANEL(s) interiors, and exteriors shall be cleaned, and coatings shall be touched up to match original finish upon completion of the work.
- E. See Section 17000 for additional installation requirements.

### 3.3 TESTING, STARTUP & TRAINING

- A. CONTROL PANEL(s) shall be factory assembled and a factory acceptance test shall be conducted at the control panel shop for sequence of operation prior to jobsite delivery (see also
- B. An additional test shall be performed on-site after all field devices have been installed and connected. The CONTRACTOR shall demonstrate to the ENGINEER, through the functional field test, the proper operation and function of each I/O point, instrument and display.
- C. The CONTRACTOR shall provide the services of its field staff to provide a minimum of 8 hours of on-site training to the CITY for the completed control system.

-END OF SECTION -

**SECTION 17600**  
**SITE ACCESS SYSTEM**

**PART 1 – GENERAL**

1.1 REQUIREMENT

- A. CONTRACTOR shall furnish, and install the site access system and all appurtenant materials and equipment. Site access system shall be suitable for the services listed, complete and operable in accordance with the requirements of the Contract Documents and in conformance with the manufacturer's recommendations.

1.2 RELATED WORK AND CONSTRUCTION STANDARDS

- A. The Contract Documents are a single integrated document, and as such all Specification Sections apply. It is the responsibility of the CONTRACTOR and its subcontractors to review all Sections and ensure a complete and coordinated project.
- B. Related Specification Sections include, but are not limited to, the following:
  - a. Division 2, Site Work
  - b. Division 3, Concrete
  - c. Division 5, Metals
  - d. Division 16, Electrical
  - e. Division 17, Instrumentation
- C. Comply with the following Codes and Standards:
  - a. UL325: Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems
  - b. UL991: Standard for Testing of Safety-Related Controls employing Solid State Devices
  - c. NFPA 70 – National Electrical Code (NEC)

1.3 SUBMITTALS

- A. Submittals shall be furnished in accordance with Sections 01300 - Submittals.
- B. Manufacturer's product literature, specifications, features and accessories, materials of construction, and data in sufficient detail to demonstrate compliance with the Specification requirements. Manufacturer's literature and data shall be marked to clearly delineate all applicable information and crossing out all inapplicable information.
- C. Detailed drawings for each gate operator showing layout and dimensions of gate, gate operator, connections to gate, gate operator support foundation, vehicle sensor system, gate operator entry system, and conduit/wiring for gate operator and accessories. Drawings shall clearly show the precise location of each vehicle detector loop and lead-in cable, loop dimensions, number of detector loop cable turns, slot width and depth, and placement of cable within the slot.
- D. Written confirmation that each proposed operator unit is adequate for the specified gate (size, weight, and required pull force).
- E. Manufacturer's requirements for gate operator support foundation(s), including minimum dimensions, concrete strength, and reinforcing steel. Manufacturer requirements for gate operator frame anchorage, including anchor bolt locations, size and embedment depth.
- F. Complete wiring connection diagram for each gate operator and accessories.
- G. Gate operator safety literature and required warning signs. Warning signs shall be in compliance with requirements of UL325.

#### 1.4 OPERATION AND MAINTENANCE MANUALS

- A. Installation requirements and procedures.
- B. Complete instructions regarding the operation and maintenance of equipment involved. Instructions and documentation not related to the equipment furnished must be removed or crossed out. O&M manuals must be individually tailored to the project and equipment as furnished.
- C. Bill of Materials, component data sheets, descriptive literature, product specification sheets, wiring diagrams and calibration procedures. O&M manuals must be individually tailored to the project and equipment as furnished.
- D. Complete nomenclature of replaceable parts, part numbers, current cost, name and address of nearest vendor of replacement parts. Information on equipment or components not related to equipment furnished must be removed or crossed out. O&M manuals must be individually tailored to the project and equipment as furnished.
- E. Complete and detailed instruction for adjusting all equipment settings, including: input power, motor settings, torque settings, status and alarm signals, etc.

#### 1.5 QUALITY ASSURANCE

- A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacture of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the CONTRACTOR from responsibility for the proper installation and functioning of the work.
- B. Equipment shall be designed and installed to conform to drawings, specifications, engineering data, related equipment furnished by other suppliers and recommendations of the component manufacturers.

#### 1.6 WARRANTY

- A. Gate operators shall be warranted by the manufacturer for a period of two (2) years from date of acceptance by the District against defects in materials or workmanship. Defective parts shall be repaired or replaced at no charge. The warranty shall be in printed form and shall be included in the O&M Manual.

### **PART 2 – PRODUCTS**

#### 2.1 AUTOMATIC SWING GATE OPERATOR

- A. General:
  - 1. CONTRACTOR shall furnish and install automatic vehicular swing gate operators to fulfill the function indicated within the Contract Documents. Each vehicular swing gate operator shall be provided complete with all drive and electrical components. Gate operators shall be heavy-duty industrial swing type openers.
  - 2. Vehicular swing gate operator unit shall automatically open and close swing gates to provide convenience and security. Operator unit shall function with standard features, options, and accessories including, but not limited to: inherent primary and secondary entrapment protection devices; connection of contact or non-contact entrapment protection devices, controls, single and three button control stations, digital keypads, coded cards, vehicle detector loops, telephone entry systems, and revenue control equipment. Unit shall operate on 115 VAC, single phase, 60 Hz power.
  - 3. Unless specified otherwise, the gate operator shall be controlled by a card reader system. Card reading system shall be compatible with gate operator.

B. Design Requirements:

1. Operator unit shall be sized as required for the specified swing gate and site conditions. Operator unit shall be completely assembled, pre-wired, and tested in the factory.
2. CONTRACTOR and operator unit manufacturer shall coordinate with gate manufacturer to insure that the selected operator and accessories will be suitable for the proposed gate. Operator unit shall open/close the gate at a rate not greater than 7 degrees per second. Operator unit shall provide a minimum pull force of 75 pounds.
3. Operator unit supplier shall provide all required operator accessories and appurtenances, including vehicle sensing loops, entry system, and entrapment protection sensors, to ensure compatibility between accessories and operator and to provide sole source responsibility.

C. Minimum Mechanical Features and Components:

1. Weather-resistant galvanized steel cabinet with automotive type powder coat finish.
2. Lockable access panel for manual disconnect and adjustable limit switches.
3. Cold rolled solid steel output drive shaft with heavy-duty ball bearings.
4. Gate operator arms and gate attachment brackets.
5. Disconnect/release for manual operation of gate.

D. Electrical Features and Components:

1. High-starting torque, continuous duty 0.5 HP (minimum) motor for single leaf gate, or two (2) 0.5 HP (minimum) motors for double leaf gates, 115 VAC, 60 Hz, single phase with thermal overload protection.
2. Solid state controller with adjustable timers, LED indicators, and self-diagnostics.
3. Adjustable motor current sensing to detect obstructions, with separate adjustments for opening and closing directions.
4. Adjustable motor RPM sensing to detect obstructions, with separate adjustments for open and closing directions.
5. Allow connection of external devices such as access control systems.
6. Integral detector loop inputs compatible with exit, shadow, and interrupt loops.
7. Controller housed in separate control box.
8. Power input "On/Off" switch.
9. Built-in 120 VAC duplex power receptacle for accessories.
10. Transformer for low voltage power. Fuse protected 24 VAC and 24 VDC secondary power shall be available on terminal strip to power accessory devices.
11. Adjustable precision snap-action type limit switches to control gate position.
12. Contacts for opening, closing and reversing accessories, as well as contact and non-contact obstruction sensing devices. In addition, a dry contact for the gate in a closed position shall be provided for remote indication. The dry contact shall be rated for 5A at 120 VAC and shall be pre-wired to a terminal strip.

E. Entrapment Protection Devices:

1. Each gate operator shall be provided with inherent entrapment protection devices which comply with Class III of UL Standard 325. Unless specified otherwise, the primary entrapment protection device shall be adjustable motor RPM sensing and the secondary entrapment protection device shall be adjustable motor current sensing.

## 2.2 ACCESSORIES

### A. Key Pads:

1. CONTRACTOR shall provide key pads in the location shown within the Contract Documents. Each key pad shall be pedestal mounted for operation of an automatic gate operator at each entry point as shown on the Drawings. Key pads shall be suitable for outdoor exposure.
2. Key pads shall be furnished by a Security System Subcontractor that has been approved by the CITY.

### B. Vehicle Sensor System:

1. Unless specified otherwise, each gate operator shall be provided with a vehicle sensor system. Each vehicle sensor system shall consist of in-ground vehicle detector loops for entrance and exit, lead-in cables, appurtenances, and gate operator integral control inputs for detector loops.
2. Detector loop cable shall be #14 AWG (minimum), stranded copper, single conductor, with cross-linked polyethylene insulation and suitable for direct burial. Loop size and number of turns shall be as determined by the gate operator manufacturer for vehicles ranging in size from small automobiles to large high bed trucks. Sufficient quantity of turns shall be provided to ensure the loop functions properly with the gate operator detector loop controls. The detector loop cable shall be continuous (no splices).
3. Lead-in cable shall be #16 AWG, stranded thinned copper, twisted pair, with aluminum/polyester shield, tinned copper drain, and polyethylene insulation. Lead-in cable shall be twisted four times per foot, minimum.

### C. Photoelectric Entrapment Protection Sensors:

1. Photoelectric sensors shall include separate transmitter and receiver units, mounting arms, wiring, and appurtenances. Sensors shall prevent gate closure on obstructions within its path.

### D. Key Pad Pedestals:

1. Location shall be as specified in Section 2.2.A.1.
2. Pedestal shall be constructed of rectangular steel tubing with a base plate that is sized per the card reader manufacturer's mounting recommendations. The steel tubing shall be capable of concealing the conductors required for card reader operation. Each card reader housing shall be provided with solid back plate sized to accommodate the proposed key pad, and solid top and sides to shield the key pad from direct sunlight exposure.
3. The CONTRACTOR and the Security System Subcontractor shall be responsible for coordinating pedestal design, fabrication and construction. The CONTRACTOR shall confirm key pad pedestal housing heights, coating, colors and customization options with the CITY.

## PART 3 – EXECUTION

### 3.1 FABRICATION AND INSPECTION

- A. Manufacturer shall inspect and test each automatic gate operation component to assure smooth opening and closing, quiet operation, control input response and proper function.

### 3.2 INSTALLATION

- A. CONTRACTOR shall install the site access system, including gate operators and accessories in accordance with the manufacturer's written installation instruction and approved shop drawings, UL Standards, and as indicated in the Contract Documents. The CONTRACTOR shall connect all necessary electrical power and control wiring, including furnishing of all necessary materials in addition to the provided with the specified equipment. Wiring materials and installation shall be in accordance with the Contract Documents and the manufacturer's requirements.

- B. CONTRACTOR shall provide a NEMA 4X stainless steel junction box or pull box directly adjacent to gate operator for supply power and remote communication conduits, as shown in the Contract Documents.
- C. CONTRACTOR shall install entrance and exit vehicle sensor system detector loops for each gate operator. Detector loops shall be placed in slots that are saw cut into the pavement. Detector loop location and dimensions shall be in accordance with the manufacturer's approved shop drawings. Slot width and depth shall be as determined by the gate operator manufacturer. Detector loop cable shall be placed into the slots and filled with epoxy in accordance with the manufacturer's written instructions.
- D. Transition from detector loop cable to lead-in cable shall be in a precast concrete hand hole located directly adjacent to the driveway.
- E. CONTRACTOR shall install grounding rod through the gate operator support foundation that is sized per the manufacturer's recommendation. The operator cabinet enclosure shall be bonded to the ground rod with a #6 AWG bare copper conductor.
- F. CONTRACTOR shall install warning signs securely with stainless steel fasteners and within view of both sides of the gate as required by the manufacturer and UL 325.

### 3.3 TESTING, STARTUP & TRAINING

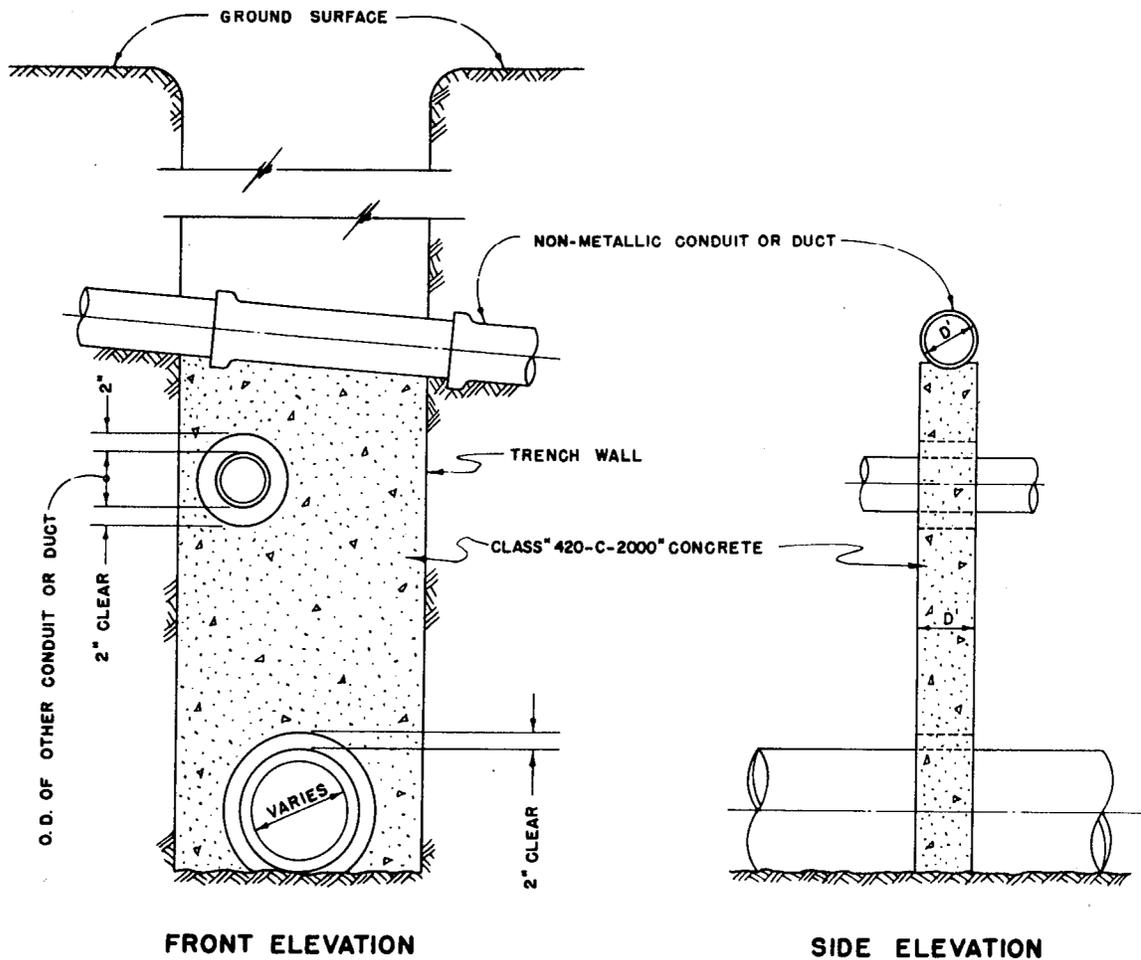
- A. Manufacturer's representative shall adjust the gate operator and accessories in accordance with the equipment installation manual and shall test the adjustments to verify correct settings for the installation. Entrapment protection shall be tested separately and independently with the other entrapment protection disabled.

-END OF SECTION -



# SV1466 - Pipe Supports Across Trenches

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**CONCRETE SUPPORT WALL FOR NON-METALLIC  
CONDUITS OR DUCTS**

- NOTES:**
1. THE SUPPORT WALL SHALL HAVE A FIRM BEARING ON THE SUBGRADE AND AGAINST THE SIDES OF THE EXCAVATION.
  2. AT LEAST 2" CLEAR DISTANCE SHALL BE MAINTAINED BETWEEN THE SUPPORT WALL AND ANY CONDUITS OR DUCTS PARALLEL TO THE TRENCH.
  3. TO PREVENT THE OCCURRENCE OF UNEQUAL PRESSURES DURING BACKFILLING, OPENINGS MAY BE PROVIDED IN THE SUPPORT WALL. THE VOLUME OF THE OPENINGS SHALL NOT EXCEED  $\frac{1}{2}$  THE VOLUME OF THE SUPPORT WALL.

**PIPE SUPPORTS ACROSS TRENCHES  
CITY OF VERNON, CALIFORNIA  
ENGINEERING DEPARTMENT**

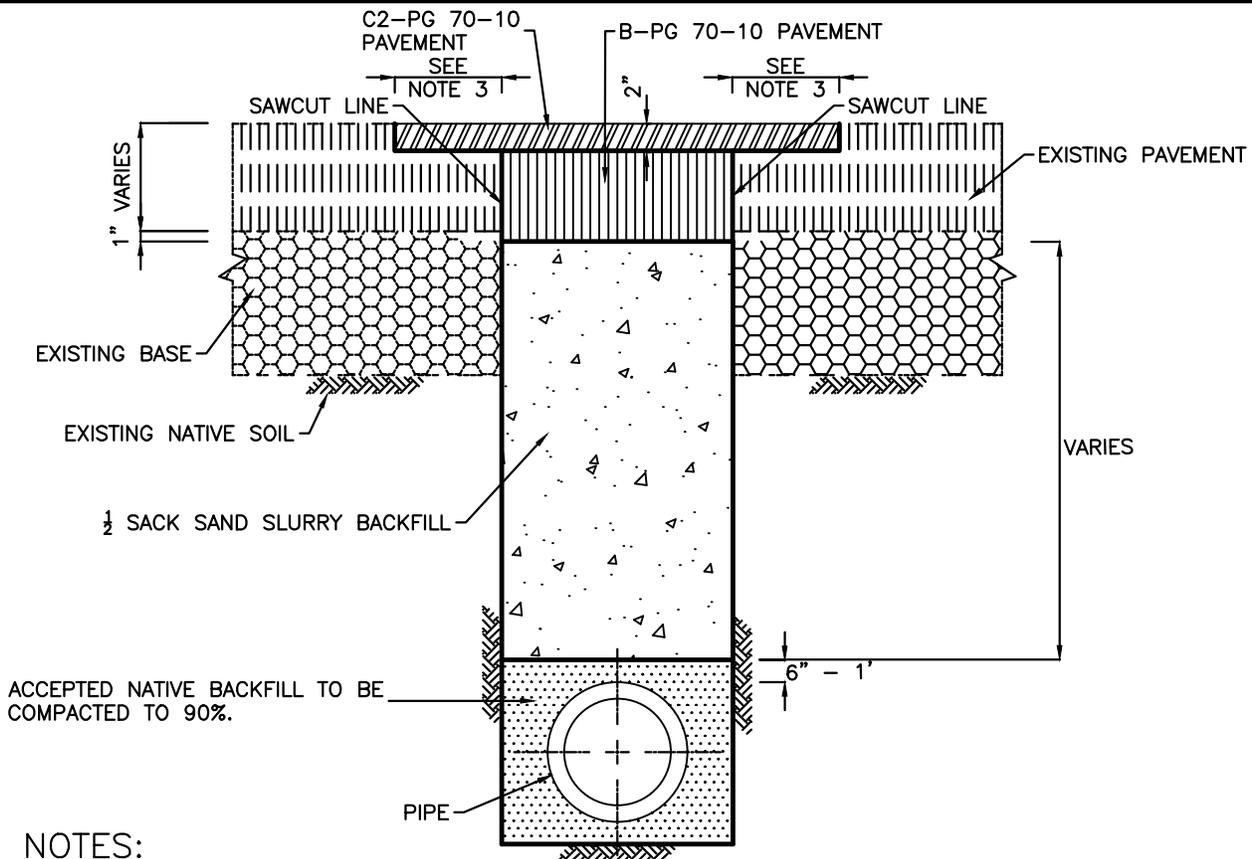
APRIL , 1985

REVISED: APRIL, 1985  
REVISED CONC. CLASS

STANDARD PLAN  
**SVI466**

## V2264 - Typical Trench Paving Section

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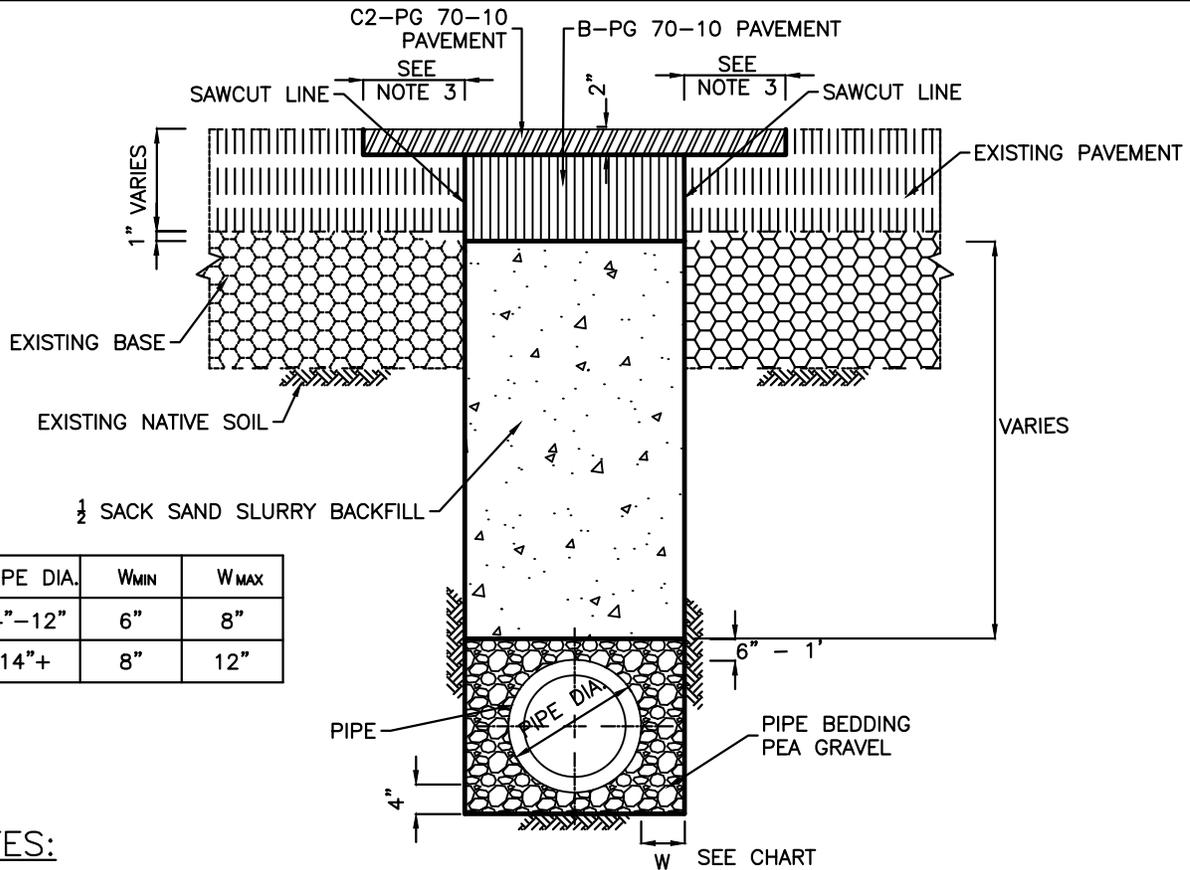
**NOTES:**

1. NEW PAVEMENT THICKNESS SHALL BE 1 INCH BELOW THE EXISTING TO A MAXIMUM OF 10 INCHES, UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
2. ASPHALT CONCRETE SHALL BE B-PG70-10. TACK COAT SHALL BE APPLIED PER LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREENBOOK).
3. FINISHED ASPHALT CONCRETE SHALL BE C2-PG70-10, 2" THICK, UNIFORM COLD PLANE MINIMUM 1 FOOT FROM SAWCUT LINE OR PER CITY ENGINEER'S APPROVAL, AND PAVED FLUSH WITH ADJACENT PAVEMENT WITHIN SAME DAY AS NEW A.C. PLACEMENT.
4. DAMAGED AND UNDERMINED PAVEMENT SHALL BE REMOVED BY SAW CUTTING FULL DEPTH PARALLEL TO TRENCH AND REPLACED WITH ASPHALT CONCRETE PER ABOVE AT NO COST TO THE CITY.
5. FOR CONCRETE STREETS THE WIDTH OF CONCRETE TO BE REPLACED SHALL EITHER BE FROM COLD JOINT LINE TO COLD JOINT LINE OR APPROVED TRENCH WIDTH WITH CONCRETE DOWELS (MIN. #4 BARS) PLACED EVERY 3 FT STAGGERED.
6. IF THE SAWCUT LINE IS 3 FEET OR LESS FROM GUTTER LINE OR COLD JOINT THE A.C. PAVEMENT OR CONCRETE SHALL BE REMOVED TO GUTTER LINE OR COLD JOINT.
7. ALL TRAFFIC SIGNAL LOOPS, DOTS, LANE LINES, CROSSWALKS, LEGENDS, AND OTHER PAINTED MARKINGS ARE TO BE REPLACED IN KIND BY THE CONTRACTOR.
8. AN ENCROACHMENT PERMIT SHALL BE OBTAINED FROM THE CITY OF VERNON PUBLIC WORKS DEPARTMENT PRIOR TO ANY ENCROACHMENT OR CONSTRUCTION WITHIN A CITY OF VERNON RIGHT-OF-WAY.
9. THE CONTRACTOR SHALL OBTAIN AN UNDERGROUND SERVICE ALERT TICKET AND OBTAIN A CALIFORNIA COMMISSION OF OCCUPATIONAL SAFETY AND HEALTH (DOSH) PERMIT IF THE TRENCH IS GREATER THAN 5 FEET DEEP PRIOR TO THE COMMENCEMENT OF WORK.
10. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING AND MAINTAINING ALL TRAFFIC CONTROLS AND SIGNAGE PER THE LATEST VERSION OF THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CA MUTCD) OR THE CALIFORNIA JOINT UTILITY TRAFFIC CONTROL MANUAL (CJUTCM) DURING ENTIRE PROJECT.
11. NO STOCK PILING OF CONSTRUCTION MATERIALS OR EQUIPMENT SHALL BE ALLOWED OVER NIGHT IN THE PUBLIC RIGHT-OF-WAY UNLESS APPROVED BY THE CITY ENGINEER.
12. ALL NECESSARY STEEL PLATES SHALL BE PROVIDED AT THE JOB SITE PRIOR TO ANY REMOVALS. PLATES SHALL BE SKID RESISTANT, RECESSED AND SECURED FROM ANY MOVEMENT.
13. ALL TRENCHES SHALL BE BACKFILLED WITH 1/2 SACK SAND SLURRY UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
14. THE CONSTRUCTION SHALL COMPLY WITH CITY STANDARDS AND THE GREENBOOK.

REVISIONS		
DATE	DESCRIPTION	INITIALS
5/30/18	UPDATED NOTE 12.	MA
7/5/18	UPDATED NOTES 7, 8, & 10.	MB

**TYPICAL TRENCH  
PAVING SECTION**  
CITY OF VERNON, PUBLIC WORKS DEPARTMENT  
JULY 2018

STANDARD PLAN  
**V2264**  
1 OF 2



PIPE DIA.	W <sub>MIN</sub>	W <sub>MAX</sub>
4"-12"	6"	8"
14"+	8"	12"

**NOTES:**

1. NEW PAVEMENT THICKNESS SHALL BE 1 INCH BELOW THE EXISTING TO A MAXIMUM OF 10 INCHES, UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
2. ASPHALT CONCRETE SHALL BE B-PG70-10. TACK COAT SHALL BE APPLIED PER LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREENBOOK).
3. FINISHED ASPHALT CONCRETE SHALL BE C2-PG70-10, 2" THICK, UNIFORM COLD PLANE MINIMUM 1 FOOT FROM SAWCUT LINE OR PER CITY ENGINEER'S APPROVAL, AND PAVED FLUSH WITH ADJACENT PAVEMENT WITHIN SAME DAY AS NEW A.C. PLACEMENT.
4. DAMAGED AND UNDERMINED PAVEMENT SHALL BE REMOVED BY SAW CUTTING FULL DEPTH PARALLEL TO TRENCH AND REPLACED WITH ASPHALT CONCRETE PER ABOVE AT NO COST TO THE CITY.
5. FOR CONCRETE STREETS THE WIDTH OF CONCRETE TO BE REPLACED SHALL EITHER BE FROM COLD JOINT LINE TO COLD JOINT LINE OR APPROVED TRENCH WIDTH WITH CONCRETE DOWELS (MIN. #4 BARS) PLACED EVERY 3 FT STAGGERED.
6. IF THE SAWCUT LINE IS 3 FEET OR LESS FROM GUTTER LINE OR COLD JOINT THE A.C. PAVEMENT OR CONCRETE SHALL BE REMOVED TO GUTTER LINE OR COLD JOINT.
7. ALL TRAFFIC SIGNAL LOOPS, DOTS, LANE LINES, CROSSWALKS, LEGENDS, AND OTHER PAINTED MARKINGS ARE TO BE REPLACED IN KIND BY THE CONTRACTOR.
8. AN ENCROACHMENT PERMIT SHALL BE OBTAINED FROM THE CITY OF VERNON PUBLIC WORKS DEPARTMENT PRIOR TO ANY ENCROACHMENT OR CONSTRUCTION WITHIN A CITY OF VERNON RIGHT-OF-WAY.
9. THE CONTRACTOR SHALL OBTAIN AN UNDERGROUND SERVICE ALERT TICKET AND OBTAIN A CALIFORNIA COMMISSION OF OCCUPATIONAL SAFETY AND HEALTH (DOSH) PERMIT IF THE TRENCH IS GREATER THAN 5 FEET DEEP PRIOR TO THE COMMENCEMENT OF WORK.
10. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING AND MAINTAINING ALL TRAFFIC CONTROLS AND SIGNAGE PER THE LATEST VERSION OF THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CA MUTCD) OR THE CALIFORNIA JOINT UTILITY TRAFFIC CONTROL MANUAL (CJUTCM) DURING ENTIRE PROJECT.
11. NO STOCK PILING OF CONSTRUCTION MATERIALS OR EQUIPMENT SHALL BE ALLOWED OVER NIGHT IN THE PUBLIC RIGHT-OF-WAY UNLESS APPROVED BY THE CITY ENGINEER.
12. ALL NECESSARY STEEL PLATES SHALL BE PROVIDED AT THE JOB SITE PRIOR TO ANY REMOVALS. PLATES SHALL BE SKID RESISTANT, RECESSED AND SECURED FROM ANY MOVEMENT.
13. ALL TRENCHES SHALL BE BACKFILLED WITH 1/2 SACK SAND SLURRY UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
14. THE CONSTRUCTION SHALL COMPLY WITH CITY STANDARDS AND THE GREENBOOK.

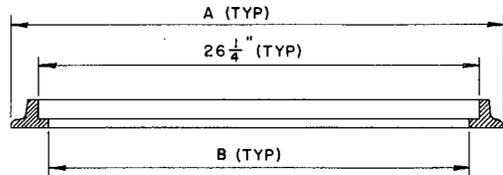
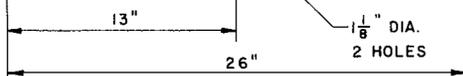
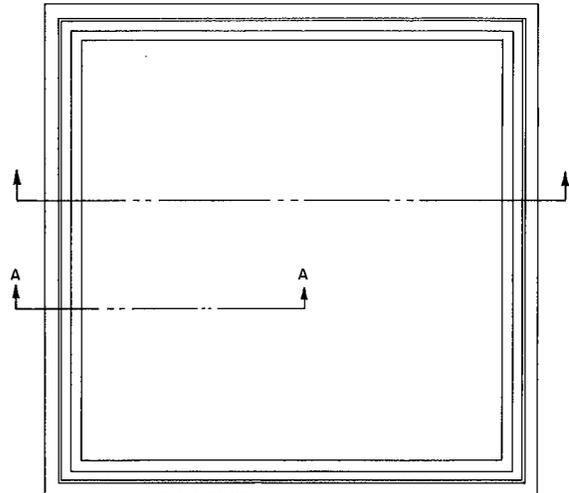
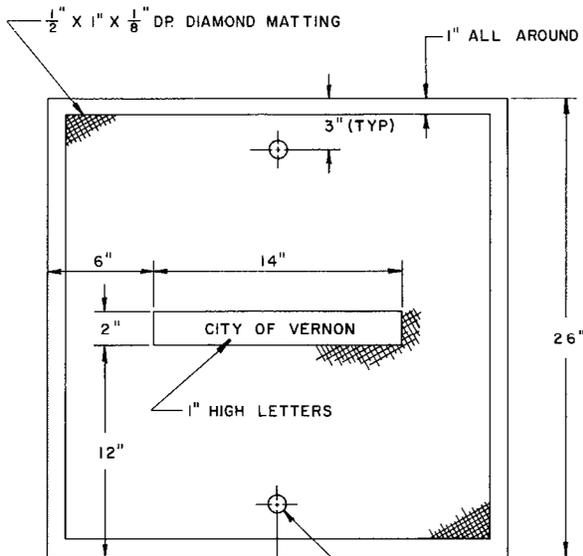
REVISIONS		
DATE	DESCRIPTION	INITIALS
5/30/18	UPDATED NOTE 12.	MA
7/5/18	UPDATED NOTES 7, 8, & 10.	MB

**TYPICAL TRENCH PAVING SECTION  
FOR SEWER LATERAL**  
CITY OF VERNON, PUBLIC WORKS DEPARTMENT  
JULY 2018

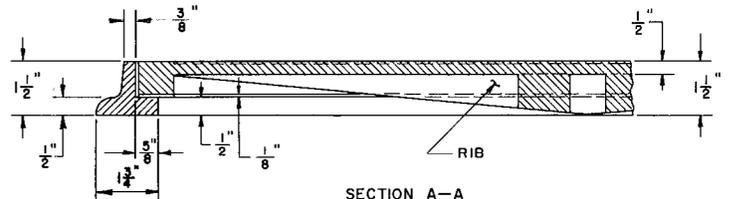
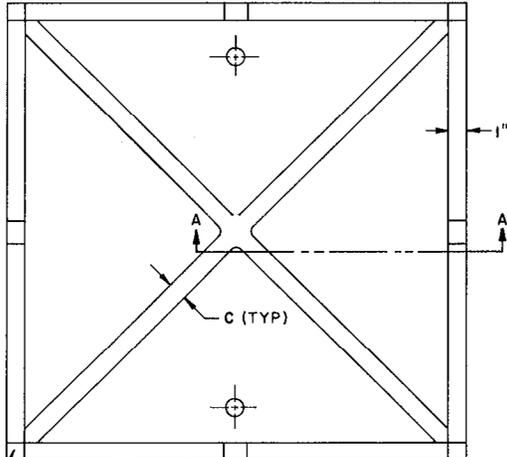
STANDARD PLAN  
**V2264**  
2 OF 2

# **WV1830 - City of Vernon Frame & Cover for Water Service**

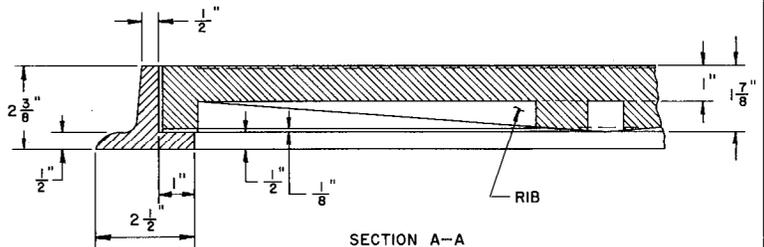
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SECTION  
FRAME



SECTION A-A  
LIGHT WEIGHT



SECTION A-A  
HEAVY TRAFFIC

**NOTES:**

1. CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30.
2. BEARING SURFACE SHALL BE MACHINED AND THE COVER SHALL SEAT FIRMLY INTO FRAME WITHOUT ROCKING.
3. FRAME AND COVER SHALL BE PAINTED OR DIPPED IN A COMMERCIAL QUALITY ASPHALTUM PAINT.

	A	B	C
HEAVY TRAFFIC	29 1/4"	24 1/4"	5/8"
LIGHT WEIGHT	28 1/2"	25"	1/2"

**STANDARD FRAME & COVER FOR WATER SERVICE**

CITY OF VERNON, CALIFORNIA

ENGINEERING DEPARTMENT

JULY, 1969

STANDARD PLAN  
**WV1830**



## GENERAL NOTES

- THE OWNER SHALL REFER TO THE CITY OF VERNON OR THEIR REPRESENTATIVE. THE CITY SHALL REFER TO THE CITY OF VERNON OR THEIR REPRESENTATIVE. CONTRACTOR SHALL REFER TO THE CONTRACTOR HIRED TO COMPLETE THE WORK. THE DESIGN ENGINEER SHALL REFER TO PACIFIC ADVANCED CIVIL ENGINEERING.
- ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH 1. THESE PLANS AND SPECIFICATIONS; 2. THE LATEST EDITION OF THE CITY OF VERNON'S DESIGN AND CONSTRUCTION STANDARDS; 3. AWWA SPECIFICATIONS.
- ALL REQUIRED PERMITS AND NECESSARY CITY BUSINESS LICENSE(S) SHALL BE OBTAINED BY THE CONTRACTOR PRIOR TO BEGINNING CONSTRUCTION.
- DURING ALL PHASES OF CONSTRUCTION, INCLUDING SUSPENSION OF WORK, UNTIL FINAL ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL OBSERVE, FOLLOW AND IMPLEMENT ALL THE REQUIREMENTS OF THE NPDES AND STORMWATER POLLUTION PREVENTION PROGRAM AND KEEP THE WORK SITE CLEAN AND FREE FROM RUBBISH AND DEBRIS. THE CONTRACTOR SHALL ALSO ABATE DUST NUISANCE BY CLEANING, SWEEPING AND SPRINKLING WITH WATER AND USING DUST FENCES OR OTHER METHODS AS DIRECTED BY THE OWNER'S REPRESENTATIVE THROUGHOUT THE CONSTRUCTION OPERATION.
- THE CONTRACTOR SHALL KEEP A STRICT RECORD OF ALL CHANGES AND SUBMIT THIS RECORD TO THE CITY. THE CONTRACTOR SHALL ALSO COORDINATE TRANSFERRING "AS-BUILT" INFORMATION ON THE CONTRACT DRAWINGS AND DELIVER THE CERTIFIED "AS-BUILT" PLANS TO THE CITY BEFORE THE RELEASE FOR OCCUPANCY OR FINAL ACCEPTANCE OF THE PROJECT SHALL BE FILED.
- THE CONTRACTOR SHALL EXERCISE DUE CARE TO AVOID INJURY TO EXISTING IMPROVEMENTS OR FACILITIES, UTILITY FACILITIES, ADJACENT PROPERTY, AND TREES AND SHRUBBERY THAT ARE NOT TO BE REMOVED. ALL DAMAGE CAUSED TO STREETS, INCLUDING HAUL ROUTES, ALLEYS, SIDEWALKS, CURBS OR STREET FURNISHINGS, OR TO PRIVATE PROPERTY SHALL BE REPAIRED AT THE SOLE EXPENSE OF THE CONTRACTOR TO THE SATISFACTION OF THE CITY.
- THE CONTRACTOR SHALL DESIGNATE AND KEEP ON THE PROJECT AT ALL TIMES DURING ITS PROGRESS A COMPETENT SUPERINTENDENT WHO SHALL NOT BE REPLACED WITHOUT A WRITTEN NOTICE TO THE CITY. THE SUPERINTENDENT WILL BE THE CONTRACTOR'S REPRESENTATIVE AT THE SITE AND SHALL HAVE AUTHORITY TO ACT ON BEHALF OF THE CONTRACTOR. ALL COMMUNICATIONS GIVEN TO THE SUPERINTENDENT SHALL BE AS BINDING AS IF GIVEN TO THE CONTRACTOR. DURING PERIODS WHEN THE WORK IS SUSPENDED, THE CONTRACTOR SHALL MAKE APPROPRIATE ARRANGEMENTS FOR ANY EMERGENCY WORK WHICH MAY BE REQUIRED.
- WHEN THE WORK OR ANY PORTION OF IT IS SUFFICIENTLY COMPLETE TO BE UTILIZED OR PLACED INTO SERVICE, THE CITY SHALL HAVE THE RIGHT UPON WRITTEN NOTIFICATION TO THE CONTRACTOR TO UTILIZE SUCH PORTIONS OF THE WORK AND TO PLACE THE OPERABLE PORTIONS INTO SERVICE AND TO OPERATE SAME. UPON SAID NOTICE AND COMMENCEMENT OF UTILIZATION OR OPERATION BY THE CITY, THE CONTRACTOR SHALL BE RELIEVED OF THE DUTY OF MAINTAINING THE PORTIONS SO UTILIZED OR PLACED INTO OPERATION; PROVIDED, HOWEVER, THAT NOTHING IN THIS NOTE SHALL BE CONSTRUED AS RELIEVING THE CONTRACTOR OF THE FULL RESPONSIBILITY FOR COMPLETING THE WORK IN ITS ENTIRETY, FOR MAKING GOOD DEFECTIVE WORK AND MATERIALS, FOR PROTECTING THE WORK FROM DAMAGE, AND FOR BEING RESPONSIBLE FOR DAMAGE.
- THE CONTRACTOR SHALL SO CONDUCT HIS OPERATIONS AS TO OFFER THE LEAST POSSIBLE OBSTRUCTION AND INCONVENIENCE, AND HE SHALL HAVE UNDER CONSTRUCTION NO GREATER LENGTH OR AMOUNT OF WORK THAN HE CAN PROSECUTE PROPERLY WITH DUE REGARD TO THE RIGHTS OF THE PUBLIC. CONVENIENT ACCESS TO DRIVEWAYS, HOUSES, AND BUILDINGS ALONG THE LINE OF WORK SHALL BE MAINTAINED AND TEMPORARY CROSSINGS SHALL BE PROVIDED AND MAINTAINED IN GOOD CONDITION. NO MORE THAN ONE CROSSING OR INTERSECTION STREET OR ROAD SHALL BE CLOSED AT ANY ONE TIME.
- UNTIL THE ACCEPTANCE OF THE WORK, THE CONTRACTOR SHALL HAVE THE RESPONSIBLE CHARGE AND CARE OF THE WORK AND OF THE MATERIALS TO BE USED THEREIN (INCLUDING MATERIALS FOR WHICH HE HAS RECEIVED PARTIAL PAYMENT OR MATERIALS WHICH HAVE BEEN FURNISHED BY THE CITY) AND SHALL BEAR THE RISK OF INJURY, LOSS, OR DAMAGE TO ANY PART THEREOF BY THE ACTION OF ELEMENTS OR FROM ANY OTHER CAUSE, WHETHER ARISING FROM THE EXECUTION OR FROM THE NONEXECUTION OF THE WORK.
- IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS OF THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK, AND THE CONTRACTOR SHALL FULLY COMPLY WITH ALL STATE, FEDERAL AND OTHER LAWS, RULES, REGULATIONS, AND ORDERS RELATING TO SAFETY OF WORKERS AND ALL OTHERS. THIS MAY INCLUDE THE ISSUANCE OF PERSONAL PROTECTIVE EQUIPMENT.
- THE LANDS AND RIGHTS-OF-WAY FOR THE FACILITY TO BE CONSTRUCTED WILL BE PROVIDED BY THE OWNER. THE CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS AND PAY ALL EXPENSES FOR ADDITIONAL AREA REQUIRED BY HIM BEYOND THE LIMITS OF THE OWNER'S LANDS AND RIGHTS-OF-WAY.
- DIG ALERT SHALL BE NOTIFIED BY CALLING 1-800-227-2600 PRIOR TO THE START OF CONSTRUCTION OR PIPELINE INSTALLATION TO SCHEDULE AN INSPECTION. INSPECTION MUST BE MADE BEFORE TRENCHING FOR BELOW-GROUND PIPING IS BACK-FILLED.
- ALL FIELD SURVEYING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- ANY INSPECTION BY THE CITY OR THE ENGINEER SHALL NOT IN ANY WAY RELIEVE THE CONTRACTOR FROM ANY OBLIGATION TO PERFORM THE WORK IN STRICT COMPLIANCE WITH THE APPLICABLE CODES AND AGENCY REQUIREMENTS.
- IF A CONFLICT OCCURS BETWEEN ANY OF THE PROJECT DOCUMENTS AND PLANS THE MORE STRINGENT SHALL APPLY.
- THE ENGINEER WILL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FOR SAFETY PRECAUTIONS OR PROGRAMS UTILIZED IN CONNECTION WITH THE WORK, AND WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- THE EXISTENCE AND LOCATIONS OF ALL UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS WERE ASCERTAINED BY EXISTING INFORMATION AND ARE APPROXIMATE. NEITHER THE OWNER NOR THE ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN.
- THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE OWNER AND CITY AND THE ENGINEER OF ALL DISCREPANCIES PRIOR TO THE COMMENCEMENT OF WORK.
- PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXPOSE EXISTING WATER SYSTEM AT THE PROPOSED CONNECTION POINTS AND VERIFY ITS EXISTING ELEVATION, LOCATION, AND ACTUAL DIAMETER.
- ALL BURIED ELECTRICAL CONDUIT SHALL BE ENCASED IN RED CONCRETE.

- PRIOR TO ANY POTABLE WATER CONNECTIONS, THE CONTRACTOR SHALL PRESSURE TEST AND DISINFECT ALL NEWLY CONSTRUCTED FACILITIES IN ACCORDANCE WITH THE DISTRICTS REQUIREMENTS AND ALL APPLICABLE AWWA STANDARDS AND PASS A BACTERIA CONTAMINATION TEST. ALL DISINFECTION AND BACTERIA TESTING SHALL BE UNDER THE OBSERVATION OF THE OWNER'S/CITY REPRESENTATIVE.
- ANY WORK TO BE CONDUCTED IN AN AREA DEFINED BY OSHA TO BE A CONFINED SPACE SHALL FOLLOW THE NECESSARY OPERATIONAL REQUIREMENTS AS DESIGNATED BY THE APPLICABLE REGULATORY AGENCIES. ALL PARTICIPANTS CONDUCTING WORK IN A CONFINED SPACE ENVIRONMENT MUST BE TRAINED AND CERTIFIED TO CONDUCT WORK IN A CONFINED SPACE. PRIOR TO ANY WORK IN AN AREA DEFINED AS A CONFINED SPACE, THE CONTRACTOR SHALL CREATE AN ENTRY PLAN THAT SHALL SATISFY ALL THE SAFETY REQUIREMENTS BY ALL REGULATORY AGENCIES (SEE ALSO SPECIFICATIONS).
- ALL DISINFECTION WORK SHALL BE PERFORMED BY PERSONNEL CERTIFIED BY THE CA DEPARTMENT OF HEALTH SERVICES IN ACCORDANCE WITH CHAPTER 9, DIVISION 5 OF THE HEALTH AND SAFETY CODE AND CITY STANDARDS. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE A DISINFECTION PLAN TO THE CITY FOR REVIEW AND APPROVAL BY THE CITY. A COPY OF THE CERTIFICATE SHALL BE PROVIDED TO THE CITY PRIOR TO THE COMMENCEMENT OF DISINFECTION.

## SCOPE OF WORK

THE CITY OF VERNON WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENT PROJECT WILL CONSIST OF THE CONSTRUCTION AND INSTALLATION OF THE POTABLE WATER WELL BOOSTER PUMP AND ASSOCIATED APPURTENANCES, YARD PIPING, CIVIL, MECHANICAL, STRUCTURAL, ELECTRICAL AND SITE WORK.

THE PROJECT WILL INCLUDE, BUT WILL NOT BE LIMITED TO, THE FOLLOWING ITEMS:

- NEW CIVIL SITE GRADING WORK, 15" RCP STORM DRAIN, 12" DI WELL DISCHARGE, 8" SEWER, SITE SECURITY UPGRADES AND ASSOCIATED APPURTENANCES.
- NEW PREFABRICATED EQUIPMENT BUILDING, CONCRETE FOOTING AND PILES, CHEMICAL DOSING EQUIPMENT AND ON-SITE STORAGE, ELECTRICAL EQUIPMENT AND ASSOCIATED APPURTENANCES.
- MECHANICAL AND PROCESS PIPING, VALVES AND ASSOCIATED FITTINGS AND ACCESSORIES.
- NEW ELECTRICAL CONDUIT, CONTROLS, INSTRUMENTATION, AND PROGRAMMING REQUIRED FOR WELL OPERATION.

## CONSTRUCTION NOTES:

- CONTRACTOR TO PROVIDE PIPE SUPPORTS PER MANUFACTURER'S REQUIREMENTS, PROJECT PLANS AND SPECIFICATIONS AND AT THE LOCATIONS INDICATED ON THE PLANS.
- ALL PROCESS PIPES SHALL BE COLOR COATED PER THE SPECIFICATIONS WITH THE EXCEPTION OF STAINLESS STEEL PIPES. ALL ABOVE GROUND PIPES SHALL ALSO BE OUTFITTED WITH A FLOW DIRECTION ARROW.
- ALL ANCHORING/FASTENING SYSTEMS (INCLUDING NUTS, BOLTS, WASHERS, ETC.) SHALL BE 316 S.S. REGARDLESS OF LOCATION, U.N.O.
- CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL FOR EACH EQUIPMENT ITEM PRIOR TO INSTALLATION. INSTALLATION DETAILS FOR ALL EQUIPMENT ITEMS SHALL BE PER RESPECTIVE EQUIPMENT MANUFACTURER'S SHOP DRAWINGS AND RECOMMENDED INSTALLATION REQUIREMENTS.
- ELEVATION OF EXISTING STRUCTURES, PIPING, AND COMPONENTS ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY PRIOR TO CONSTRUCTION.
- CONTRACTOR SHALL PROVIDE ALL NECESSARY FITTING AND PIPE APPURTENANCES REQUIRED FOR PROPER INSTALLATION AND SHALL ACCOUNT FOR ADEQUATE LAY LENGTH COMPLETE AND IN PLACE.
- PRECAST CONCRETE AND PREFABRICATED BUILDING MANUFACTURER SUPPLIER SHALL PROVIDE STRUCTURAL CALCULATIONS STAMPED BY A REGISTERED PROFESSIONAL ENGINEER IN CALIFORNIA TO DOCUMENT DESIGN OF THEIR RESPECTIVE STRUCTURE.

## GENERAL GRADING NOTES:

- CONTRACTOR TO FOLLOW RECOMMENDATIONS LISTED IN THE GEOTECHNICAL EVALUATION REPORT PROVIDED BY CONVERSE. SHOULD ANY CONFLICTS ARISE BETWEEN THE EVALUATION AND THESE PLANS, THE CIVIL ENGINEER SHALL BE CONTACTED AND THE GEOTECHNICAL EVALUATION RECOMMENDATIONS SHALL BE FOLLOWED.
- THE ENGINEER MAKES NO REPRESENTATION OR GUARANTEE REGARDING EARTHWORK QUANTITIES OR THAT THE EARTHWORK FOR THIS PROJECT WILL BALANCE DUE TO VARIOUS FIELD CONDITIONS, CHANGING SOIL TYPES, ALLOWABLE CONSTRUCTION TOLERANCES AND CONSTRUCTION METHODS THAT ARE BEYOND THE CONTROL OF THE ENGINEER.
- PRIOR TO THE BIDDING OF WORK, THE CONTRACTOR SHALL THOROUGHLY SATISFY HIMSELF AS TO THE ACTUAL CONDITIONS AND EARTHWORK QUANTITIES, IF ANY. NO CLAIM SHALL BE MADE TO THE OWNER OR ENGINEER FOR ANY EXCESS OF DEFICIENCY HEREIN, ACTUAL OR RELATIVE.
- THE ENGINEER/SURVEYOR WILL PERFORM FIELD SURVEYS FOR PAD ELEVATION CERTIFICATIONS UPON NOTIFICATION BY THE GRADING CONTRACTOR THAT THE PADS ARE COMPLETE AND READY FOR CERTIFICATION ONLY AS NEEDED. IT IS UNDERSTOOD THAT CERTIFICATION PROVIDES ONLY A REPRESENTATIVE ELEVATION OF THE AVERAGE GRADE OF EACH LOT, BUILDINGS OR UNIT PAD, AND SHALL NOT BE CONSTRUED TO INCLUDE YARD AND STREET SUBGRADE CERTIFICATION OR CERTIFICATION THAT THE ENTIRE PAD IS LEVEL, THAT IS WAS CONSTRUCTED IN THE DESIGN LOCATION OR WAS GRADED TO THE CROSS-SECTION SET FORTH ON THE PLANS OR AS DESIGNATED IN THE GEOTECHNICAL EVALUATION.
- AN APPROVED GRADING AND DRAINAGE PLAN MUST BE ON THE JOBSITE AT ALL TIMES. DEVIATIONS FROM THIS PLAN MUST BE PRECEDED BY AN APPROVED PLAN REVISION.
- HAUL PERMITS, WHEN REQUIRED, MUST BE OBTAINED PRIOR TO OR CONCURRENTLY WITH THE GRADING AND DRAINAGE PERMIT.
- THE PLANS SHALL COMPLY WITH THE AMERICANS WITH DISABILITIES ACT'S ACCESSIBILITY GUIDELINES, AS PUBLISHED IN FEDERAL REGISTER ON JULY 26, 1991, AS PERTAINS TO CURB AND RAMP, RAMP, CROSSWALK, SLOPE AND CROSS-SLOPE OF SIDEWALK, AND PARKING REQUIREMENTS.
- AS STATED IN THE SITE GEOTECHNICAL REPORT, SITE DEWATERING WILL BE REQUIRED IN ORDER TO CONSTRUCT THE PROPOSED IMPROVEMENTS.
- SUBSOIL OF ALL STRUCTURES SHALL BE PREPARED PER THE SITE GEOTECHNICAL REPORT. THIS SPECIFICALLY INCLUDES REMOVING THE SPECIFIED SOIL UNDER THE PROPOSED WELL LOCATION AND REPLACING WITH ENGINEERED FILL.

## FIRE DEPARTMENT NOTES

- ADDITIONAL SIGNAGE AND FIRE EXTINGUISHERS MAY BE REQUIRED. LOCATION AND TYPE SHALL BE DETERMINED PRIOR TO FINAL FIRE DEPARTMENT INSPECTION.
- ALL WORKS SHALL COMPLY WITH THE LATEST EDITION OF THE CALIFORNIA FIRE CODE.
- PERMITS SHALL BE OBTAINED FROM THE FIRE CODE OFFICIAL. PERMIT(S) AND FEES, IF ANY, SHALL BE PAID BY THE CONTRACTOR PRIOR TO ISSUANCE OF ANY AND/OR ALL PERMITS. ISSUED PERMITS SHALL BE KEPT ON THE PREMISES DESIGNATED THEREIN AT ALL TIMES AND SHALL BE READILY AVAILABLE FOR INSPECTION BY THE FIRE CODE OFFICIAL.
- FINAL APPROVAL IS SUBJECT TO FIELD INSPECTIONS. MINIMUM 48 HOURS NOTICE REQUIRED TO ANY LIFE-SAFETY FIRE INSPECTION. OTHER CONDITIONS MAY APPLY AT TIME OF INSPECTIONS AND SUBJECT TO CORRECTIONS.

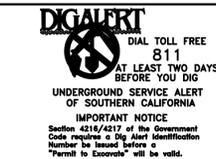
## ABBREVIATIONS

A.B.	AGGREGATE BASE	FL	FLOW LINE	PCC	PORTLAND CEMENT CONCRETE
A.C.	ASPHALT CONCRETE	FLG	FLANGE	PG	PRESSURE GAUGE
AI	ANALOG INPUT	FM	FORCE MAIN	PI	POINT OF INTERSECTION
APPROX	APPROXIMATELY	FLGS	FLANGED	PLC	PROGRAMMABLE LOGIC CONTROLLER
ARCH	ARCHITECTURAL	FPS	FEET PER SECOND	PP	POWER POLE, PIPE PENETRATION
ARV	AIR RELEASE VALVE	FT	FEET	PRV	PRESSURE RELIEF VALVE
AVV	AIR VACUUM VALVE	FUT	FUTURE	PRC	POINT OF REVERSE CURVE
BC	BEGINNING OF CURVE	GA	GAUGE	PRV	PRESSURE REGULATING (REDUCING) VALVE
BF	BLIND FLANGE	GAL	GALLONS	PS	PRESSURE SWITCH, PIPE SUPPORT
BM	BEAM, BENCHMARK	GALV	GALVANIZED	PSI	POUNDS PER SQUARE INCH
BOT	BOTTOM	GB	GRADE BREAK	PV	PLUG VALVE
BVC	BEGIN VERTICAL CURVE	GPD	GALLONS PER DAY	PVC	POLYVINYL CHLORIDE
CFH	CUBIC FOOT PER HOUR	GPM	GALLONS PER MINUTE	R	RADIUS
CFM	CUBIC FOOT PER MINUTE	HDPE	HIGH DENSITY POLYETHYLENE	RA	RETURN ACTIVATED SLUDGE
CFS	CUBIC FOOT PER SECOND	HOA	HAND-OFF-AUTOMATIC	RED	REDUCER
CH	CHUCK	HORIZ	HORIZONTAL	REF	REFERENCE
CML & C	CONCRETE MORTAR LINED & COATED	HP	HORSEPOWER	REQD	REQUIRED
CML & EC	CONCRETE MORTAR LINED & EPOXY COATED	H.W.L.	HIGH WATER LEVEL	RPM	REVOLUTIONS PER MINUTE
CLR	CLEAR	HZ	HERTZ	RMT	REQUIREMENT
CMU	CONCRETE MASONRY UNIT	ID	INSIDE DIAMETER	R&R	REMOVE AND RELOCATE (REINSTALL)
CO	CLEANOUT	IE	INVERT ELEVATION	R&S	REMOVE AND SAVE (SALVAGE)
CONT.	CONTINUOUS	IN	INCHES	RW	RECLAIMED WATER
COTG	CLEANOUT TO GRADE	INF	INFLUENT	R&W	REMOVE AND WASTE
CONST	CONSTRUCTION	IRR	IRRIGATION	S	SLOPE
CPLG	COUPLING	INV.	INVERT	SBR	SEQUENCING BATCH REACTOR
CTR	CENTER	JB	JUNCTION BOX	SCH.	SCHEDULE
CV	CHECK VALVE	LBS	POUNDS	SECT.	SECTION
CW	COLD WATER	LBS/D	POUNDS PER DAY	SF.	SQUARE FEET
CYL	CYLINDER	LF	LINEAR FEET	SHT.	SHEET
DAF	DISSOLVED AIR FLOATATION	LFPS	LOW FLOW PUMP STATION	SPEC.	SPECIFICATION
DI	DIGITAL INPUT	LI	LEVEL INDICATOR	SQ.	SQUARE
DIA	DIAMETER	LP	LOW PRESSURE	STA	STATION
DIP	DUCTILE IRON PIPE	LT	LEVEL TRANSDUCER	T&B	TOP AND BOTTOM
DO	DISSOLVED OXYGEN	L.W.L.	LOW WATER LEVEL	TB	THRUST BLOCK
DTL	DETAILS	MAX.	MAXIMUM	TC	TOP OF CURB
DWG	DRAWING	MCC	MOTOR CONTROL CENTER	T&A	TO BE ABANDONED
E	ELECTRICAL POWER	MECH	MECHANICAL	TOH	TOTAL DYNAMIC HEAD
EA	EACH	MFR	MANUFACTURER	TEL	TELEPHONE
EC	END OF CURVE	MGD	MILLION GALLONS PER DAY	TG	TOP OF GRATE
ECC	ECCENTRIC	MG/L	MILLIGRAMS PER LITER	TEMP	TEMPERATURE
EF	EACH FACE	MH	MANHOLE OR MAINTENANCE HOLE	TOS	TOP OF SLAB
EL.	ELEVATION	MIN	MINIMUM, MINUTE	TSP	TWISTED SHIELDED PAIR
ELEC	ELECTRIC	MISC	MISCELLANEOUS	TYP	TYPICAL
ELECT	ELECTRICAL	MJ	MECHANICAL JOINT	U.N.O.	UNLESS NOTED OTHERWISE
EP	EDGE OF PAVEMENT	N	NORTHING	VAC	VOLTS ALTERNATING CURRENT
EQUIP	EQUIPMENT	NIC	NORMALLY CLOSED	VERT.	VERTICAL
E.W.	EACH WAY	N/O	NORMALLY OPEN	VCP	VITRIFIED CLAY PIPE
EXH	EXHAUST	NTS	NOT TO SCALE	W	WATER
EXIST.	EXISTING	NWL	NORMAL WATER LEVEL	WAS	WASTE ACTIVATED SLUDGE
FD	FLOOR DRAIN	NPSH	NET POSITIVE SECTION HEAD	W/	WITH
FF	FINISHED FLOOR	OC	ON CENTER	W/O	WITHOUT
FG	FINISHED GROUND	OD	OUTSIDE DIAMETER	W.S.	WATER SURFACE
FH	FIRE HYDRANT			WWF	WELDED WIRE FABRIC

## LEGEND

	DETAIL OR SECTION LETTER		ASPHALT
	SHEET WHERE DETAIL IS SHOWN		DECOMPOSED GRAVEL FILL
	PROPERTY BOUNDARY		CONCRETE
	SETBACK		BACKFILL
	EXISTING ACCESS ROAD		ENGINEERED BACKFILL
	EXISTING 5' CONTOUR		DEMO
	EXISTING 1' CONTOUR		CONTROL PANEL
	PROPOSED 5' CONTOUR		DETAIL LETTER SHEET #
	PROPOSED 1' CONTOUR		EXISTING UTILITY POLE
	PROPOSED FUTURE 5' CONTOUR		EXISTING LIGHT POLE
	EXISTING FENCE		
	PROPOSED CHAINLINK FENCE		
	EXISTING UNDERGROUND ELECTRICAL CONDUIT		
	PROPOSED UNDERGROUND ELECTRICAL CONDUIT		
	EXISTING WATER LINE		
	EQUIPMENT CALL OUT (SEE EQUIPMENT LIST)		

**CONSTRUCTION NOTES INCL. FITTINGS, VALVES & MISC. EQUIPMENT (SEE THE SAME SHT.)**



NO.	DATE	REVISIONS

UTIL. DIV.	REVIEWED BY	DATE
TRAFFIC		
ENG. SERVICES		
STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L.		
CONSTRUCTION		

DESIGN:	DRAWN:	CHECKED:	DATE:
D.S.L.	M.S.A. / J.S. / R.C.	D.S.L.	SEPTEMBER 2021



WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS	SHEET NO.
4305 SANTA FE AVENUE VERNON, CA. 90058	G2.0
GENERAL NOTES	DWG. NO.
	2 OF 60

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**CIVIL CONSTRUCTION NOTES**

- C1 INSTALL 4,170 SQ. FT. OF 4" A.C. ON 4" A.B.
- C2 INSTALL 576 SQ. FT. OF 6" PERVIOUS CONCRETE ON 4" A.B.
- C3 CONSTRUCT 3' WIDE CONCRETE V-GUTTER PER DETAIL A, SHEET C1.0.
- C4 CONSTRUCT 27' WIDE DRIVEWAY PER CITY OF VERNON STD. PLAN PV693.
- C5 INSTALL 2,000 PSI CLASS IV 15" RCP STORM DRAIN AND FITTINGS.
- C6 CORE DRILL INTO EX. 36" SD MH. TIE NEW 15" RCP SD INTO EX. INVERT.
- C7 INSTALL 48"Ø MANHOLE PER SPPWC STANDARD PLAN NO. 200-4.
- C8 INSTALL 4' STUB OUT OF 15" RCP TO BE PLUGGED WITH BRICK AND MORTAR FOR FUTURE CONNECTION.
- C9 CONSTRUCT TRENCH BACKFILL PER CITY OF VERNON STANDARD PLAN V2264.
- C10 INSTALL 15" RCP CONNECTION TO ENERGY DISSIPATION STRUCTURE.
- C11 CONSTRUCT 3'x3' CONCRETE CATCH BASIN WITH H-20 ALUMINUM GRATE.
- C12 INSTALL 12" DUCTILE IRON PIPE AND FITTINGS.
- C13 CONNECT TO EXIST. 12" FLANGED DUCTILE IRON TEE W/ INSULATING JOINT.
- C14 INSTALL KEY CARD READER PER SPECIFICATION SECTION 17600.
- C15 INSTALL 12" 45° DUCTILE IRON ELBOW (RESTRAINED).
- C16 INSTALL 12" 90° DUCTILE IRON ELBOW (RESTRAINED).
- C17 INSTALL SINGLE AUTOMATIC SWING GATE PER DETAIL A, SHEET C4.0. POWER AND CONTROL PER ELECTRICAL AND INSTRUMENTATION SHEETS. GATE, MOTOR OPERATOR AND KEY PAD TO BE PROVIDED AS A COMPLETE SYSTEM IN A DEFERRED SUBMITTAL.
- C18 INSTALL DOUBLE SWING GATE PER DETAIL B, SHEET C4.0.
- C19 NOT USED
- C20 P.I.P. SOUTH AND SOUTHEAST EXISTING DOUBLE SWING GATE AND SIGNAGE.
- C21 DEMOLISH EXISTING SOUTHEAST SINGLE SWING MANWAY AND INSTALL WROUGHT IRON MANWAY.
- C22 INSTALL 12' TALL CMU WALL PER STRUCTURAL. WALL TO EXTEND 18" NORTH AND SOUTH OF PROPOSED FRP BUILDING.
- C23 REMOVE AND RELOCATE PARKING SIGNAGE PER CITY STANDARDS.
- C24 INSTALL 2" COMBINATION AIR VALVE AND FITTINGS PER DETAIL B, SHEET C4.1.
- C25 INSTALL 12" GATE VALVE (MJ RESTRAINED/FLG).
- C26 ENERGY DISSIPATION STRUCTURE PER MECHANICAL.
- C27 NOT USED.
- C28 INSTALL TERMINAL CLEANOUT STRUCTURE PER SPPWC STANDARD PLAN NO. 204-2.
- C29 INSTALL 8" PVC SEWER PIPE WITH A MINIMUM 4% SLOPE PER SHEET C3.3.
- C30 INSTALL 12"x12" CITY OF VERNON WELL 22 SITE DESCRIPTION SIGN ON THE WEST SIDE OF THE PUMP PEDESTAL PER DETAIL B, SHEET C1.0.
- C31 INSTALL 2" SCH. 80 PVC POTABLE WATER SITE USE LINE PER DETAIL A, SHEET C3.2 AND WATER FLUSH.
- C32 INSTALL REMOVABLE BOLLARD PER DETAIL C, SHEET C4.1.
- C33 INSTALL WALL-MOUNTED NFPA SIGN FOR CHLORINE PER DETAIL C, SHEET C1.0.
- C34 INSTALL 6" CONCRETE CURB PER DETAIL D, SHEET C4.1.

**MECHANICAL CONSTRUCTION NOTES**

- M1 INSTALL VERTICAL TURBINE PUMP, MOTOR, DISCHARGE HEAD AND ASSOCIATED APPURTENANCES PER MECHANICAL DETAILS.
- M2 INSTALL CONCRETE PUMP PAD, PEDESTAL AND SHADE STRUCTURE PER STRUCTURAL AND DETAIL E, SHEET M3.5.
- M3 INSTALL 12" DUCTILE IRON PIPE AND FITTINGS (FLGXFLG).
- M4 INSTALL 12" DUCTILE IRON PIPE AND FITTINGS (FLGXGROOVED).
- M5 INSTALL 12" COUPLING (GROOVED).
- M6 INSTALL 12"-90° DUCTILE IRON PIPE ELBOW (FLGXFLG).
- M7 INSTALL 12"-90° FLG. DUCTILE IRON PIPE ELBOW WITH INSECT SCREEN.
- M8 INSTALL 12"-45° DUCTILE IRON PIPE ELBOW (FLGXFLG).
- M9 INSTALL 12"x12"x12" DUCTILE IRON PIPE TEE (FLGXFLGXFLG).
- M10 INSTALL 3/4" STAINLESS STEEL CHEMICAL INJECTION QUILL AND FEED LINE.
- M11 INSTALL 12" DUCTILE IRON BLIND FLANGE.
- M12 INSTALL 5(H)x5(L)x6(H) PRECAST ENERGY DISSIPATION CONCRETE SPLASH PAD W/ ALUMINUM STEEL GRATE.
- M13 INSTALL WATER MAIN THRUST BLOCK PER DETAIL D, SHEET M3.4.
- M14 INSTALL CHLORINE HOUSEKEEPING PAD PER DETAIL A, SHEET M3.5.
- M15 ELECTRICAL EQUIPMENT. SEE SECTION "SES (NORTH WALL)" AND "(NORTH WALL)" PER DETAIL D, SHEET E7.1.
- M16 ELECTRICAL EQUIPMENT. SEE SECTION "MCC SECTION (EAST WALL)" PER DETAIL D, SHEET E7.1.
- M17 ELECTRICAL EQUIPMENT. SEE SECTION "MCC SECTION (SOUTH WALL)" PER DETAIL D, SHEET E7.1.
- M18 ELECTRICAL EQUIPMENT. SEE SECTION "PLC (WEST WALL)" PER DETAIL D, SHEET E7.1.
- M19 INSTALL EMERGENCY EYEWASH STATION PER DETAIL B, SHEET M3.5.
- M20 NOT USED.
- M21 PORTABLE GENERATOR POINT OF CONNECTION JUNCTION BOX PER ELECTRICAL.
- M22 INSTALL 12"-90° DUCTILE IRON PIPE ELBOW (MJxMJ).
- M23 INSTALL PIPE SUPPORT PER DETAIL C, SHEET M3.4.
- M24 INSTALL 4" FLOOR DRAIN WITH P-TRAP AND 4" SCH. 80 PVC DRAIN LINE PER DETAIL E, SHEET M3.4.
- M25 INSTALL 4" FLOOR DRAIN WITH P-TRAP AND 4" SCH. 80 PVC DRAIN LINE PER DETAIL F, SHEET M3.4.
- M26 INSTALL 12" INSULATING FLANGE KIT.
- M27 INSTALL ROOF MOUNTED PIPE SUPPORT PER DETAIL D, SHEET M3.5.
- M28 INSTALL 3/8" O.D. x 1/2" I.D. PVDF CHEMICAL TUBING IN 1" SCH. 80 PVC CONDUIT.
- M29 INSTALL 3/8" O.D. PVDF CHEMICAL TUBING.
- M30 INSTALL 2" SCH. 80 PVC VENT PIPE AND FITTINGS W/ ROOF JACK AND INSECT SCREEN.
- M31 INSTALL 2" CHLORINE TANK FILL LINE WITH 2" TRUE-UNION BALL VALVE, 45° ELBOW AND 2" CHEMLOCK FITTING.
- M32 INSTALL CHLORINE INJECTION PUMP SKID.
- M33 INSTALL 2" SCH. 80 PVC OVERFLOW PIPE.
- M34 INSTALL 1" PTFE FLEXIBLE EXPANSION JOINT (PROCO STYLE 442-BD OR EQUAL).
- M35 INSTALL CHLORINE TANK HOLD DOWN CLIPS PER MFR REQUIREMENT.
- M36 INSTALL HOSE BIB PER DETAIL B, SHEET M3.5.
- M37 INSTALL 3/8" O.D. x 1/2" I.D. PVDF CHEMICAL TUBING IN 1" SCH. 80 PVC CONDUIT FOR DOSING PUMP PRESSURE RELIEF.
- M38 INSTALL 2" SCH. 80 PVC POTABLE WATER SITE USE LINE PER DETAIL A, SHEET C4.2.
- M39 INSTALL 1" CONTINUOUS-LUBE WATER FLUSH SUPPLY ASSEMBLY PER DETAIL C, SHEET M3.2.
- M40 INSTALL 12"x10" DUCTILE IRON REDUCER (FLGXFLG).
- M41 INSTALL 12" THICK CONCRETE PAD.
- M42 INSTALL 4" THICK ELECTRICAL EQUIPMENT HOUSEKEEPING PAD.
- M43 INSTALL 18"(L)x12"(W)x6"(H) CONCRETE CONTAINMENT CURB W/ DRAIN.
- M44 INSTALL 12" SQ 20 GAUGE ALUMINUM DUCTING.
- M45 INSTALL STANCHION MOUNTED REMOTE FLOW TRANSMITTER.
- M46 INSTALL 12" BLIND FLANGE WITH 2" NPT TAP.

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**DIAL AHEAD**  
 DIAL TOLL FREE  
**811**  
 AT LEAST TWO DAYS  
 BEFORE YOU DIG  
 UNDERGROUND SERVICE ALERT  
 OF SOUTHERN CALIFORNIA  
 IMPORTANT NOTICE  
 Section 4216/4217 of the Government  
 Code requires a Dig Alert Identification  
 Number be issued before  
 "Permit to Excavate" will be valid.

**PACE**  
 Advanced Water Engineering  
 17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708  
 P: (714) 481-7300 | www.pacewater.com

REGISTERED PROFESSIONAL ENGINEER  
 DUNCAN S. LEE  
 No. C44825  
 Exp. 03-31-22  
 CIVIL  
 STATE OF CALIFORNIA

NO.	DATE	REVISIONS

LINE IS 2 INCHES  
 AT FULL SCALE  
 (IF NOT 2"=SCALE ACCORDINGLY)

DESIGN: *D.S.L.*

DRAWN: *M.S.A. / J.S. / R.C.*

CHECKED: *D.S.L.*

DATE: *SEPTEMBER 2021*

UTIL. DIV.	REVIEWED BY	DATE
TRAFFIC		
ENG. SERVICES		
STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L		
CONSTRUCTION		

REVIEWED BY	DATE

PREPARED UNDER THE SUPERVISION OF:

DUNCAN S. LEE, P.E. DATE: \_\_\_\_\_  
 R.C.E. NO. C44825 EXP. DATE: 03-31-22

REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

R.C.E. NO. \_\_\_\_\_ EXP. DATE: \_\_\_\_\_



**CITY OF VERNON**  
 PUBLIC UTILITIES  
 DEPARTMENT

**WELL NO. 22  
 EQUIPMENT AND  
 SITE IMPROVEMENTS**  
 4305 SANTA FE AVENUE VERNON, CA. 90058

**CONSTRUCTION NOTES**

SHEET NO.  
**G2.1**  
 DWG. NO.  
 3 OF 60

11020-302-01.dwg, 11020 - Construction Notes.dwg, by: mmiller on 12/08/21 at 11:46:34 AM





**CONSTRUCTION NOTES:**

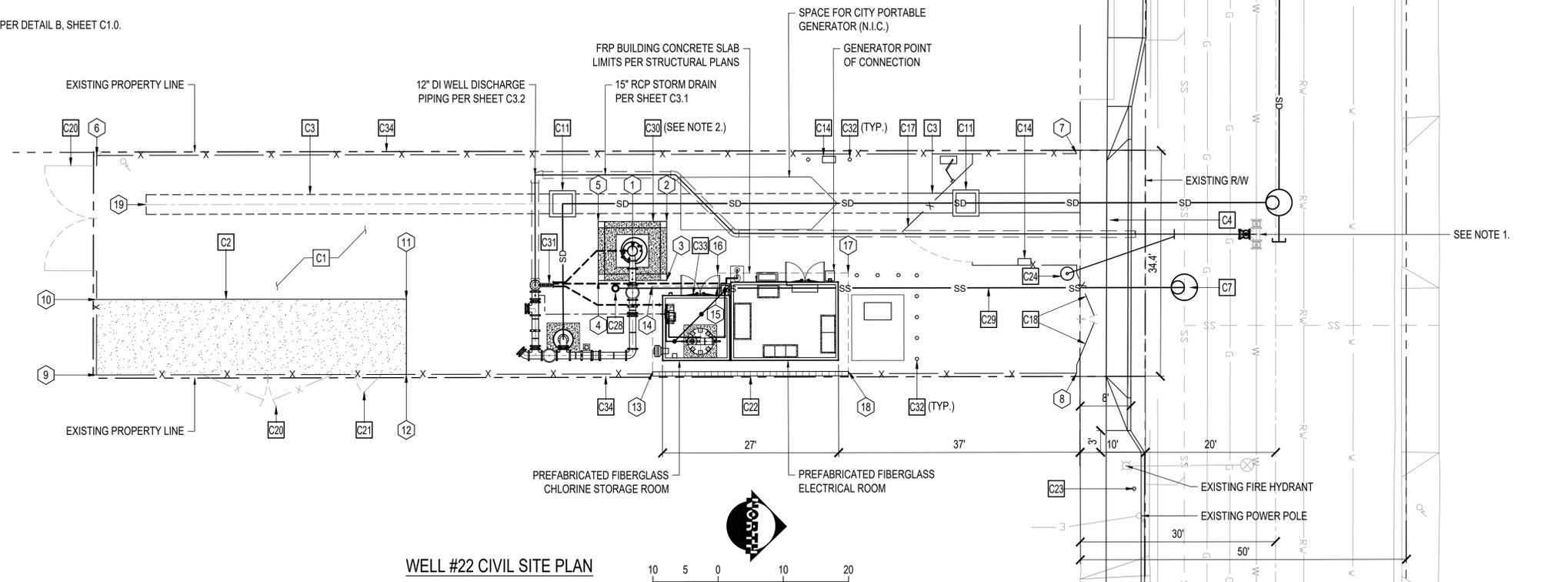
- C1 INSTALL 4,170 SQ. FT. OF 4" A.C. ON 4" A.B.
- C2 INSTALL 576 SQ. FT. OF 6" PERVIOUS CONCRETE ON 4" A.B.
- C3 CONSTRUCT 3' WIDE CONCRETE V-GUTTER PER DETAIL A, SHEET C1.0.
- C4 CONSTRUCT 27' WIDE DRIVEWAY PER CITY OF VERNON STD. PLAN PV693.
- C7 INSTALL 48"Ø MANHOLE PER SPPWC STANDARD PLAN NO. 200-4.
- C11 CONSTRUCT 3'x3' CONCRETE CATCH BASIN WITH H-20 ALUMINUM GRATE.
- C14 INSTALL KEY CARD READER PER SPECIFICATION SECTION 17600.
- C17 INSTALL SINGLE AUTOMATIC SWING GATE PER DETAIL A, SHEET C4.0. POWER AND CONTROL PER ELECTRICAL AND INSTRUMENTATION SHEETS. GATE, MOTOR OPERATOR AND KEY PAD TO BE PROVIDED AS A COMPLETE SYSTEM IN A DEFERRED SUBMITTAL.
- C18 INSTALL DOUBLE SWING GATE PER DETAIL B, SHEET C4.0.
- C19 NOT USED
- C20 P.I.P. SOUTH AND SOUTHEAST EXISTING DOUBLE SWING GATE AND SIGNAGE.
- C21 DEMOLISH EXISTING SOUTHEAST SINGLE SWING MANWAY AND INSTALL WROUGHT IRON MANWAY.
- C22 INSTALL 12" TALL CMU WALL PER STRUCTURAL. WALL TO EXTEND 18" NORTH AND SOUTH OF PROPOSED FRP BUILDING.
- C23 REMOVE AND RELOCATE PARKING SIGNAGE PER CITY STANDARDS.
- C24 INSTALL 2" COMBINATION AIR VALVE AND FITTINGS PER DETAIL B, SHEET C4.1.
- C25 INSTALL 12" GATE VALVE (MJ RESTRAINEDxFLG).
- C28 INSTALL TERMINAL CLEANOUT STRUCTURE PER SPPWC STANDARD PLAN NO. 204-2.
- C29 INSTALL 8" PVC SEWER PIPE WITH A MINIMUM 4% SLOPE PER SHEET C3.3.
- C30 INSTALL 12"x12" CITY OF VERNON WELL 22 SITE DESCRIPTION SIGN ON THE WEST SIDE OF THE PUMP PEDESTAL PER DETAIL B, SHEET C1.0.
- C31 INSTALL 2" SCH. 80 PVC POTABLE WATER SITE USE LINE PER DETAIL A, SHEET C3.2 AND WATER FLUSH.
- C32 INSTALL REMOVABLE BOLLARD PER DETAIL C, SHEET C4.1.
- C33 INSTALL WALL-MOUNTED NFPA SIGN FOR CHLORINE PER DETAIL C, SHEET C1.0.
- C34 INSTALL 6" CONCRETE CURB PER DETAIL D, SHEET C4.1.

**NOTES:**

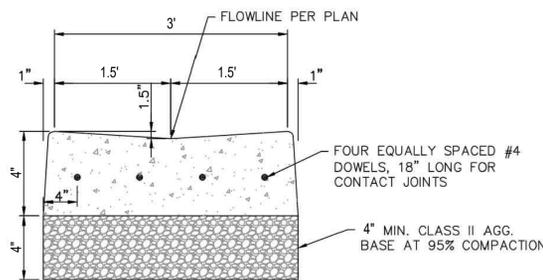
1. CONTRACTOR TO CONFIRM THE LOCATION OF TEE AND VALVES AND THE TYPE OF CONNECTIONS INSTALLED PER "50TH ST WATER MAIN REPLACEMENT" AS - BUILT PLANS.
2. SIGN DESCRIPTION IS FOR REFERENCE ONLY. THE FINAL LETTERING SHALL BE COORDINATED AND APPROVED BY CITY PRIOR TO FABRICATION.
3. CONTRACTOR SHALL PROVIDE ALL NECESSARY FITTINGS AND PIPE APPURTENANCES REQUIRED FOR PROPER INSTALLATION AND SHALL ACCOUNT FOR ADEQUATE LAY LENGTH. THIS INCLUDES PROVIDING THE NECESSARY FLANGE ADAPTERS NEEDED FOR PROPER CONNECTION.
4. ALL DUCTILE IRON PIPE SHALL BE CLASS 350. ALL PIPE AND PIPE APPURTENANCES SHALL BE CEMENT MORTAR LINED AND COAL TAR EPOXY COATED. ALL UNDERGROUND PIPING SHALL BE POLYETHYLENE DOUBLE WRAPPED. ALL BOLTS AND NUT FASTENERS SHALL BE 316 STAINLESS STEEL, UNO.
5. CONTRACTOR SHALL INSTALL ALL DUCTILE IRON PIPE AND FITTINGS PER APPLICABLE AWWA REQUIREMENTS.
6. ALL DAMAGED CEMENT LINER AND COAL TAR EPOXY COATING SHALL BE REPAIRED IN THE FIELD.
7. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL EXPOSE THE EXISTING PIPE LINES AT THE PROPOSED CONNECTION POINTS AND VERIFY HORIZONTAL LOCATION, ELEVATION, MATERIAL OF CONSTRUCTION, AND SIZE. DIMENSIONS OF STRUCTURES, PIPING, AND COMPONENTS ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY PRIOR TO CONSTRUCTION.
8. CONTRACTOR TO PROVIDE AND INSTALL PIPE SUPPORTS PER MANUFACTURER'S REQUIREMENTS AND SPECIFICATIONS. ALL DRY AREA PIPE SUPPORTS SHALL BE STAINLESS STEEL U.N.O.
9. CONTRACTOR TO INSTALL PUMP BASE, GUIDE RAILS, AND BRACKETS PER MANUFACTURER'S REQUIREMENTS. CONTRACTOR SHALL CONFIRM SUPPLY OF PUMP MOUNTING EQUIPMENT WITH PUMP SUPPLIER.
10. ALL PROCESS PIPES SHALL BE COLOR COATED PER THE SPECIFICATIONS WITH THE EXCEPTION OF STAINLESS STEEL PIPES. ALL ABOVE GROUND PIPES SHALL ALSO BE OUTFITTED WITH A FLOW DIRECTION ARROW.
11. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL FOR EACH EQUIPMENT ITEM PRIOR TO INSTALLATION. INSTALLATION DETAILS FOR ALL EQUIPMENT ITEMS SHALL BE PER RESPECTIVE EQUIPMENT MANUFACTURER'S SHOP DRAWINGS AND RECOMMENDED INSTALLATION REQUIREMENTS.
12. GROOVE FITTINGS MAY BE USED IN LIEU OF FLANGE FITTINGS FOR ALL ABOVE GROUND D.I. PIPING.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY PIPING AND EQUIPMENT NEEDED FOR PROCESS ISOLATION, BYPASS, AND TRANSITION.
14. ALL YARD PIPING SHALL BE SURVEYED AT ALL FITTINGS PRIOR TO BACKFILL.

POINT TABLE			
PNT. #	NORTHING	EASTING	DESCRIPTION
1	1821722.64	6495577.71	WELL CENTER
2	1821727.81	6495573.11	WELL HEAD STRUCTURE
3	1821727.98	6495582.10	WELL HEAD STRUCTURE
4	1821717.48	6495582.31	WELL HEAD STRUCTURE
5	1821717.31	6495573.31	WELL HEAD STRUCTURE
6	1821640.28	6495564.57	SITE LIMITS
7	1821790.50	6495561.67	SITE LIMITS
8	1821791.06	6495595.16	SITE LIMITS
9	1821640.81	6495598.05	SITE LIMITS
10	1821640.63	6495586.55	PERVIOUS CONCRETE LIMITS

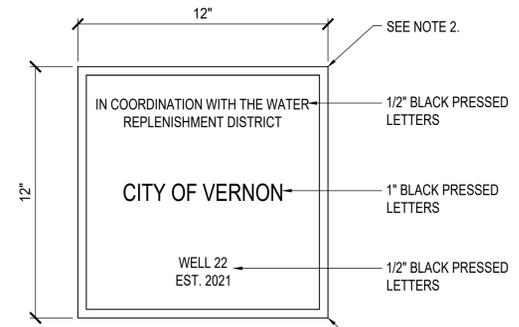
POINT TABLE			
PNT. #	NORTHING	EASTING	DESCRIPTION
11	1821688.12	6495585.64	PERVIOUS CONCRETE LIMITS
12	1821688.30	6495597.14	PERVIOUS CONCRETE LIMITS
13	1821726.06	6495596.08	FRP CONCRETE SLAB LIMITS
14	1821725.81	6495583.08	FRP CONCRETE SLAB LIMITS
15	1821735.81	6495582.89	FRP CONCRETE SLAB LIMITS
16	1821735.77	6495580.89	FRP CONCRETE SLAB LIMITS
17	1821755.76	6495580.50	FRP CONCRETE SLAB LIMITS
18	1821756.05	6495595.50	FRP CONCRETE SLAB LIMITS
19	1821647.97	6495571.93	END OF SD V-DITCH



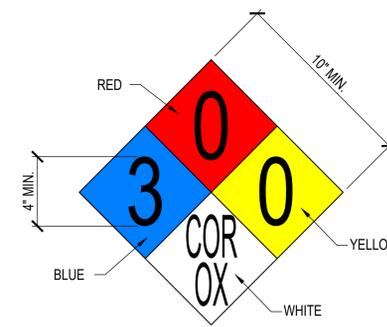
**WELL #22 CIVIL SITE PLAN**  
SCALE: 1" = 10'-0"



**DETAIL A: 3' V-DITCH**  
SCALE: N.T.S.



**DETAIL B: PLAQUE**  
SCALE: N.T.S.



**DETAIL C: NFPA CHLORINE SIGN**  
SCALE: N.T.S.

**DGA/ERT**  
DIAL TOLL FREE 811  
AT LEAST TWO DAYS BEFORE YOU DIG  
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA  
IMPORTANT NOTICE  
Section 4216/4217 of the Government Code require a Dig Alert Identification Number be issued before "Permit to Excavate" will be valid.

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Exp. 03-31-22  
CIVIL  
STATE OF CALIFORNIA

NO.	DATE	REVISIONS

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DESIGN: D.S.L.	UTIL. DIV. TRAFFIC ENG. SERVICES
DRAWN: M.S.A./J.S./R.C.	STREET DESIGN MAINTENANCE RIGHT-OF-WAY P.T. & L. CONSTRUCTION
CHECKED: D.S.L.	
DATE: SEPTEMBER 2021	

REVIEWED BY: _____	DATE: _____
PREPARED UNDER THE SUPERVISION OF: DUNCAN S. LEE, P.E.	DATE: _____
R.C.E. NO. C44825	EXP. DATE: 03-31-22
REVIEWED BY: _____	DATE: _____
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**CITY OF VERNON**  
PUBLIC UTILITIES DEPARTMENT

**WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058  
**PROPOSED SITE PLAN**

SHEET NO. **C1.0**  
DWG. NO. 6 OF 60

ISSUED FOR CONSTRUCTION  
THESE DRAWINGS ARE THE PROPERTY OF P.A.C.E AND SHALL NOT BE REPRODUCED IN ANY MANNER NOR USED FOR CONSTRUCTION UNLESS STAMPED "ISSUED FOR CONSTRUCTION"





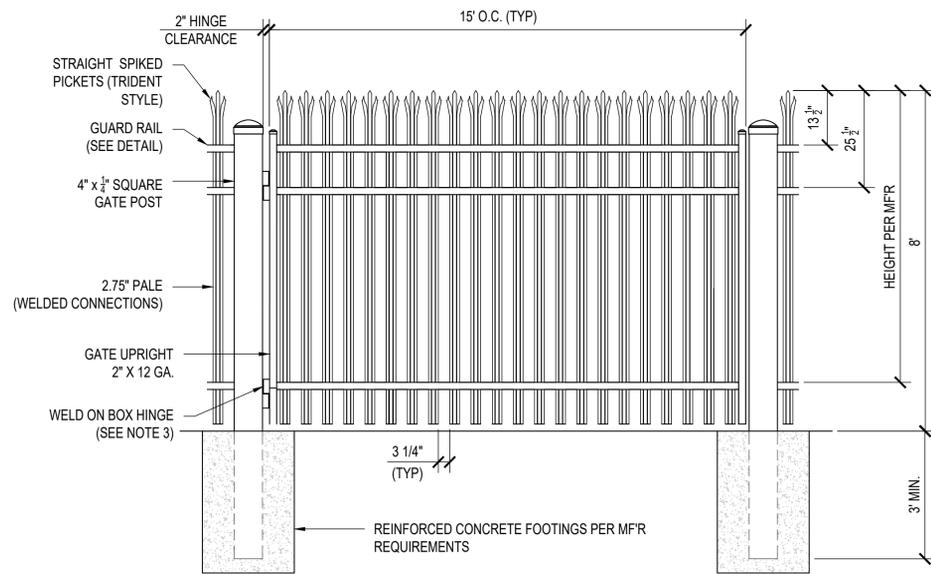




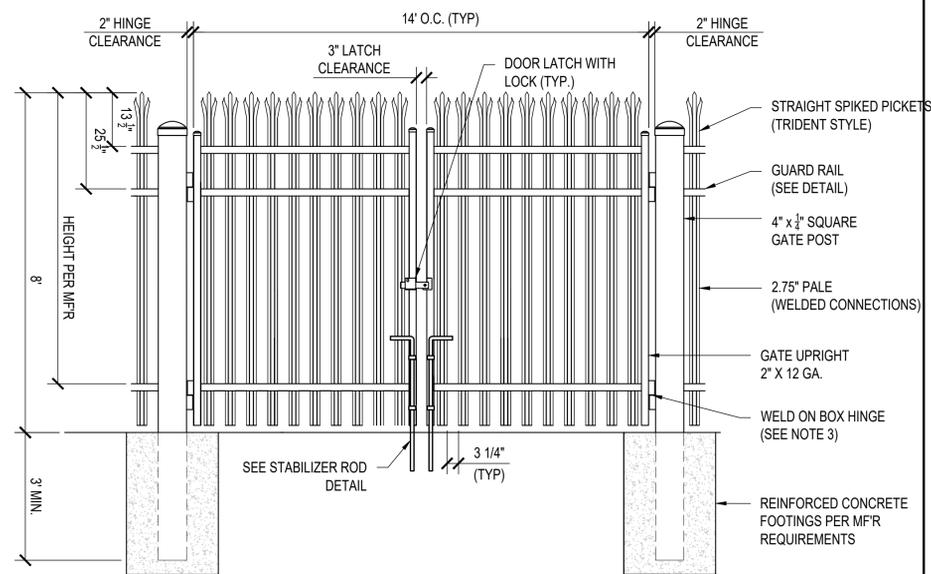


**NOTES:**

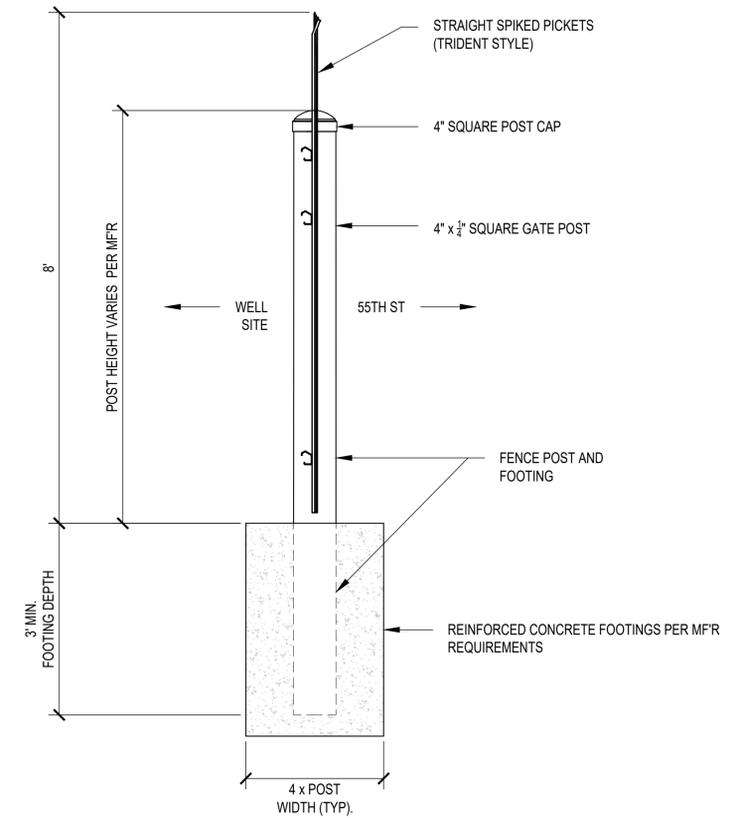
1. MANUFACTURER SHALL DESIGN FENCING FOR APPLICABLE SITE LOADS.
2. SEE SPECIFICATION SECTION 05562 FOR ADDITIONAL DETAILS.
3. WELD ALL BAR CONNECTIONS PER THE MANUFACTURER'S REQUIREMENTS.
4. EXACT HEIGHT AND WIDTH OF FENCE TO BE DETERMINED IN THE FIELD BY CONTRACTOR.
5. AUTOMATIC GATE SYSTEM NOT SHOWN.



**SINGLE GATE ENTRANCE ELEVATION**

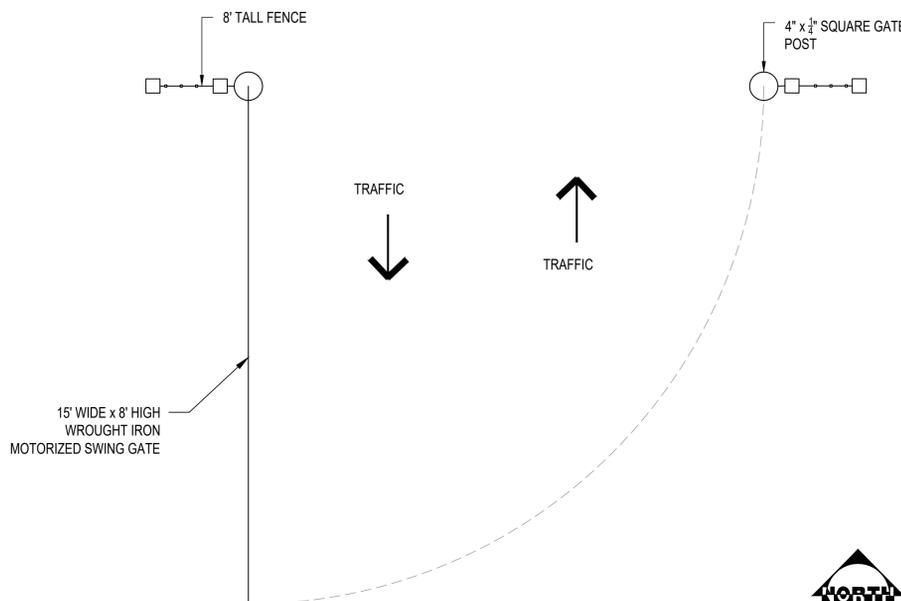


**DOUBLE GATE ENTRANCE ELEVATION**

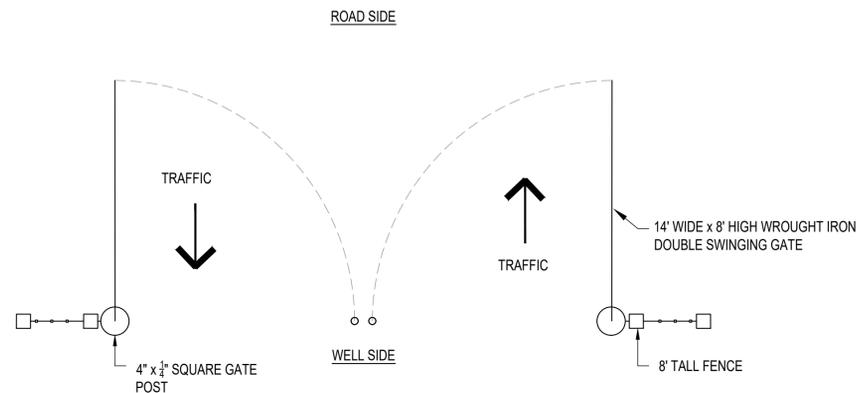


**FENCE POST SIDE VIEW**

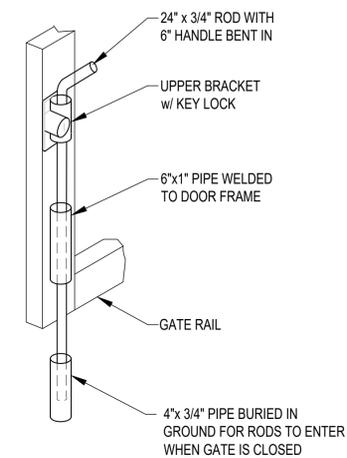
N.T.S C



**SINGLE GATE ENTRANCE PLAN**

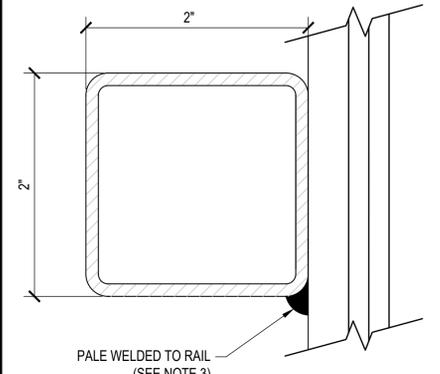


**DOUBLE GATE ENTRANCE PLAN**



**STABILIZER ROD**

N.T.S B



**GATE RAIL**

N.T.S D

**ISSUED FOR CONSTRUCTION**

**SINGLE GATE ENTRANCE DETAIL**

N.T.S A

**DOUBLE GATE ENTRANCE DETAIL**

N.T.S B

**STABILIZER ROD**

N.T.S D

**GATE RAIL**

N.T.S E

D:\Projects\96117\96117.dwg - 11/15/2021 11:22:30 AM

**DIALER**  
DIAL TOLL FREE  
811  
AT LEAST TWO DAYS  
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UTIL. DIV.	REVIEWED BY	DATE
TRAFFIC		
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STREET DESIGN		
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RIGHT-OF-WAY		
P.T. & L.		
CONSTRUCTION		

PREPARED UNDER THE SUPERVISION OF:  
DUNCAN S. LEE, P.E.  
R.C.E. NO. C44825 EXP. DATE: 03-31-22  
REVIEWED BY:  
DATE:  
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**CITY OF VERNON**  
PUBLIC UTILITIES  
DEPARTMENT

**WELL NO. 22**  
**EQUIPMENT AND**  
**SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058

**CIVIL DETAILS 1**

SHEET NO.  
**C4.0**  
DWG. NO.  
12 OF 60



**CONSTRUCTION NOTES:**

- M1 INSTALL VERTICAL TURBINE PUMP, MOTOR, DISCHARGE HEAD AND ASSOCIATED APPURTENANCES PER MECHANICAL DETAILS.
- M2 INSTALL CONCRETE PUMP PAD, PEDESTAL AND SHADE STRUCTURE PER STRUCTURAL AND DETAIL E, SHEET M3.5.
- M3 INSTALL 12" DUCTILE IRON PIPE AND FITTINGS (FLGXFLG).
- M4 INSTALL 12" DUCTILE IRON PIPE AND FITTINGS (FLGXGROOVED).
- M5 INSTALL 12" COUPLING (GROOVED).
- M6 INSTALL 12"-90° DUCTILE IRON PIPE ELBOW (FLGXFLG).
- M7 INSTALL 12"-90° FLG. DUCTILE IRON PIPE ELBOW WITH INSECT SCREEN.
- M8 INSTALL 12"-45° DUCTILE IRON PIPE ELBOW (FLGXFLG).
- M9 INSTALL 12"x12"x12" DUCTILE IRON PIPE TEE (FLGXFLGXFLG).
- M10 INSTALL 3/4" STAINLESS STEEL CHEMICAL INJECTION QUILL AND FEED LINE.
- M11 INSTALL 12" DUCTILE IRON BLIND FLANGE.
- M12 INSTALL 5'(H)x5'(L)x6'(H) PRECAST ENERGY DISSIPATION CONCRETE SPLASH PAD W/ ALUMINUM STEEL GRATE.
- M13 INSTALL WATER MAIN THRUST BLOCK PER DETAIL D, SHEET M3.4.
- M14 INSTALL CHLORINE HOUSEKEEPING PAD PER DETAIL A, SHEET M3.5.
- M15 ELECTRICAL EQUIPMENT. SEE SECTION "SES (NORTH WALL)" AND "(NORTH WALL)" PER DETAIL D, SHEET E7.1.
- M16 ELECTRICAL EQUIPMENT. SEE SECTION "MCC SECTION (EAST WALL)" PER DETAIL D, SHEET E7.1.
- M17 ELECTRICAL EQUIPMENT. SEE SECTION "MCC SECTION (SOUTH WALL)" PER DETAIL D, SHEET E7.1.
- M18 ELECTRICAL EQUIPMENT. SEE SECTION "PLC (WEST WALL)" PER DETAIL D, SHEET E7.1.
- M19 INSTALL EMERGENCY EYEWASH STATION PER DETAIL B, SHEET M3.5.
- M20 NOT USED.
- M21 PORTABLE GENERATOR POINT OF CONNECTION JUNCTION BOX PER ELECTRICAL.
- M22 INSTALL 12"-90° DUCTILE IRON PIPE ELBOW (MxM).
- M23 INSTALL PIPE SUPPORT PER DETAIL C, SHEET M3.4.
- M24 INSTALL 4" FLOOR DRAIN WITH P-TRAP AND 4" SCH. 80 PVC DRAIN LINE PER DETAIL E, SHEET M3.4.
- M25 INSTALL 4" FLOOR DRAIN WITH P-TRAP AND 4" SCH. 80 PVC DRAIN LINE PER DETAIL F, SHEET M3.4.
- M26 INSTALL 12" INSULATING FLANGE KIT.
- M28 INSTALL 3/8" O.D. x 1/2" I.D. PVDF CHEMICAL TUBING IN 1" SCH. 80 PVC CONDUIT.
- M29 INSTALL 3/8" O.D. PVDF CHEMICAL TUBING.
- M30 INSTALL 2" SCH. 80 PVC VENT PIPE AND FITTINGS W/ ROOF JACK AND INSECT SCREEN.
- M31 INSTALL 2" CHLORINE TANK FILL LINE WITH 2" TRUE-UNION BALL VALVE, 45° ELBOW AND 2" CHEMLOCK FITTING.
- M32 INSTALL CHLORINE INJECTION PUMP SKID.

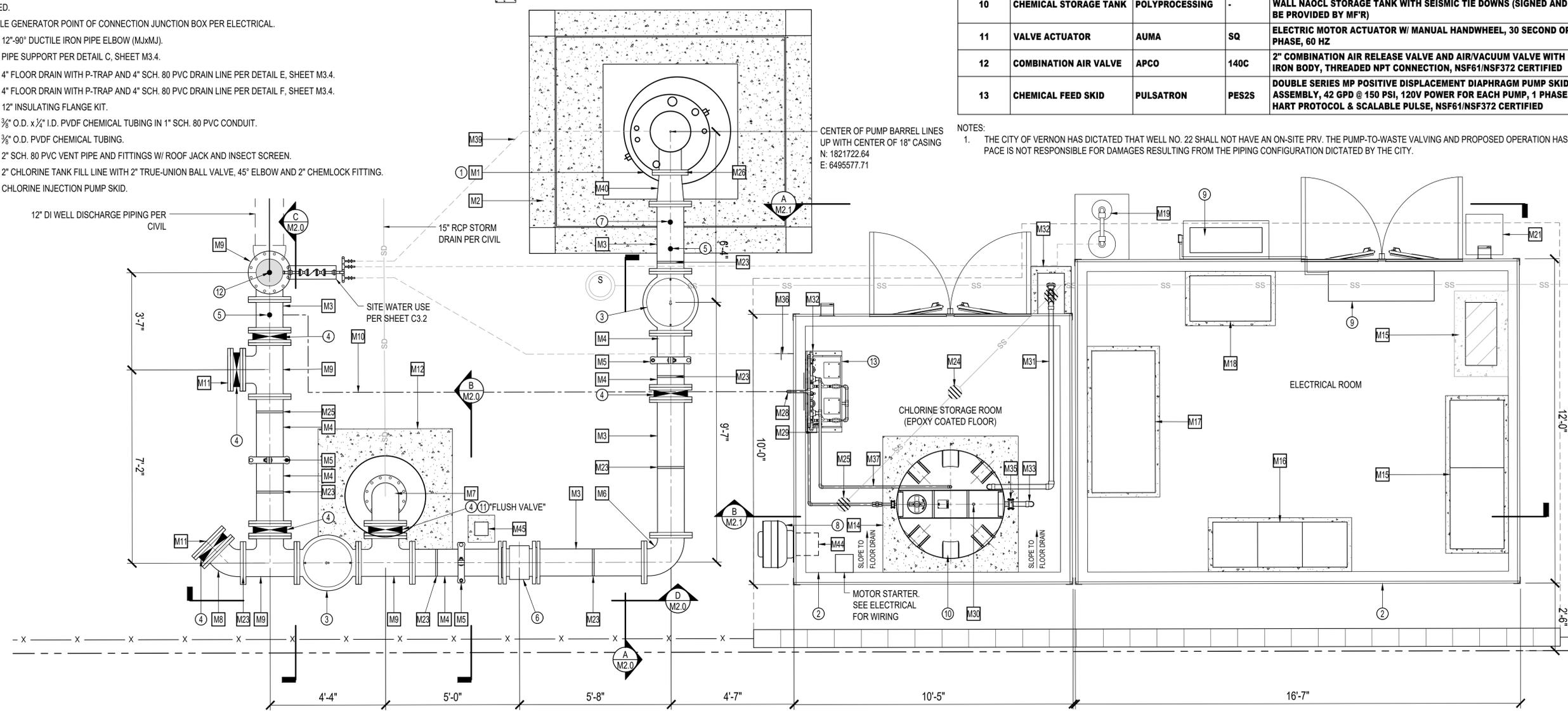
- M33 INSTALL CHLORINE INJECTION PUMP SKID.
- M34 INSTALL 2" SCH. 80 PVC OVERFLOW PIPE.
- M35 INSTALL 1" PTFE FLEXIBLE EXPANSION JOINT (PROCO STYLE 442-BD OR EQUAL).
- M36 INSTALL CHLORINE TANK HOLD DOWN CLIPS PER MFR REQUIREMENT.
- M37 INSTALL HOSE BIB PER DETAIL B, SHEET M3.5.
- M38 INSTALL 3/8" O.D. x 1/2" I.D. PVDF CHEMICAL TUBING IN 1" SCH. 80 PVC CONDUIT FOR DOSING PUMP PRESSURE RELIEF.
- M39 INSTALL 2" SCH. 80 PVC POTABLE WATER SITE USE LINE PER DETAIL A, SHEET C4.2.
- M40 INSTALL 1" CONTINUOUS-LUBE WATER FLUSH SUPPLY ASSEMBLY PER DETAIL C, SHEET M3.2.
- M41 INSTALL 12"x10" DUCTILE IRON REDUCER (FLGXFLG).
- M42 INSTALL 12" THICK CONCRETE PAD.
- M43 INSTALL 4" THICK ELECTRICAL EQUIPMENT HOUSEKEEPING PAD.
- M44 INSTALL 18"(L)x12"(W)x6"(H) CONCRETE CONTAINMENT CURB W/ DRAIN.
- M45 INSTALL 12" SQ 20 GAUGE ALUMINUM DUCTING.
- M46 INSTALL STANCHION MOUNTED REMOTE FLOW TRANSMITTER.
- M47 INSTALL 12" BLIND FLANGE WITH 2" NPT TAP.

**LEGEND:**



MECHANICAL EQUIPMENT LIST					
ITEM NO.	DESCRIPTION	MANUFACTURER	MODEL	MINIMUM SPECIFICATIONS	QTY.
1	VERTICAL TURBINE PUMP	FLOWERVE	12EMB	MULTI-STAGE VERTICAL TURBINE PUMP, 2,100 GPM @ 500' TDH, 350 HP, 480V, 3 PHASE, 60 HZ (VFD CONTROLLED), NSF61 CERTIFIED	1
2	FIBER REINFORCED POLYMER BUILDING	ORENCO	-	FRP PACKAGED BUILDING W/ TWO SEPARATE STRUCTURES CONSISTING OF A 10'(L)x10'(W)x10'(H) CHLORINE ROOM AND A 17'(L)x12'(W)x10'(H) ELECTRICAL ROOM (COMPLETE PACKAGE TO BE PROVIDED AS A DEFERRED SUBMITTAL)	1
3	CHECK VALVE	VAL-MATIC	7800	12" GLOBE STYLE CHECK VALVE WITH PRESSURE GAUGE AND VALVE POSITION INDICATOR, ASME/ANSI B16.42 CLASS 250 FLANGED CONNECTION, ASTM A536 DUCTILE IRON, EPOXY COATED, NSF61/NSF372 CERTIFIED	2
4	ISOLATION VALVE	DEZURIK	BAW	12" BUTTERFLY VALVE W/ HANDWHEEL, ASME/ANSI B16/1 CLASS 250 FLANGED CONNECTION, ASTM A126 CAST IRON BODY, EPOXY COATED, NSF61/NSF372 CERTIFIED	7
5	PRESSURE TRANSMITTER	ROSEMOUNT	3051C	GAUGE PRESSURE TRANSMITTER, -14.7 TO 300 PSI (3 PSI MINIMUM SPAN), 4-20 MA OUTPUT W/ DIGITAL HART PROTOCOL, LCD DISPLAY	2
6	FLOW METER	ROSEMOUNT	8750W	12" MAGNETIC FLOW METER WITH REMOTE TRANSMITTER, ASME/ANSI B16.5 CLASS 250 FLANGED CONNECTION, 24 VDC POWER, 4-20 MA OUTPUT W/ DIGITAL HART PROTOCOL & SCALABLE PULSE, NSF61/NSF372 CERTIFIED	1
7	HIGH VOLUME AIR RELEASE/VACUUM VALVE	APCO	146DAT	3" HIGH VOLUME AIR RELEASE/VACUUM VALVE W/ DOUBLE ACTING THROTTLING DEVICE AND WATER DIFFUSER, DUCTILE IRON BODY	1
8	EXHAUST FAN	GREENHECK	CUE	WALL MOUNTED EXHAUST FAN AND DUCTING, 200 CFM MINIMUM AT 0.2 IN WG, SPEED CONTROL, 120V, 1 PHASE, 60 HZ	1
9	A/C SYSTEM	DAIKIN	-	SPLIT A/C SYSTEM WITH OUTDOOR CONDENSER UNIT, INDOOR WALL/ROOF-MOUNTED FAN AND PIPING, 48,000 BTU/HR. RATED COOLING CAPACITY, INDOOR UNIT - 240V, 1 PHASE, 60 HZ, AND OUTDOOR UNIT - 240V, 1 PHASE, 60 HZ, SPEED CONTROL	1
10	CHEMICAL STORAGE TANK	POLYPROCESSING	-	475 GALLON, 4' Ø X 5'-2" SIDE WALL HEIGHT (6'-3 1/4" OVERALL HEIGHT) OPAQUE WHITE DOUBLE WALL NAOCL STORAGE TANK WITH SEISMIC TIE DOWNS (SIGNED AND STAMPED CALCULATIONS TO BE PROVIDED BY MFR)	1
11	VALVE ACTUATOR	AUMA	SQ	ELECTRIC MOTOR ACTUATOR W/ MANUAL HANDWHEEL, 30 SECOND OPEN/CLOSE TIME, 240V, 1 PHASE, 60 HZ	1
12	COMBINATION AIR VALVE	APCO	140C	2" COMBINATION AIR RELEASE VALVE AND AIR/VACUUM VALVE WITH BALL VALVE TAP, DUCTILE IRON BODY, THREADED NPT CONNECTION, NSF61/NSF372 CERTIFIED	2
13	CHEMICAL FEED SKID	PULSATRON	PES2S	DOUBLE SERIES MP POSITIVE DISPLACEMENT DIAPHRAGM PUMP SKID WITH DEGASSING HEAD ASSEMBLY, 42 GPD @ 150 PSI, 120V POWER FOR EACH PUMP, 1 PHASE, 60 HZ, 4-20 MA DIGITAL HART PROTOCOL & SCALABLE PULSE, NSF61/NSF372 CERTIFIED	1

NOTES:  
 1. THE CITY OF VERNON HAS DICTATED THAT WELL NO. 22 SHALL NOT HAVE AN ON-SITE PRV. THE PUMP-TO-WASTE VALVING AND PROPOSED OPERATION HAS BEEN DICTATED BY THE CITY OF VERNON. PACE IS NOT RESPONSIBLE FOR DAMAGES RESULTING FROM THE PIPING CONFIGURATION DICTATED BY THE CITY.



**WELL #22 MECHANICAL SITE PLAN**  
 SCALE: 1/2" = 1'-0"

<p>DIAL TOLL FREE 811 AT LEAST TWO DAYS BEFORE YOU DIG UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA</p>	<p>Advanced Water Engineering                  17520 Newhope Street, Suite 200   Fountain Valley, CA 92708                  P: (714) 481-7300   www.pacewater.com</p>	<p>REGISTERED PROFESSIONAL ENGINEER                  DUNCAN S. LEE                  No. C44825 Exp. 03-31-22                  CIVIL                  STATE OF CALIFORNIA</p>	NO.	DATE	REVISIONS	LINE IS 2 INCHES AT FULL SCALE (IF NOT 2" = SCALE ACCORDINGLY) DESIGN: D.S.L. DRAWN: M.S.A./J.S./R.C. CHECKED: D.S.L. DATE: SEPTEMBER 2021	UTIL. DIV. TRAFFIC ENG. SERVICES STREET DESIGN MAINTENANCE RIGHT-OF-WAY P.T. & L CONSTRUCTION	REVIEWED BY: _____ DATE: _____ R.C.E. NO. C44825 EXP. DATE: 03-31-22 REVIEWED BY: _____ DATE: _____ R.C.E. NO. _____ EXP. DATE: _____	PREPARED UNDER THE SUPERVISION OF: DUNCAN S. LEE, P.E. DATE: _____ R.C.E. NO. C44825 EXP. DATE: 03-31-22	<p>CITY OF VERNON                  PUBLIC UTILITIES DEPARTMENT</p>	<p><b>WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS</b>                  4305 SANTA FE AVENUE VERNON, CA. 90058  <b>MECHANICAL SITE PLAN</b></p>	SHEET NO. <b>M1.0</b> DWG. NO. 14 OF 60
			<p>THESE DRAWINGS ARE THE PROPERTY OF P.A.C.E AND SHALL NOT BE REPRODUCED IN ANY MANNER NOR USED FOR CONSTRUCTION UNLESS STAMPED "ISSUED FOR CONSTRUCTION"</p>									



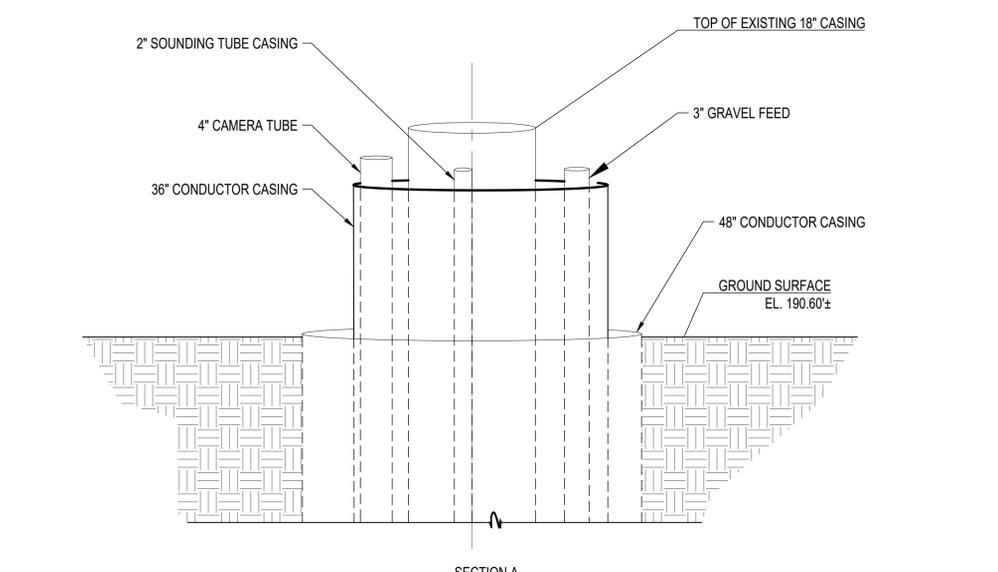
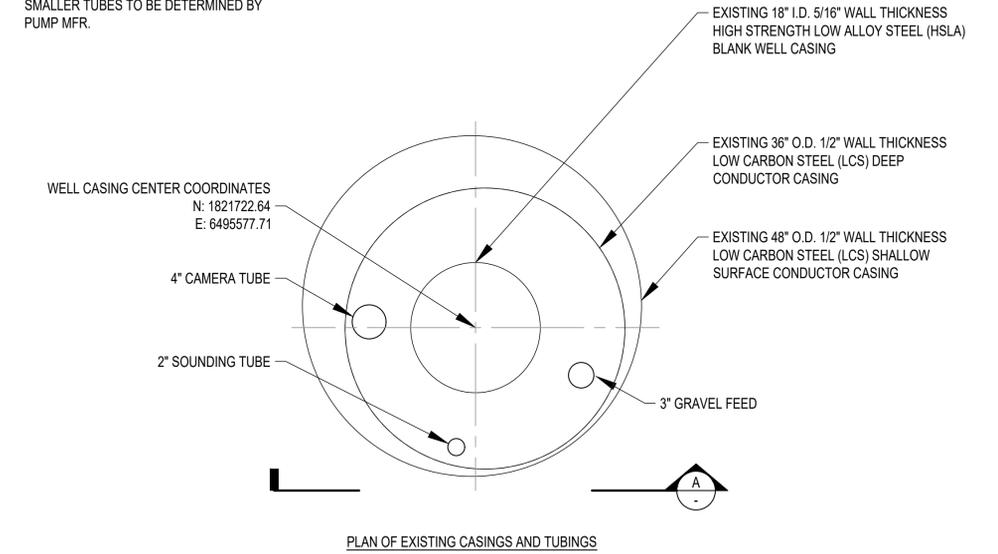




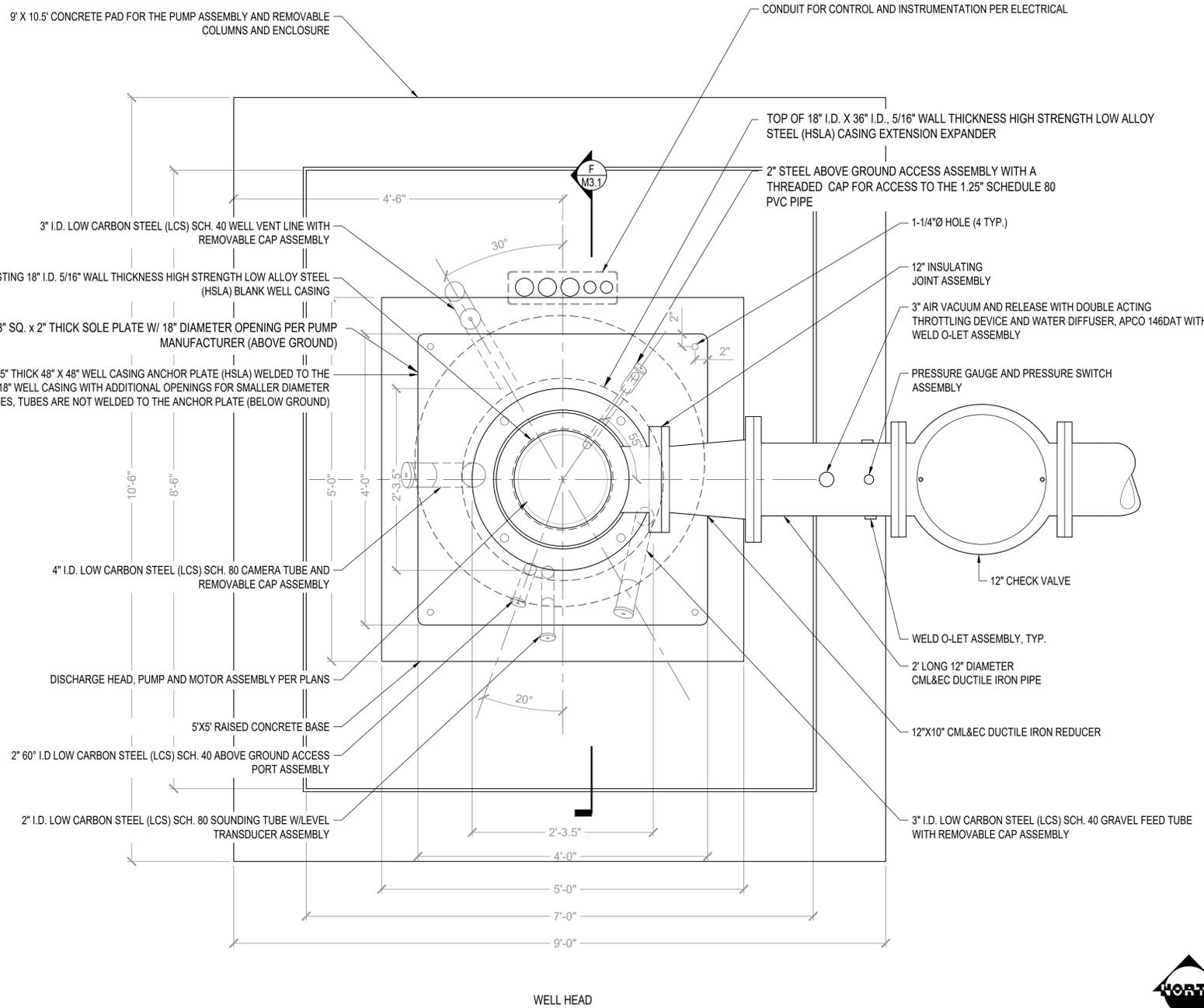
NOTES:

- MOTOR NOT SHOWN FOR CLARITY
- TO PROVIDE MINIMUM CLEARANCE BETWEEN THE PUMP CASING, THE PUMP BOWL, THE EDGE OF THE 1.5" MULTI-PURPOSE TUBE, AND TO ACCOUNT FOR THE CASING BEING SLIGHTLY OUT OF PLUMB, THE CENTER OF THE PUMP SHAFT WILL LINE UP WITH THE CENTER OF THE 18" WELL CASING NEAR THE GROUND SURFACE.
- ALL WETTED PARTS AND MATERIALS SHALL BE NSF61 CERTIFIED.

NOTE: EXACT LOCATION OF 3" AND SMALLER TUBES TO BE DETERMINED BY PUMP MFR.



PLAN / SECTION OF EXISTING CASING AND TUBING



WELL HEAD

WELL CASING CONNECTION

PLAN / SECTION OF EXISTING CASING AND TUBING

**DIG ALERT**  
DIAL TOLL FREE 811  
AT LEAST TWO DAYS BEFORE YOU DIG  
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA  
IMPORTANT NOTICE  
Section 4216/4217 of the Government Code requires a Dig Alert Identification Number be issued before "Permit to Excavate" will be valid.

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REGISTERED PROFESSIONAL ENGINEER  
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Exp. 03-31-22  
CIVIL  
STATE OF CALIFORNIA

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DRAWN: *M.S.A. / J.S. / R.C.*  
CHECKED: *D.S.L.*  
DATE: *SEPTEMBER 2021*

UTIL. DIV.	REVIEWED BY	DATE
TRAFFIC		
ENG. SERVICES		
STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L		
CONSTRUCTION		

PREPARED UNDER THE SUPERVISION OF:  
DUNCAN S. LEE, P.E.  
R.C.E. NO. C44825 EXP. DATE: 03-31-22  
REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
R.C.E. NO. \_\_\_\_\_ EXP. DATE: \_\_\_\_\_

**CITY OF VERNON**  
PUBLIC UTILITIES DEPARTMENT

**WELL NO. 22**  
**EQUIPMENT AND**  
**SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058  
**MECHANICAL DETAILS 1**

SHEET NO. **M3.0**  
DWG. NO. 18 OF 60

ISSUED FOR CONSTRUCTION

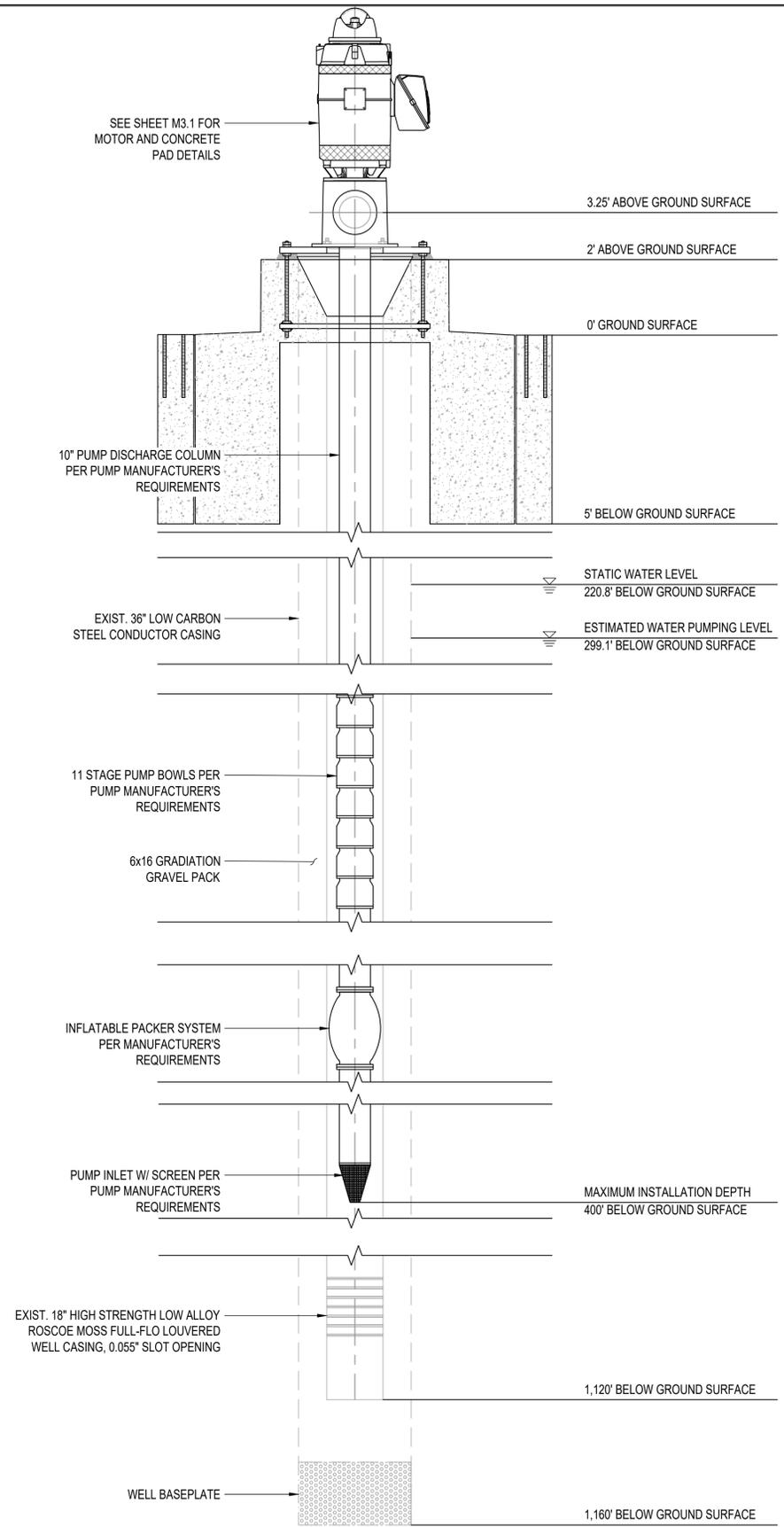
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**NOTES:**

- WELL PROFILE IS SHOWN FOR REFERENCE ONLY. CONTRACTOR SHALL INSTALL PUMP AND ASSOCIATED PIPING IN ACCORDANCE TO RICHARD C. SLADE & ASSOCIATES GROUNDWATER REPORT.

EXIST. CONDUIT DEPTH LOCATION		
ITEM	SIZE (IN)	DEPTH (BGS)
GRAVEL FEED TUBE	3"	575'
CAMERA TUBE	4"	580'-590'
SOUNDING TUBE	2"	600-601'



**WELL PROFILE**

N.T.S A

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CITY OF VERNON  
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**WELL NO. 22  
 EQUIPMENT AND  
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 4305 SANTA FE AVENUE VERNON, CA. 90058  
**MECHANICAL DETAILS 3**

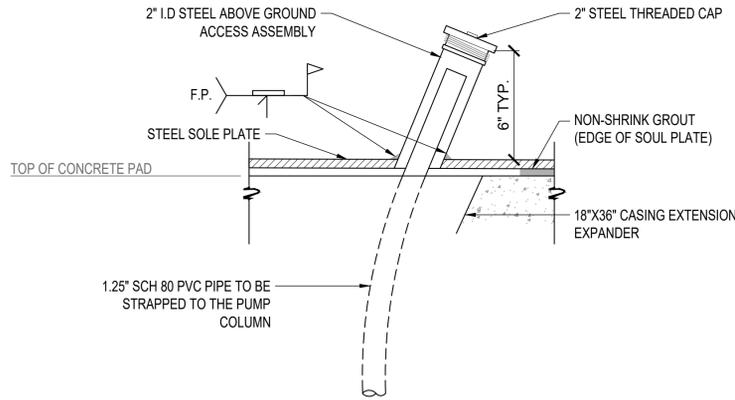
SHEET NO. **M3.2**  
 DWG. NO. 20 OF 60

ISSUED FOR CONSTRUCTION

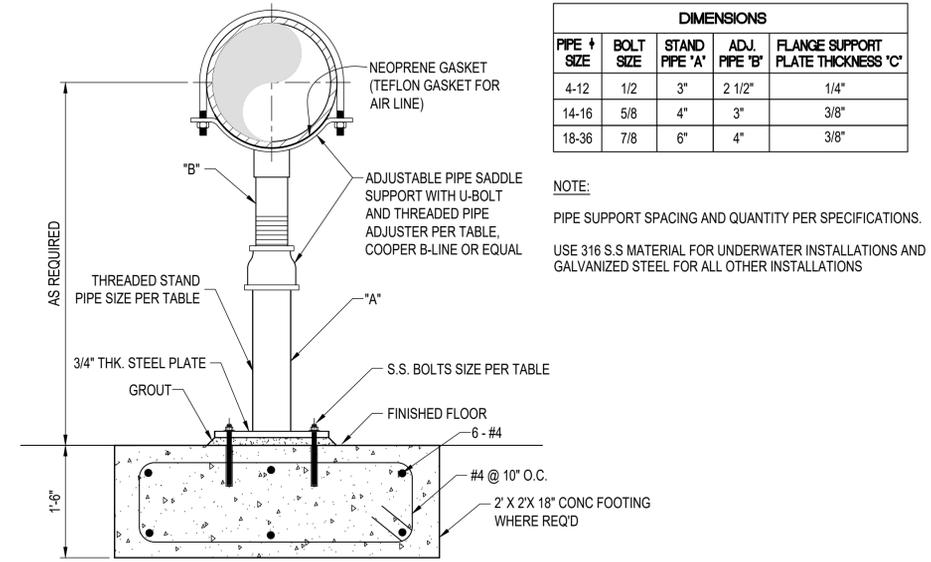
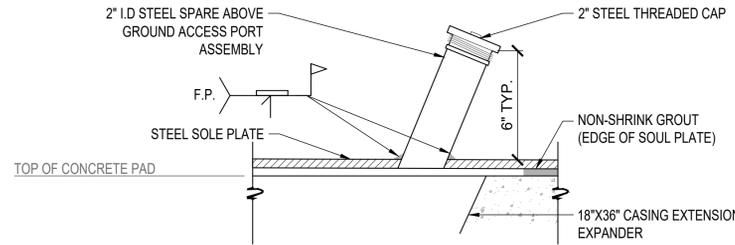
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NOTE:  
1. ASSEMBLY MATERIAL IS TO BE AS SHOWN.



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DIMENSIONS				
PIPE SIZE	BOLT SIZE	STAND PIPE 'A'	ADJ. PIPE 'B'	FLANGE SUPPORT PLATE THICKNESS 'C'
4-12	1/2	3"	2 1/2"	1/4"
14-16	5/8	4"	3"	3/8"
18-36	7/8	6"	4"	3/8"

NOTE:  
PIPE SUPPORT SPACING AND QUANTITY PER SPECIFICATIONS.  
USE 316 S.S. MATERIAL FOR UNDERWATER INSTALLATIONS AND GALVANIZED STEEL FOR ALL OTHER INSTALLATIONS

2" STEEL ABOVE GROUND ACCESS ASSEMBLY

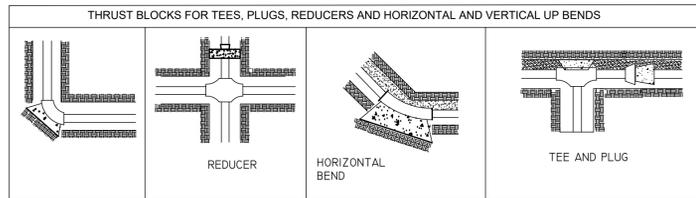
N.T.S. A

2" STEEL SPARE ABOVE GROUND ACCESS ASSEMBLY

N.T.S. B

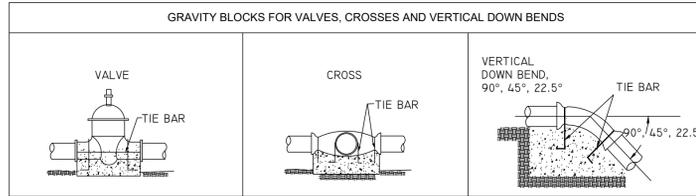
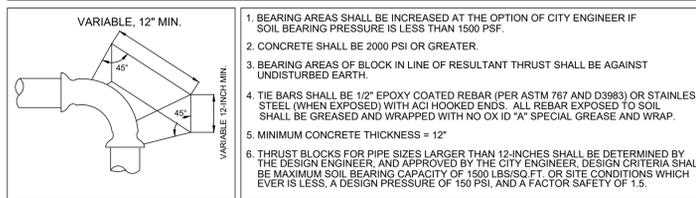
PIPE/FLANGE SUPPORT DETAIL

N.T.S. C



PIPE DIAMETER	BEARING AREA SQUARE FEET				
	TEES, PLUGS & REDUCERS	90° BEND	45° BENDS	22.5° BENDS	11.25° BENDS
4 & 6	4	6	3	2	1
8	7	10	5	3	2
12	15	21	12	6	3

GENERAL NOTES FOR ALL BLOCKS



PIPE DIAMETER	VALVES AND CROSSES	90° VERTICAL DOWN	45° VERTICAL DOWN	22.5° VERTICAL DOWN
4"	21 CUBIC FEET	21 CUBIC FEET	11 CUBIC FEET	7 CUBIC FEET
6"	1.5 CUBIC YARD	1.5 CUBIC YARD	21 CUBIC FEET	10 CUBIC FEET
8"	2.5 CUBIC YARDS	2.5 CUBIC YARDS	1.5 CUBIC YARD	19 CUBIC FEET
12"	6 CUBIC YARDS	6 CUBIC YARDS	3 CUBIC YARDS	1.5 CUBIC YARD

THRUST AND GRAVITY BLOCKS

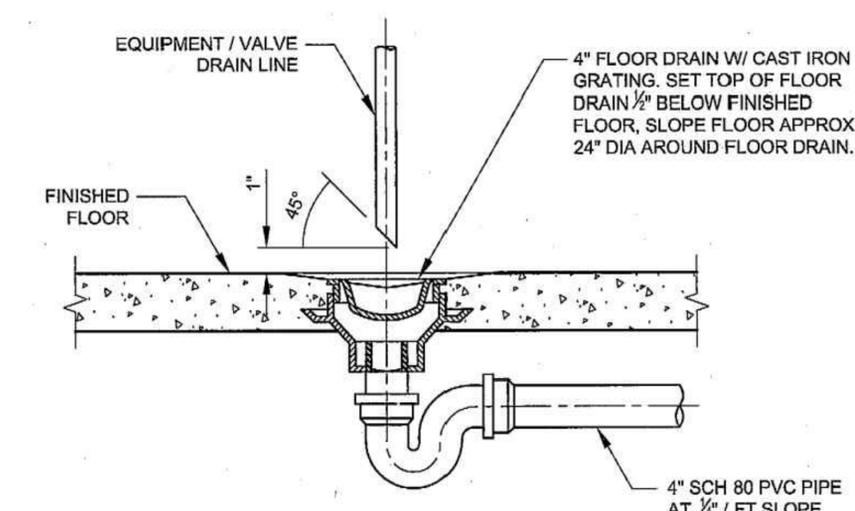
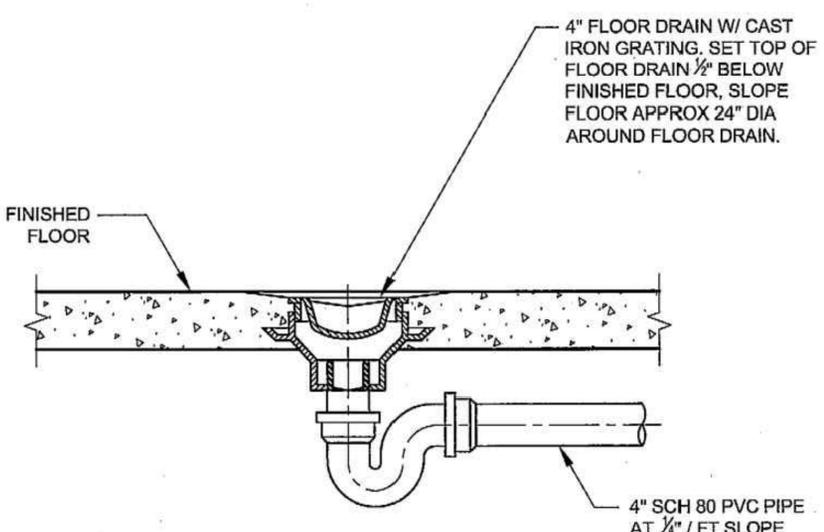
N.T.S. D

FLOOR DRAIN SECTION

N.T.S. E

EQUIPMENT DRAIN SECTION

N.T.S. F



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CITY OF VERNON  
PUBLIC UTILITIES DEPARTMENT

**WELL NO. 22**  
**EQUIPMENT AND**  
**SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058  
**MECHANICAL DETAILS 5**

SHEET NO.  
**M3.4**  
DWG. NO.  
22 OF 60

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**1 GENERAL**

STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE PROJECT SPECIFICATIONS, AND THE ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING, CIVIL, SITE DRAWINGS ETC. CONSULT THESE DRAWINGS FOR PENETRATIONS AND DETAILS NOT SHOWN ON STRUCTURAL DRAWINGS. ANY CONFLICTS BETWEEN THE DRAWINGS, SPECIFICATIONS, EXISTING CONDITIONS, ETC. SHALL BE BROUGHT TO THE ATTENTION OF THE PROFESSIONAL OF RECORD FOR RESOLUTION PRIOR TO PROCEEDING WITH AFFECTED WORK. ANY COST INCURRED FROM NEGLIGENCE OF THIS COORDINATION SHALL BE PAID FOR BY THE CONTRACTOR.

**EXISTING CONDITIONS:** ALL DIMENSIONS AND CONDITIONS MUST BE VERIFIED IN THE FIELD AGAINST EXISTING CONDITIONS. SUCH DIMENSIONS INCLUDE, BUT ARE NOT LIMITED TO, THOSE DIMENSIONS WITH "+" SHOWN AFTER THE NUMERICAL MEASUREMENT. DIMENSIONS SHOWN ON STRUCTURAL DRAWINGS ARE NOT PURPORTED TO BE COMPLETE OR CORRECT. ANY DISCREPANCIES MUST BE BROUGHT TO THE ATTENTION OF THE PROFESSIONAL OF RECORD BEFORE PROCEEDING WITH ANY AFFECTED PARTS OF WORK. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEANS TO VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING LAYOUTS OF PILES, PREPARATION OF SHOP DRAWING, ETC. THE FIRST SUBMITTAL OF SHOP DRAWINGS MUST CONTAIN CORRECT CONDITIONS AND DIMENSIONS OBTAINED FROM CONTRACTOR'S FIELD OBSERVATIONS AND MEASUREMENTS. IF CONDITIONS AND/OR DIMENSIONS VARY GREATLY FROM THOSE SHOWN, THE CONTRACTOR SHALL NOTIFY THE PROFESSIONAL OF RECORD PRIOR TO THE PREPARATION OF SHOP DRAWINGS. COORDINATE ALL OTHER WORK WITH ALL DRAWINGS. ALL WORK SHALL BE DONE IN A MANNER THAT WILL NOT DAMAGE THE EXISTING CONSTRUCTION THAT ARE TO REMAIN.

**ERECTION AND SHORING:** IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION AND SHORING PROCEDURES AND SEQUENCE TO ENSURE THE STABILITY OF THE BUILDING, SOIL EXCAVATIONS, AND ALL OTHER PROJECT COMPONENTS DURING CONSTRUCTION. THIS INCLUDES BUT NOT LIMITED TO THE ADDITION OF NECESSARY SHORING, SHEETING, & TEMPORARY BRACING. IT SHALL ALSO BE SOLELY THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ADJACENT STRUCTURES, EXISTING UTILITIES, ETC. FROM DAMAGE DURING CONSTRUCTION.

**FRAMING PENETRATIONS:** CONTRACTOR SHALL COORDINATE QUANTITY, SIZE, AND LOCATION OF ALL COMPONENTS SHOWN WITHIN THE CONTRACTOR DOCUMENTS, INCLUDING BUT NOT LIMITED TO ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND CIVIL DOCUMENTS, TO ENSURE THAT ALL SUBCONTRACTORS PERFORM THEIR RESPECTIVE SCOPE OF WORK TAKING EVERY PRECAUTION POSSIBLE TO AVOID CONFLICT WITH STRUCTURAL FRAMING SHOWN WITHIN THE CONTRACT DOCUMENTS. UNAVOIDABLE FRAMING PENETRATIONS MAY OR MAY NOT APPEAR ON THE STRUCTURAL DOCUMENTS; CONTRACTOR SHALL COORDINATE WITH ALL CONTRACT DOCUMENTS. SEE TYPICAL DETAILS FOR ADDITIONAL REINFORCING REQUIREMENTS AT FRAMING PENETRATIONS. ANY PENETRATIONS THAT ARE NOT SHOWN ON CONTRACT DRAWINGS OR APPROVED SHOP DRAWINGS SHALL NOT BE MADE IN ANY FOUNDATION MEMBERS, FLOOR SLABS, CONCRETE BEAMS, ETC. WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE STRUCTURAL ENGINEER. THE EXPENSE FOR ALL ADDITIONAL PROFESSIONAL OF RECORD COSTS, LABOR, FRAMING, REINFORCING, ETC. REQUIRED TO CORRECT AND/OR STRENGTHEN ANY AVOIDABLE FRAMING PENETRATIONS DUE TO THE LACK OF THE CONTRACTOR'S COORDINATION OF THE OTHER COMPONENTS OF CONSTRUCTION SHALL BE BORE SOLELY BY THE CONTRACTOR.

**TYPICAL DETAILS:** SECTIONS AND DETAILS LABELED AS "TYPICAL" OR "TYP." ANYWHERE ON THE CONTRACT DOCUMENTS SHALL APPLY TO ALL SITUATIONS THAT OCCUR ON THE PROJECT THAT ARE THE SAME AS OR SIMILAR TO THOSE SPECIFICALLY DETAILED. SUCH SECTIONS AND DETAILS SHALL APPLY WHETHER OR NOT THEY ARE CALLED-OUT AT EACH LOCATION. QUESTIONS REGARDING APPLICABILITY OF TYPICAL DETAILS SHALL BE DETERMINED BY THE PROFESSIONAL OF RECORD.

**SUBSTITUTIONS:** ALL SUBSTITUTIONS FOR PRODUCTS AND/OR MATERIALS OTHER THAN THOSE SPECIFIED WITHIN CONTRACT DOCUMENTS SHALL BE SUBMITTED PRIOR TO FINAL BIDS BEING SUBMITTED. FINAL BIDS SHALL BE BASED ON PRODUCTS AND/OR MATERIALS SHOWN WITHIN CONTRACT DOCUMENTS OR APPROVED PRIOR TO FINAL BID SUBMISSION. ANY SUBSTITUTIONS SUBMITTED FOR APPROVAL AFTER FINAL BIDS HAVE BEEN SUBMITTED SHALL BE REVIEWED FOR EQUIVALENCE BY A CALIFORNIA LICENSED ENGINEER HIRED AND PAID FOR BY THE CONTRACTOR, A LETTER STAMPED AND SIGNED BY THE ENGINEER VERIFYING EQUIVALENCE SHALL BE SUBMITTED FOR RECORD, AND ALL POST-BID APPROVED SUBSTITUTIONS SHALL RESULT IN A CREDIT TO THE OWNER.

**DISCREPANCIES:** ALL DISCREPANCIES, CONFLICTS, AND/OR AMBIGUITIES WITHIN THE CONTRACT DOCUMENTS, WHETHER WITHIN THE DRAWINGS OR SPECIFICATIONS, OR BETWEEN THE DRAWINGS AND SPECIFICATIONS, SHALL BE BROUGHT TO THE ATTENTION OF THE PROFESSIONAL OF RECORD FOR CLARIFICATION PRIOR TO SUBMITTING BIDS. IF CLARIFICATION IS NOT GIVEN ON DISCREPANCIES, CONFLICTS, AND/OR AMBIGUITIES WITHIN THE CONTRACT DOCUMENTS PRIOR TO SUBMITTING BIDS, INTERPRETATION WILL BE GIVEN DURING THE PROJECT SOLELY BY THE PROFESSIONAL OF RECORD. ANY COST INCURRED FROM INTERPRETATIONS OF DISCREPANCIES, CONFLICTS, AND/OR AMBIGUITIES SHALL BE BORE SOLELY BY THE CONTRACTOR.

**DAMAGE TO EXISTING CONSTRUCTION TO REMAIN:** ALL WORK SHALL BE DONE IN A MANNER THAT WILL NOT DAMAGE ANY EXISTING CONSTRUCTION THAT IS TO REMAIN. ALL EXPENSES INCURRED FOR CORRECTIVE WORK TO REPAIR EXISTING CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROFESSIONAL OF RECORD SHALL BE BORE SOLELY BY THE CONTRACTOR.

**2 FOUNDATION**

THE FOUNDATION DESIGN IS BASED ON THE RECOMMENDATION OF THE GEOTECHNICAL REPORT TITLED "PROPOSED STRUCTURES AND SITE IMPROVEMENTS FOR WELL NO. 22", DATED JUNE 1, 2020 (CONVERSE PROJECT NO. 19-31-328-01) AND "ADDENDUM GEOTECHNICAL RECOMMENDATIONS", DATED AUGUST 18, 2020. THE GEOTECHNICAL CONSULTANT FOR THIS PROJECT IS CONVERSE CONSULTANT LOCATED AT THE ADDRESS OF 3176 PULLMAN STREET, SUITE 108, COSTA MESA, CA 92626 AND MAY BE REACHED BY PHONE NUMBER OF (714) 444 9660. THE FOUNDATIONS FOR THE PROJECT SHALL CONSIST OF SPREAD FOOTINGS AND CAST-IN-DRILLED-HOLES (CIDH) PILE FOUNDATIONS. THE RECOMMENDATIONS OF THE REPORT SHALL BE FOLLOWED.

**GENERAL SITE CLEARING**  
AREAS TO BE DEVELOPED SHALL BE CLEARED OF ALL SURFACE AND SUBSURFACE DELETERIOUS MATERIALS, INCLUDING DEBRIS, SHRUBS, ASSOCIATED ROOTS, ETC. CLEAN AND BACK FILL EXCAVATIONS EXTENDING BELOW THE PLANNED FINISHED SITE GRADES WITH SUITABLE MATERIAL COMPACTED TO THE RECOMMENDATIONS GIVEN BELOW. FOLLOWING CLEARING, STRIP THE SITE TO REMOVE SURFACE ORGANIC MATERIALS. STRIP ORGANICS FROM THE GROUND SURFACE TO A DEPTH OF AT LEAST 2 TO 3 INCHES BELOW THE SURFACE. REMOVE STRIPPINGS FROM THE SITE OR USE THEM IN LANDSCAPE FILL, IF APPROVED.

**OVER EXCAVATION AND COMPACTION**  
THE PROPOSED SHALLOW FOUNDATIONS SHALL REST ON EXISTING SOIL THAT IS PROPERLY PREPARED AS RECOMMENDED BY THE GEOTECHNICAL REPORT. THE EXISTING SOIL SHALL BE OVER EXCAVATED TO A MINIMUM DEPTH OF 3 FEET BELOW THE BOTTOM OF THE FOUNDATIONS OR 6 FEET BELOW THE LOWEST ADJACENT GRADE AND EXTEND LATERALLY AT LEAST 5 FEET BEYOND THE FOOT PRINTS OF THE FOUNDATIONS. THE OVER EXCAVATION SHALL BE DEEPEEN AS NEEDED TO REMOVE ANY EXISTING FILL AND ANY VERY SOFT OR SATURATED SOIL. THE BOTTOM OF THE FOUNDATIONS SHALL BE SCARIFIED TO A DEPTH OF 12 INCHES AND COMPACTED TO AT LEAST 90 PERCENT OF LABORATORY MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557 TEST METHOD. THE SOIL SHALL BE MOISTURE CONDITIONED TO WITHIN 3 PERCENT OF OPTIMUM MOISTURE CONTENT FOR COARSE-GRAINED SOILS AND 0-2 PERCENT ABOVE OPTIMUM MOISTURE CONTENT FOR FINE-GRAINED SOILS. ALL FILL PLACED AT THE SITE SHALL BE COMPACTED TO AT LEAST 90 PERCENT OF THE LABORATORY MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557 TEST METHOD.

**SHALLOW FOUNDATIONS**  
1. THE SHALLOW FOUNDATIONS ARE DESIGNED BASED ON AN ALLOWABLE NET VERTICAL BEARING PRESSURE OF 2,500 PSF, WITH A 300 PSF INCREASE FOR ADDITIONAL FOOT OF WIDTH TO A MAXIMUM VALUE OF 3,500 PSF.  
2. THE BOTTOM OF THE FOOTING SHALL BE A MINIMUM OF 18 INCHES BELOW THE LOWEST ADJACENT GRADE.  
3. A COEFFICIENT OF FRICTION OF 0.35 CAN BE UTILIZED FOR LATERAL SLIDING RESISTANCE.  
4. A PASSIVE PRESSURE OF 250 PCF CAN BE UTILIZED FOR STRUCTURES FOUNDED ON ENGINEERED FILL. THE PASSIVE PRESSURE CAN BE INCREASED BY 250 PSF PER ADDITIONAL FOOT OF DEPTH TO A MAXIMUM VALUE OF 2,000 PSF. WHEN PASSIVE PRESSURE AND FRICTION ARE COMBINED FOR LATERAL RESISTANCE, THE PASSIVE PRESSURE NEEDS TO BE REDUCED BY ONE-HALF.  
5. A THIRD INCREASE OF THE BEARING CAPACITY AND PASSIVE RESISTANCE IS ALLOWED FOR WIND AND SEISMIC LOADS.

**CIDH PILES**  
PILES SHALL BE INSTALLED PER THE GEOTECHNICAL REPORT. THE PILE CAPACITIES BASED ON SKIN FRICTION FOR 3 DIAMETER CENTER TO CENTER SPACING ARE AS FOLLOWS:

ALLOWABLE AXIAL CIDH PILE CAPCITIES (24-IN DIAMETER)		
PILE DEPTH (FEET)	COMPRESSION (KIPS)	TENSION (KIPS)
10	4.96	4.83
15	14.65	11.37
20	28.24	20.14

ALLOWABLE LATERAL PILE CAPACITY (24-IN DIAMETER)				
PILE HEAD CONDITION	PILE HEAD DEFLECTION (INCHES)	MAXIMUM SHEAR (KIPS)	MAX. BENDING MOMENT (KIP-FT)	DEPTH TO MAX. BENDING MOMENT (FT, BELOW PILE HEAD)
FREE	1/2	57.5	249.2	7.4

THE CAPACITIES CAN BE INCREASED BY A THIRD FOR WIND AND SEISMIC LOADS.

**INSPECTION, TESTING & QUALITY ASSURANCE**  
DURING GRADING ACTIVITIES, THE CONTRACTOR SHALL CONSULT WITH THE PROJECT GEOTECHNICAL ENGINEERING FIRM FOR ADDITIONAL RECOMMENDATIONS TO ADDRESS SITE-SPECIFIC CONDITIONS AND IF UNSATISFACTORY SOIL CONDITIONS ARE ENCOUNTERED.

**3 CONCRETE**

ALL CAST-IN-PLACE CONCRETE, FORMWORK, AND CONCRETE REINFORCING SHALL BE PERFORMED IN CONFORMANCE WITH SPECIFICATION 03300.

ALL STRUCTURAL CONCRETE FOR BUILDING FOUNDATIONS, CIDH PILES, FOOTINGS, WALLS, BEAMS, SLABS, ETC. SHALL BE A READY-MIX CONCRETE OF NORMAL WEIGHT AGGREGATES ABLE TO ACHIEVE A 28 DAY STRENGTH OF 4,000 PSI WITH A WATER-TO-CEMENT RATIO NOT EXCEEDING 0.45. ALL STRUCTURAL CONCRETE FOR TANK FOUNDATIONS, FOOTINGS, WALLS, BEAMS, SLABS, ETC. SHALL BE A READY-MIX CONCRETE OF NORMAL WEIGHT AGGREGATES ABLE TO ACHIEVE A 28 DAY STRENGTH OF 4,500 PSI WITH A WATER-TO-CEMENT RATIO NOT EXCEEDING 0.42.

THE MIX DESIGN SHALL BE SUBMITTED TO A RECOGNIZED TESTING LABORATORY FOR APPROVAL. PROPOSED MIX DESIGN SHALL BE UNIQUELY IDENTIFIED BY A MIX NUMBER OR OTHER POSITIVE MEANS. MIX DESIGN AND VERIFYING TEST REPORTS, PERFORMED IN ACCORDANCE WITH ACI 214 & ACI 318 OF THE LATEST REVISIONS, SHALL BE SUBMITTED AT LEAST 5 DAYS PRIOR TO USE. CALCIUM CHLORIDE SHALL NOT BE UTILIZED, OTHER ADMIXTURES MAY ONLY BE UTILIZED WITH THE APPROVAL OF THE STRUCTURAL ENGINEER.

ALL CONCRETE WORK SHALL COMPLY WITH ALL THE REQUIREMENTS OF ASTM STANDARD C94 FOR THE MEASURING, MIXING, TRANSPORTING, ETC. CONCRETE TICKETS SHALL BE TIME STAMPED WHEN THE CONCRETE IS BATCHED. THE MAXIMUM TIME ALLOWED FROM THE TIME MIXING WATER IS ADDED TO THE TIME THE CONCRETE IS DEPOSITED, SHALL NOT EXCEED ONE AND ONE HALF HOURS. IT SHALL BE THE DUTY OF THE TESTING LAB TO NOTIFY THE OWNER'S REPRESENTATIVE AND THE CONTRACTOR OF ANY NONCOMPLIANCE WITH THE ABOVE.

NO HORIZONTAL JOINTS SHALL BE PERMITTED. VERTICAL CONSTRUCTION JOINTS IN FLOORS SHALL BE LOCATED WITHIN THE MIDDLE THIRD OF SPANS OF SLABS, BEAMS, AND GIRDERS. JOINTS IN GIRDERS SHALL BE OFFSET A MINIMUM DISTANCE OF TWO TIMES THE WIDTH OF INTERSECTING BEAMS. A POUR SEQUENCE SHALL BE SUBMITTED FOR REVIEW. ALL VERTICAL CONCRETE SURFACES SHOWN ON THE CONTRACT DOCUMENTS SHALL BE BOARD FORMED.

DESIGN, ERECTION, AND REMOVAL OF ALL FORMWORK, SHALL MEET THE REQUIREMENTS SET FORTH IN ACI STANDARDS 301 AND 347.

**VAPOR BARRIER:**  
PROVIDE A 15 MIL VAPOR RETARDER, CONFORMING TO ASTM E1745 CLASS A, ON TOP OF FILL UNDER ALL SLABS AND BEAMS. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. OMIT AT ALL PENETRATIONS AND SEAL AT PENETRATIONS IN ACCORDANCE WITH ALL MANUFACTURER'S REQUIREMENTS. VAPOR BARRIER SHALL BE INSTALLED IN ACCORDANCE WITH ALL MANUFACTURER'S REQUIREMENTS.-TYPICAL.

**REINFORCEMENT DETAILING:**  
DETAILING OF CONCRETE REINFORCEMENT SHALL BE PERFORMED IN ACCORDANCE WITH ACI 315 STANDARD, OF THE LATEST REVISION. A STANDARD HOOK SHALL BE PROVIDED AT THE TERMINATION OF ALL BEAM TOP REINFORCING BARS AND WHERE A HOOK IS SHOWN ON THE DRAWINGS, BUT A SPECIFIC DIMENSION IS NOT GIVEN. ROTATE HOOKED END OF BARS AS NEEDED TO FIT WITHIN THE LIMITATION OF THE CONCRETE DIMENSIONS AND REQUIRED CLEARANCES; DO NOT CUT LENGTH OF HOOK. DETAILING AND PLACEMENT OF ALL REINFORCEMENT SHALL BE BASED ON A MEMBER SPAN OF CENTER-OF-SUPPORT TO CENTER-OF-SUPPORT; THIS INCLUDES THE CENTER OF FOOTINGS AS THE CENTER-OF-SUPPORT. CONTINUOUS TOP BARS SHALL BE HOOKED AT NON-CONTINUOUS ENDS AND LAPPED 30 BAR DIAMETERS AT MID-SPAN. BOTTOM BARS SHALL LAP 9" AT CENTER OF INTERIOR SUPPORTS AND EXTEND 5" PAST CENTER-OF-SUPPORT AT NON-CONTINUOUS SUPPORTS. AT TEMPERATURE REINFORCEMENT, INTERMEDIATE HORIZONTAL BARS IN WALLS AND BEAMS, AND WHERE CONTINUOUS (CONT.) REINFORCEMENT IS CALLED FOR, A FULL TENSION LAP SPLICE SHALL BE PROVIDED AT SPLICES;

SEE TABLE BELOW FOR REQUIRED LAP LENGTH. CORNER BARS WITH FULL TENSION LAPS, MATCHING CONTINUOUS BARS SIZE AND SPACING SHALL BE PROVIDED FOR ALL LONGITUDINAL BEAM REINFORCEMENT AND FOR ALL HORIZONTAL WALL REINFORCEMENT. ALL BEAM STIRRUPS AND COLUMN TIES SHALL CONFORM TO SEISMIC DETAILING REQUIREMENTS. MINIMUM REQUIRED DEVELOPMENT, LAP SPLICE, HOOK LENGTHS, & HOOK EMBEDMENT ARE THE FOLLOWING TABLE. ALL REINFORCEMENT LAP SPLICES SHALL BE FULL CLASS B LAP SPLICE LENGTH UNLESS SPECIFICALLY ALLOWED OTHERWISE-TYPICAL. DEVELOPMENT LENGTH AND LAP SPLICES FOR ALL VERTICAL REINFORCEMENT IN WALLS SHALL BE 1.25 TIMES THE APPROPRIATE LENGTHS GIVEN IN THE TABLE BELOW.

BAR SIZE	DEVELOPMENT LENGTH (l <sub>d</sub> )		HOOK EMBED (l <sub>eh</sub> )	LAP SPLICE LENGTH (l <sub>st</sub> )				HOOK LENGTH	
	TOP BARS	OTHER BARS		TOP BARS	OTHER BARS	TOP BARS	OTHER BARS	STD 90° HOOK	180° HOOK
	#3	1'-7"	1'-3"	8"	1'-7"	1'-3"	2'-0"	1'-7"	6"
#4	2'-1"	1'-7"	10"	2'-1"	1'-7"	2'-8"	2'-1"	8"	6"
#5	2'-7"	2'-0"	1'-0"	2'-7"	2'-0"	3'-4"	2'-7"	10"	7"
#6	3'-1"	2'-5"	1'-3"	3'-1"	2'-5"	4'-0"	3'-1"	1'-0"	8"
#7	4'-6"	3'-6"	1'-5"	4'-6"	3'-6"	5'-10"	4'-6"	1'-2"	10"
#8	5'-2"	4'-0"	1'-7"	5'-2"	4'-0"	6'-8"	5'-2"	1'-4"	11"
#9	5'-10"	4'-6"	1'-10"	5'-10"	4'-6"	7'-7"	5'-10"	1'-7"	1'-3"

**3 CONCRETE - CONTINUED**

**REINFORCEMENT PLACEMENT & CLEARANCES:**  
ALL REINFORCEMENT SHALL BE PLACED WITHIN THE MORE STRINGENT TOLERANCES SET FORTH IN ACI 318-14, ACI 350-06, ACI 117-10, AND THE PROJECT SPECIFICATIONS. UNLESS SPECIFICALLY INDICATED OTHERWISE ON THE SECTIONS AND/OR DETAILS, REINFORCEMENT SHALL BE PLACED SUCH THAT THERE IS MINIMUM A CLEAR SPACING BETWEEN BARS SHALL BE THE GREATER OF 1 1/2 IN., 1 1/2 x d<sub>b</sub> (BAR DIAMETER), OR 1/2 TIMES THE MAXIMUM SIZE OF AGGREGATE. ADDITIONALLY, THE FOLLOWING CONCRETE COVER CLEARANCES SHALL BE PROVIDED THROUGHOUT THE PROJECT:

SLAB:	1 1/2" CLEAR BOTTOM; 1 1/2" CLEAR TOP EXPOSED TO EARTH OR WEATHER 3/4" CLEAR TOP ALL OTHER.
BEAMS:	3" CLEAR TO STIRRUPS BOTTOM EARTH FORMED, 3" CLEAR TO STIRRUPS SIDES EARTH FORMED, 1 1/2" CLEAR TO STIRRUPS TOP, 1 1/2" CLEAR TO STIRRUPS BOTTOM & SIDES BOARD FORMED, 2" CLEAR TO LONGITUDINAL REINFORCEMENT BOTTOM & SIDES BOARD FORMED.
FOOTINGS:	3" CLEAR TO STIRRUPS BOTTOM EARTH FORMED, 3" CLEAR TO STIRRUPS SIDES EARTH FORMED, 2" CLEAR TO STIRRUPS TOP, 2" CLEAR TO STIRRUPS BOTTOM & SIDES BOARD FORMED, 2" CLEAR TO LONGITUDINAL REINFORCEMENT BOTTOM & SIDES BOARD FORMED.
COLUMNS:	1 1/2" CLEAR, TYPICAL.
WALLS:	2" CLEAR EACH SIDE ALL OTHER, TYPICAL.

REINFORCING STEEL SHALL BE OF ASTM A615 GRADE 60 DEFORMED BARS, FREE OF OIL, SCALE, AND RUST. REINFORCEMENT SHALL BE FABRICATED AND PLACED IN ACCORDANCE WITH THE TYPICAL BENDING DIAGRAM & PLACING DETAILS OF ACI, STANDARDS & SPECIFICATIONS OF THE LATEST REVISIONS.

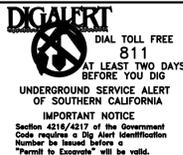
REINFORCING SHALL BE SECURED IN PLACE BY THE USE OF METAL TIES AND SUPPORTED BY METAL, BOLSTERS, CHAIRS, SPACERS, AND OTHER DEVICES. SUPPORTS FOR ELEVATED SLABS SHALL HAVE LEGS PROTECTED WITH PLASTIC.

ALL MECHANICAL SPLICES SHALL COMPLY WITH ACI 318-14 REQUIREMENTS. BAR ENDS MUST BE TAPER THREADED WITH COUPLER MANUFACTURER'S BAR THREADED TO ENSURE PROPER TAPER AND THREAD ENGAGEMENT. BARS SHALL BE TIGHTENED TO THE MANUFACTURER'S RECOMMENDED WRENCH SETTING. MECHANICAL THREADED BAR SPLICES SHALL BE AS MANUFACTURED BY ERICO CONCRETE PRODUCTS OR AS APPROVED BY THE STRUCTURAL ENGINEER.

**CONDUITS, SLEEVES, AND PIPES EMBEDDED IN CONCRETE:**  
ALL PENETRATIONS NOT SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE APPROVED BY THE ARCHITECT. SEE SPECIFICATIONS FOR REQUIREMENTS OF CONDUITS, SLEEVES, AND PIPES EMBEDDED IN CONCRETE. THE CONTRACTOR MUST COORDINATE ALL WORK TO FOLLOW THE ABOVE GUIDELINES AT HIS EXPENSE.

**TESTING & QUALITY ASSURANCE:**  
SEE SPECIFICATIONS FOR TESTING AND INSPECTION REQUIREMENTS. THE TESTING LABORATORY SHALL SUBMIT DOCUMENTATION OF HAVING MET THE REQUIREMENTS OF ASTM E329, OF THE LATEST REVISION.

Dimension 1: 1, Title = 1, P13046 = 1, AC10 Ver = 23.0a (LMS Tech), Version = 1, Xref: 12325-30224 - 5.0mg



NO.	DATE	REVISIONS

LINE IS 2 INCHES AT FULL SCALE (IF NOT 2" = SCALE ACCORDINGLY)

UTIL. DIV. TRAFFIC ENG. SERVICES STREET DESIGN MAINTENANCE RIGHT-OF-WAY P.T. & L CONSTRUCTION

DESIGN: S.B.S	CHECKED: S.B.S	DATE: SEPTEMBER 2021
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REVIEWED BY:	DATE:
SANTOSH SHAHI	DATE: 6/30/2023
R.C.E. NO. S5149	EXP. DATE: 6/30/2023
REVIEWED BY:	DATE:
R.C.E. NO. _____	EXP. DATE: _____



**WELL NO. 22  
EQUIPMENT AND  
SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058

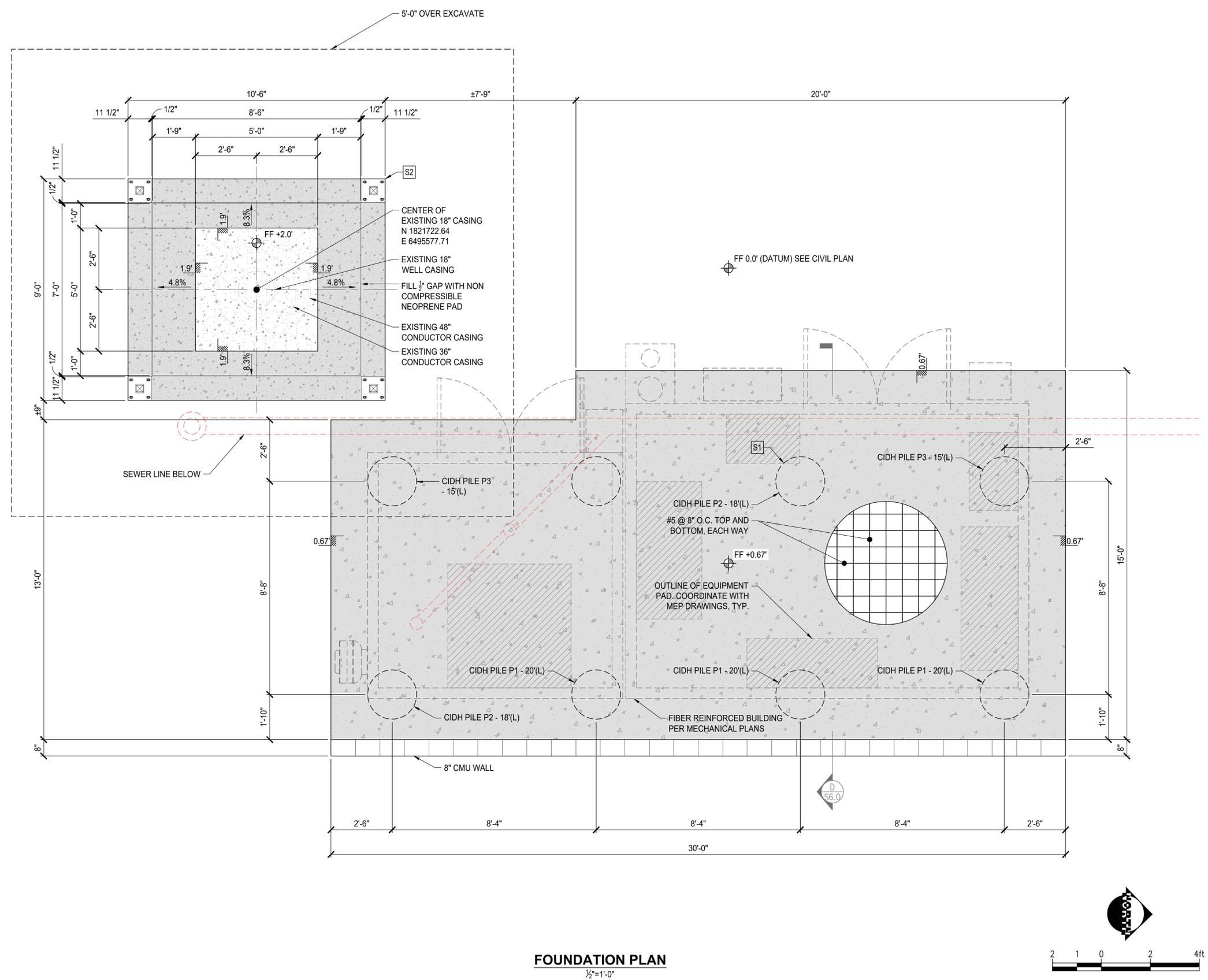
**STRUCTURAL NOTES**

SHEET NO. **S1.0**  
DWG. NO. **24 OF 60**

ISSUED FOR CONSTRUCTION  
WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS  
#16204engprojg4201 well 22/beam2626-S1 (STRUCTURAL NOTES) by rshah on 09/22/21 at 10:45:59 AM







**LEGENDS:**

INDICATES AREA OF 12" CONCRETE SLAB WITH MICROSYNTHETIC FIBERS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. SEE SECTIONS AND DETAILS FOR ADDITIONAL REINFORCEMENT.

INDICATES 8" FULLY GROUTED CMU WALL. SEE S6.0 FOR REINFORCING DETAILS.

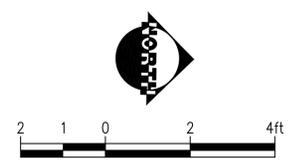
SLOPE

INDICATES SLOPING SURFACE WITH THE ARROW POINTING DOWN SLOPE. CONTRACTOR SHALL COORDINATE / VERIFY DIMENSIONS, EXTENT, AND DEGREE OF SLOPING SURFACE WITH ARCHITECTURAL DOCUMENTS. SEE ELEVATIONS INDICATED ON PLAN FOR DEGREE OF SLOPE. UNLESS OTHERWISE INDICATED WITHIN THE CONTRACT DOCUMENTS, SLOPING SURFACES SHALL TRANSITION UNIFORMLY. DEPTHS OF ALL CONCRETE MEMBERS SHALL BE MAINTAINED ACROSS ENTIRE SLOPED AREA. ALL REINFORCING STEEL, INCLUDING SLAB AND BEAM REINFORCING, SHALL BE BENT AS NEEDED TO MAINTAIN SPECIFIED CONCRETE COVER AND TO AVOID CONFLICT WITH CONCRETE SURFACES.

- FOUNDATION NOTES (UNLESS NOTED OTHERWISE):**
- TOP OF CONCRETE SLAB AT EL. VARIES - SEE CIVIL PLAN FOR AREAS OF SLOPING CONCRETE.
  - FLOOR PENETRATIONS: CONTRACTOR SHALL COORDINATE THE NUMBER, LOCATION, AND SIZE OF ALL FLOOR PENETRATIONS, INCLUDING BUT NOT LIMITED TO FLOOR DRAINS, WITH MEP DRAWINGS.
  - ELECTRICAL STUB-UPS TO BE SECURED IN PLACE PRIOR TO CONCRETE POUR.

- CONSTRUCTION NOTES:**
- S1 2"Ø CIDH PILE, 8 TYP. PER DETAIL 'A' ON SHEET S4.0
- S2 WELL HEAD STRUCTURE PER DETAIL 'F' ON SHEET S4.0

**FOUNDATION PLAN**  
1/2"=1'-0"



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D:\Projects\11\_Traffic - F:\S:\Shah - F:\CAD\Ver - 23.0a (LMS Tech)\Vernon - 1  
 Xrefs: B220 - Foundation and Framing.dwg; B200 - Construction Notes.dwg; B205-30-24.rvt; S.dwg

**DIAL ALERT**  
DIAL TOLL FREE 811  
AT LEAST TWO DAYS BEFORE YOU DIG  
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA  
IMPORTANT NOTICE  
Section 4216/4217 of the Government Code requires a Dig Alert Identification Number be issued before "Permit to Excavate" will be valid.

**PACE**  
Advanced Water Engineering  
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REGISTERED PROFESSIONAL ENGINEER  
SANTOSH B. SHAH  
S5149  
Exp. 6/30/2023

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UTIL. DIV.  
TRAFFIC  
ENG. SERVICES  
STREET DESIGN  
MAINTENANCE  
RIGHT-OF-WAY  
P.T. & L  
CONSTRUCTION

REVIEWED BY	DATE

PREPARED UNDER THE SUPERVISION OF:  
SANTOSH SHAHI  
R.C.E. NO. S5149 EXP. DATE: 6/30/2023  
REVIEWED BY:  
DATE:  
R.C.E. NO. EXP. DATE:



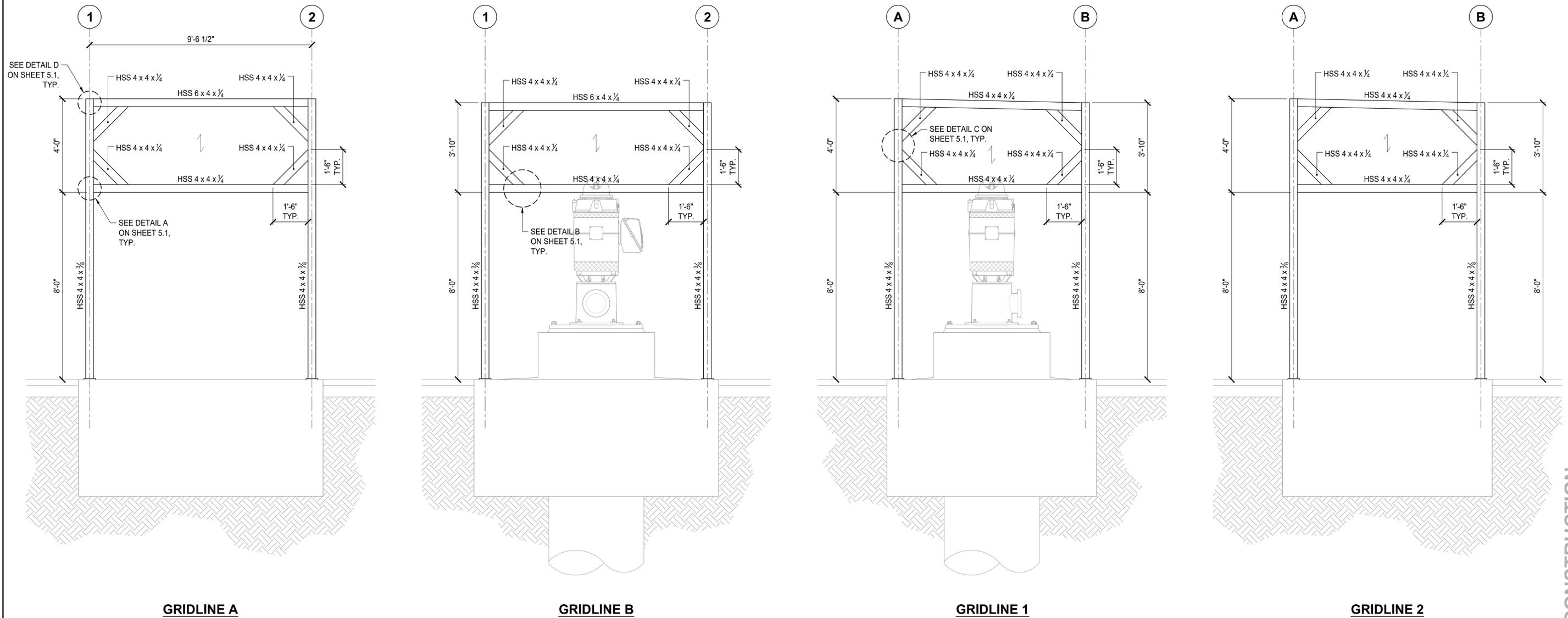
CITY OF VERNON  
PUBLIC UTILITIES DEPARTMENT

**WELL NO. 22  
EQUIPMENT AND  
SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058

**FOUNDATION PLAN**

SHEET NO. **S2.0**  
DWG. NO. **27 OF 60**





GRIDLINE A

GRIDLINE B

GRIDLINE 1

GRIDLINE 2

ISSUED FOR CONSTRUCTION

**FRAMING SECTIONS**

**DIAL ALERT**  
 DIAL TOLL FREE  
 811  
 AT LEAST TWO DAYS  
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UTIL. DIV.  
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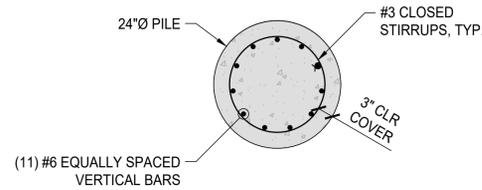
CITY OF VERNON  
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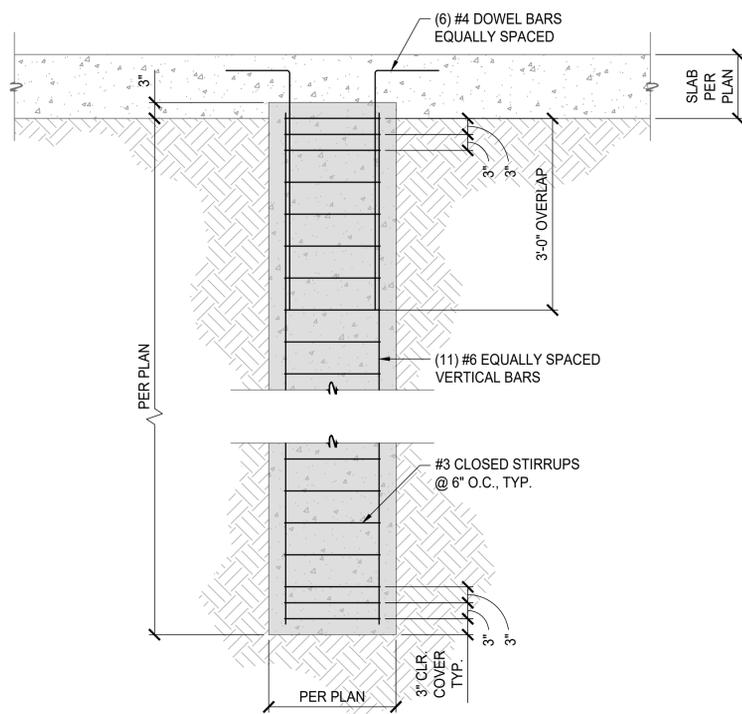
**ELEVATIONS**

SHEET NO.
S3.0
DWG. NO.
29 OF 60

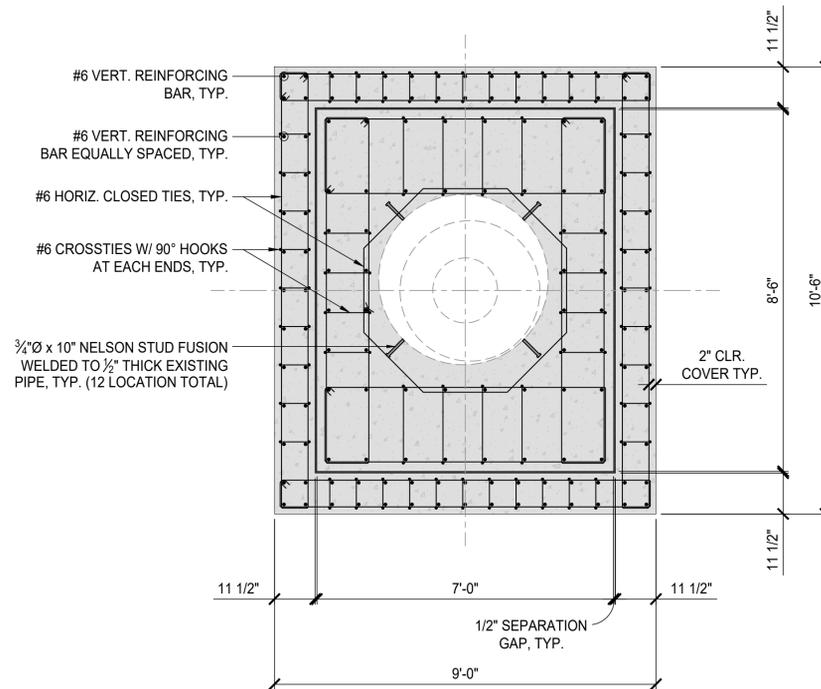
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 Xref: E:\2022 - Structural Sections.dwg; B06-230424v - S.dwg



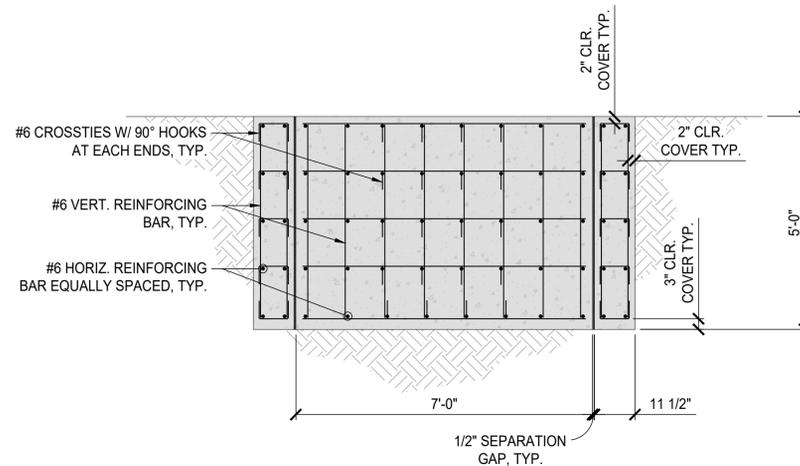
PLAN



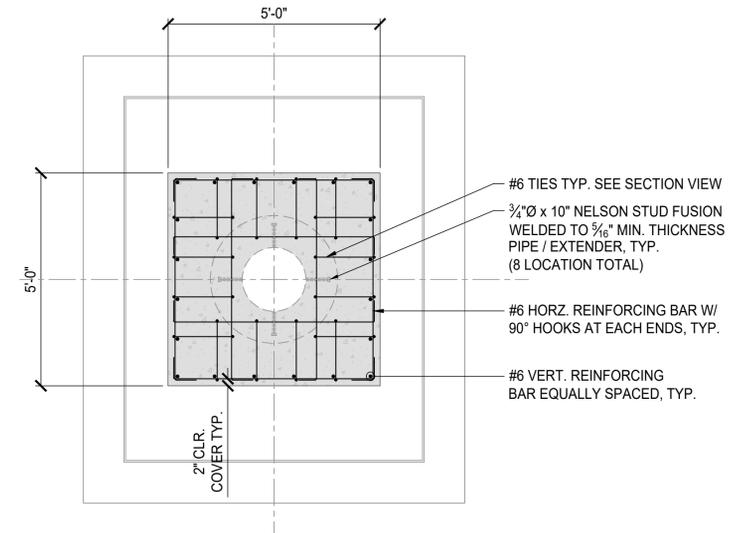
SECTION



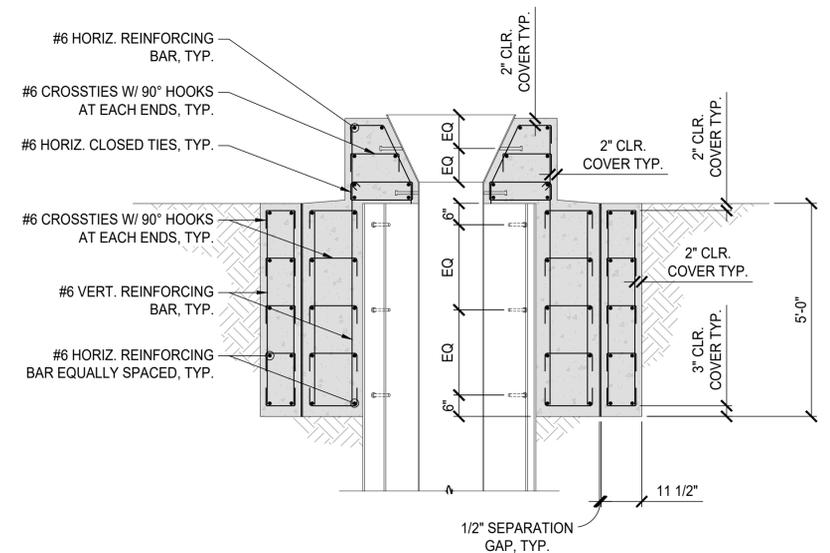
PLAN VIEW - WELL HEAD BLOCK



SECTION A



PLAN VIEW - PEDESTAL



SECTION B

TYPICAL CIDH PILE DETAIL

NTS A

WELL HEAD STRUCTURE

NTS F



NO.	DATE	REVISIONS

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UTIL. DIV. TRAFFIC ENG. SERVICES STREET DESIGN MAINTENANCE RIGHT-OF-WAY P.T. & L CONSTRUCTION

REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
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CITY OF VERNON PUBLIC UTILITIES DEPARTMENT

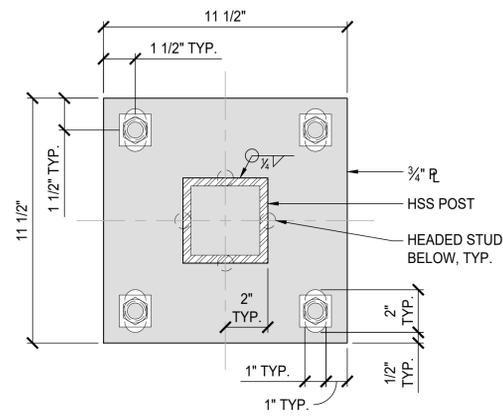
WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS 4305 SANTA FE AVENUE VERNON, CA. 90058

CONCRETE DETAILS

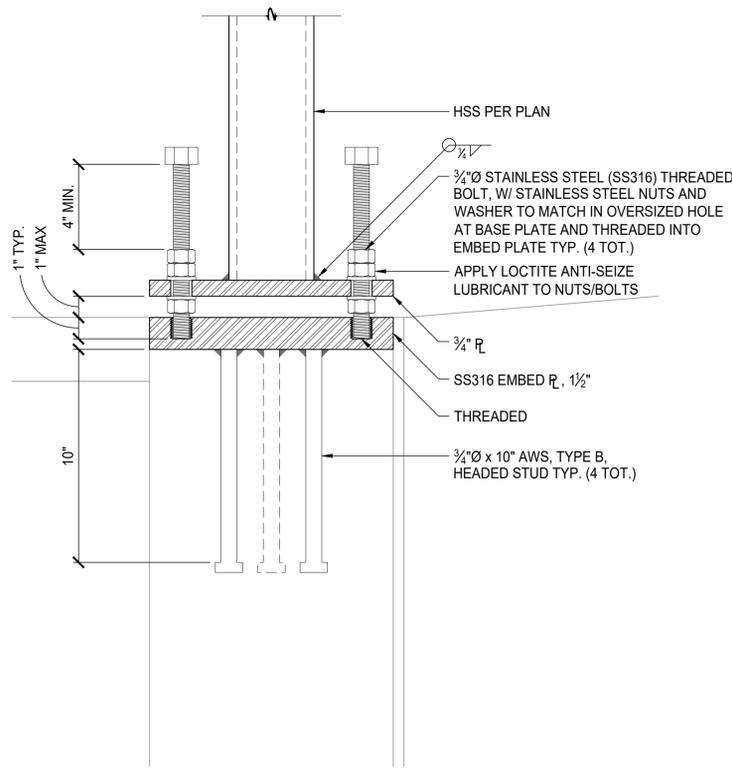
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WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS

SHEET NO. S4.0 DWG. NO. 30 OF 60



**PLAN**



**SECTION**

NOT USED

N.T.S.

**B**

NOT USED

N.T.S.

**C**

**TYPICAL HSS POST TO CONCRETE CONNECTION**

N.T.S.

**A**

NOT USED

N.T.S.

**E**

NOT USED

N.T.S.

**F**

D:\projects\11\11\Drawings\11\_Plan\11\_A040\_Ver=210.dwg (LMS Tech) | Vernon = 1  
 Xref: Base Plate.dwg | B026-50624v - S.dwg

**DIALERT**  
 DIAL TOLL FREE  
 811  
 AT LEAST TWO DAYS  
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REGISTERED PROFESSIONAL ENGINEER  
 SANJIV B. SHAH  
 S5149  
 E.C. 03/30/2023  
 STATE OF CALIFORNIA

NO.	DATE	REVISIONS

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UTIL. DIV.  
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 P.T. & L  
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REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

PREPARED UNDER THE SUPERVISION OF:  
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CITY OF VERNON  
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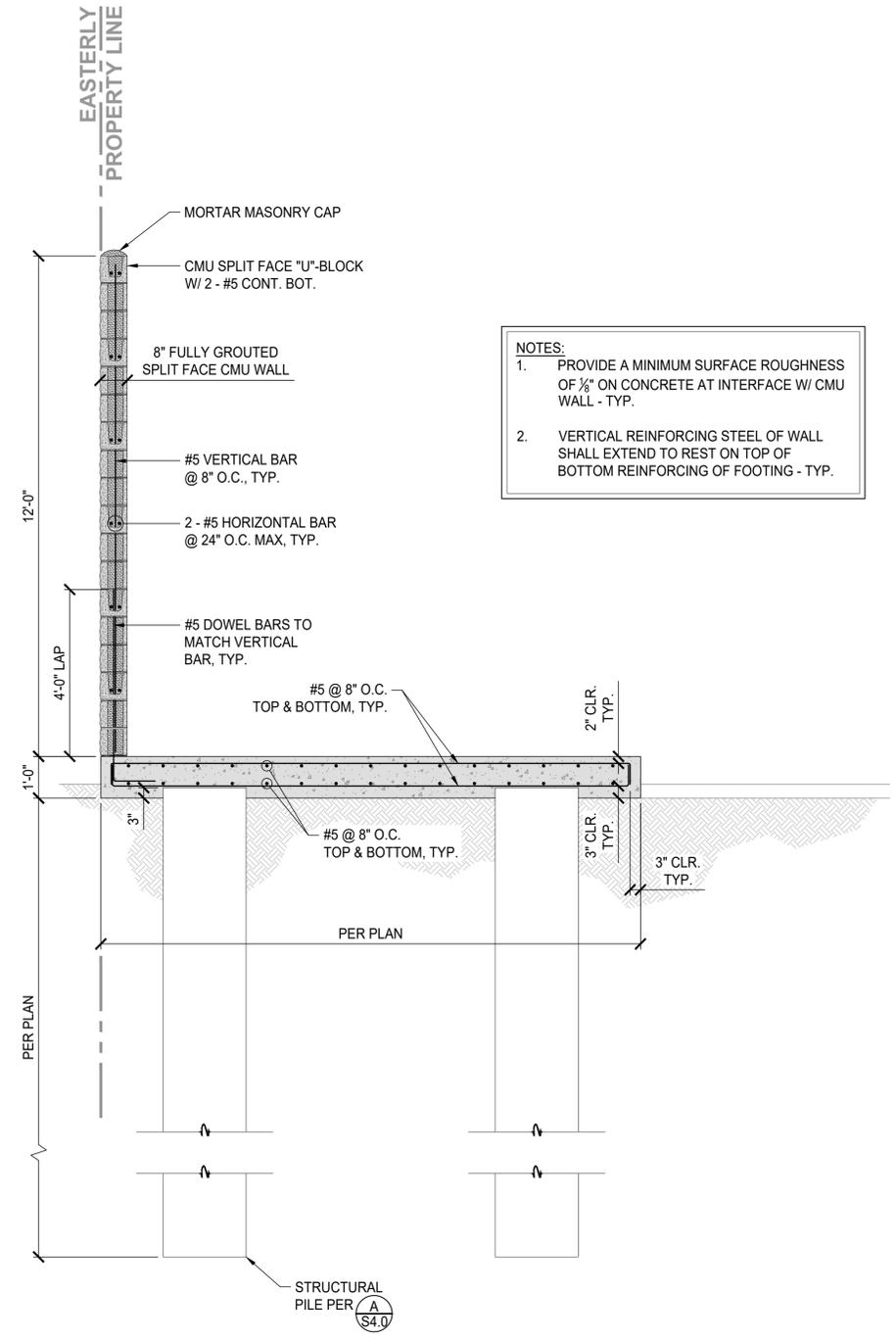
**STEEL DETAILS**

SHEET NO.  
**S5.0**  
 DWG. NO.  
 31 OF 60

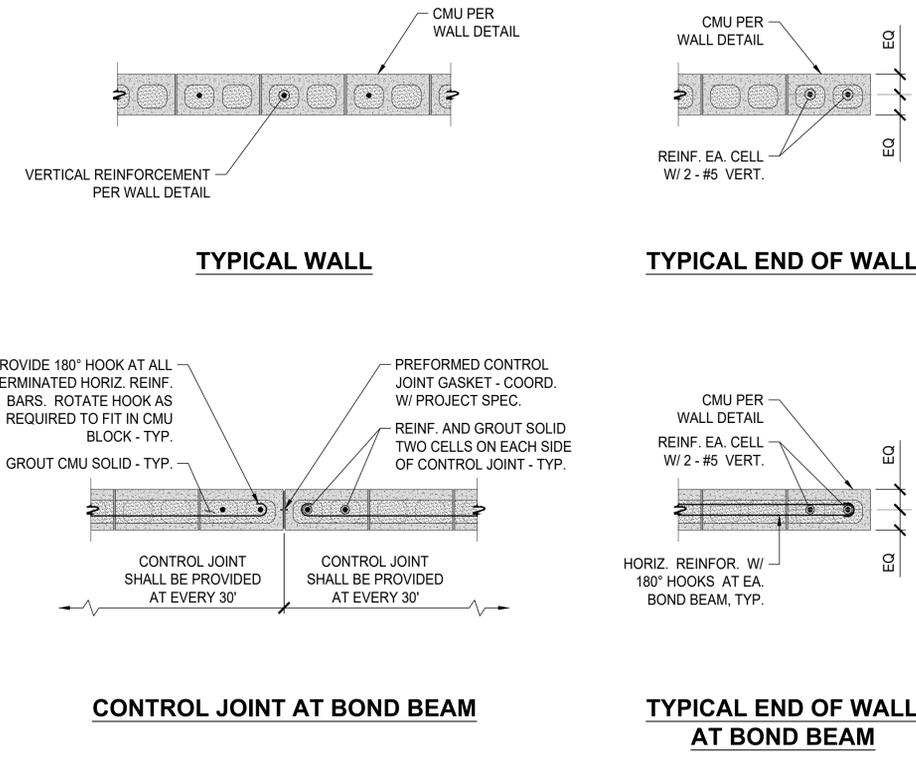
**ISSUED FOR CONSTRUCTION**

WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS





**NOTES:**  
 1. PROVIDE A MINIMUM SURFACE ROUGHNESS OF 1/8" ON CONCRETE AT INTERFACE W/ CMU WALL - TYP.  
 2. VERTICAL REINFORCING STEEL OF WALL SHALL EXTEND TO REST ON TOP OF BOTTOM REINFORCING OF FOOTING - TYP.



**NOTES:**  
 1. CONTRACTOR SHALL COORDINATE WITH CONTRACT DOCUMENTS AND PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS OF CMU BLOCK CONSTRUCTION. UNLESS NOTED OTHERWISE, ALL CMU SHALL BE SPLIT FACE BLOCK. COORDINATE WITH CONTRACT DOCUMENTS AS NEEDED.  
 2. CONSTRUCTION BRACING: CONTRACTOR SHALL PROVIDE ADEQUATE HORIZONTAL AND VERTICAL SUPPORT AND BRACING FOR ALL CMU WALLS AND CMU WALL OPENINGS DURING CONSTRUCTION AS REQUIRED UNTIL CMU WALLS HAVE GAINED SPECIFIED STRENGTH TO SUPPORT APPLICABLE LOADS.  
 3. TERMINATION OF VERTICAL REINFORCING: ALL VERTICAL CMU WALL REINFORCING SHALL EXTEND SIX (6) INCHES INTO THE UPPER MOST "U"-BLOCK AT THE TOP OF THE CMU WALL. ALL VERTICAL CMU WALL REINFORCING SHALL BE TERMINATED WITH A STANDARD HOOK IN THE "U"-BLOCK - TYPICAL.  
 4. REINFORCEMENT PLACEMENT TOLERANCE: TOLERANCE FOR THE PLACEMENT OF REINFORCEMENT STEEL IN WALLS AND FLEXURAL ELEMENTS SHALL BE 1/2", WHICH SHALL BE ACHIEVED WITH ADEQUATELY SPACED BAR POSITIONERS.

**TYPICAL CMU WALL**

N.T.S. **C**

**MASONRY WALL**

N.T.S. **D NOT USED**

N.T.S. **E NOT USED**

N.T.S. **F**

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 SANTOSH B. SHAH  
 S5149  
 Exp. 6/30/2023

NO.	DATE	REVISIONS

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DESIGN: S.B.S	UTIL. DIV. TRAFFIC ENG. SERVICES	REVIEWED BY:	DATE:
DRAWN: R.C.	STREET DESIGN MAINTENANCE RIGHT-OF-WAY	PREPARED UNDER THE SUPERVISION OF:	DATE:
CHECKED: S.B.S	P.T. & L CONSTRUCTION	SANTOSH SHAHI	DATE:
DATE: SEPTEMBER 2021		R.C.E. NO. S5149	EXP. DATE: 6/30/2023


**CITY OF VERNON**  
 PUBLIC UTILITIES DEPARTMENT

**WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS**  
 4305 SANTA FE AVENUE VERNON, CA. 90058  
**MASONRY DETAILS**

SHEET NO. **S6.0**  
 DWG. NO. **33 OF 60**

ISSUED FOR CONSTRUCTION

D:\projects\11\Drawings\11\_P\DWG\Ver-2201a\MSD\Tech\Wellno-11.dwg  
 Xrefs: B202-3624.rvt, B202-3624.dwg, B202-3624.dwg, B202-3624.rvt, S.dwg  
 6/30/2023 10:11:02 AM

**ELECTRICAL NOTES:**

1. ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRICAL CODE (2020), CALIFORNIA ELECTRICAL CODE (2019), BUILDING ENERGY EFFICIENCY STANDARDS TITLE 24 (2019), FEDERAL, STATE AND LOCAL JURISDICTION CODES.
2. ALL WORK SHALL BE DONE IN A NEAT, WORKMANLIKE, FINISHED AND SAFE MANNER, ACCORDING TO THE LATEST PUBLISHED NATIONAL ELECTRICAL CONTRACTOR'S ASSOCIATION STANDARDS OF INSTALLATION, UNDER COMPETENT SUPERVISION.
3. CONTRACTOR SHALL VISIT THE SITE PRIOR TO CONSTRUCTION TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND ALL OTHER FACTORS WHICH MAY AFFECT THE EXECUTION OF THIS WORK.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO EXISTING WALKS, WALLS, DRIVEWAYS, CURBS, ETC. DAMAGES SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE CITY AT NO ADDITIONAL COST TO THE CITY.
5. CONTRACTOR SHALL PAY FOR LOCAL FEES, PERMITS AND INSPECTIONS AS MAY BE REQUIRED AND PROVIDE A CERTIFICATE OF INSPECTION TO THE CITY.
6. LEAVE THE SITE CLEAN, REMOVE ALL DEBRIS, EMPTY CARTONS, TOOLS, CONDUIT, WIRE SCRAPS AND ALL MISCELLANEOUS SPARE EQUIPMENT AND MATERIALS USED IN THE WORK DURING CONSTRUCTION.
7. IT IS THE OBLIGATION OF THE CONTRACTOR TO ORGANIZE HIS WORK SO THAT A COMPLETE ELECTRICAL, INSTRUMENTATION, AND/OR CONTROL SYSTEM FOR THE FACILITY WILL BE PROVIDED AND SUPPORTED BY ACCURATE SHOP AND RECORD DRAWINGS, AND ALL O&M MANUALS.
8. ALL CABLES SHALL BE NEW, COPPER, RATED FOR 600V AND LISTED FOR ITS LOCATION WITH A MINIMUM TEMPERATURE RATING OF 75 DEG C WET AND 90 DEG C DRY; POWER CABLES SHALL BE TYPE XHHW-2 FOR UNDERGROUND/ABOVE GROUND, 2000 VOLT VFD RATED CABLE FOR VFD MOTOR LEADS, UNLESS NOTED OTHERWISE.
9. MINIMUM SIZE CONDUIT ABOVE GROUND SHALL BE 3/4" AND MINIMUM SIZE CONDUIT BELOW GROUND SHALL BE 1" UNLESS NOTED OTHERWISE. ALL CONDUITS FOR POWER AND LIGHTING SHALL CONTAIN A GROUNDING CONDUCTOR.
10. MINIMUM SIZE POWER CONDUCTORS SHALL BE #12 AWG UNLESS NOTED OTHERWISE.
11. ALL TERMINAL RATINGS SHALL HAVE A MINIMUM TEMPERATURE RATING OF 75 DEG C. CABLES SHALL BE DE-RATED PER NEC 110.14 (C).
12. CONDUIT SIZE SHALL BE AS SPECIFIED IN THE PLANS OR DETAILS. UNDERGROUND CONDUIT SHALL BE SCH 40 PVC ENCASED IN CONCRETE WITH PVC COATED GALVANIZED RIGID STEEL BENDS, ELBOWS AND TURN-UPS. EXPOSED CONDUIT IN THE CHEMICAL ROOM AND OUTDOORS SHALL BE PVC COATED GRS. ALL OTHER EXPOSED ABOVE-GROUND CONDUIT SHALL BE GALVANIZED RIGID STEEL.
13. EQUIPMENT AND WIRING METHODS IN THE CHEMICAL ROOM SHALL BE RATED FOR CORROSIVE LOCATIONS, ENCLOSURES SHALL BE NEMA 4X. EQUIPMENT IN THE ELECTRICAL ROOM SHALL BE NEMA 1 UNLESS NOTED OTHERWISE. OUTDOOR EXPOSED EQUIPMENT SHALL BE NEMA 3R; UNLESS NOTED OTHERWISE.
14. GROUND AND BOND ALL EQUIPMENT AND ENCLOSURES PER NEC ARTICLE 250 AND MANUFACTURER REQUIREMENTS.
15. CONTRACTOR SHALL PLAN AND INSTALL WORK IN SUCH A MANNER AS TO CONFORM TO THE STRUCTURE, AVOID OBSTRUCTIONS, PRESERVE HEADROOM AND KEEP OPENINGS AND PASSAGEWAYS CLEAR.
16. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, ETC. NECESSARY FOR A COMPLETE AND WORKABLE ELECTRICAL SYSTEM WHETHER OR NOT THESE ITEMS ARE SPECIFICALLY NOTED ON THESE DRAWINGS. INCIDENTAL ITEMS NOT INDICATED ON THE DRAWINGS, NOR MENTIONED IN SPECIFICATIONS THAT CAN BE LEGITIMATELY AND REASONABLY INFERRED TO BELONG TO THE WORK DESCRIBED OR BE NECESSARY IN GOOD PRACTICE TO PROVIDE A COMPLETE SYSTEM, SHALL BE FURNISHED AND INSTALLED AS THOUGH ITEMIZED HERE IN EVERY DETAIL.
17. ALL TRENCHING, CONDUITS, ETC. SHALL BE ROUTED AND INSTALLED IN SUCH A MANNER THAT WILL NOT DAMAGE EXISTING FACILITIES OR UNDERGROUND UTILITIES. SHOULD DAMAGE OCCUR, IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR DAMAGE TO THE SATISFACTION OF THE CITY OR INSPECTOR.
18. ALL CONDUIT RUNS SHOWN ON THIS PLAN ARE SCHEMATIC IN NATURE. THE CONTRACTOR SHALL MAKE SURE THAT ALL CONDUIT MEETS LOCAL AND STATE CODES.
19. WHEN CROSSING PATHWAYS OR SIDEWALKS, CONTRACTOR SHALL BORE UNDER EXISTING CONCRETE WALKS AND SAWCUT ASPHALT WALKS. ASPHALT WALKS AND CONCRETE SIDEWALKS TO BE REPLACED IN KIND.
20. CONTRACTOR SHALL GUARANTEE WORK INSTALLED UNDER THE CONTRACT TO BE FREE FROM DEFECTIVE WORKMANSHIP AND MATERIALS, USUAL WEAR EXPECTED, AND SHOULD ANY SUCH DEFECTS DEVELOP WITHIN A PERIOD OF ONE YEAR ACCEPTANCE OF THE PROJECT BY THE CITY, THE CONTRACTOR SHALL REPAIR AND/OR REPLACE ANY DEFECTIVE ITEMS AND DAMAGE RESULTING FROM FAILURE OF THESE ITEMS, AT NO EXPENSE WHATSOEVER TO THE CITY.
21. ALL CIRCUITS SHALL BE LEGIBLY IDENTIFIED AT THE PANEL, JUNCTION BOXES AND AT ALL EQUIPMENT IN A PERMANENT MANNER (I.E. ETCHED PLATES, CONDUCTOR TAG, PERMANENT MARKER, ETC.). THE LABELING SHALL INCLUDE PANEL CIRCUIT NUMBER, "TO" AND "FROM" IDENTIFICATION, AND MARKED "SPARE" WHERE APPLICABLE.
22. CONTRACTOR SHALL TEST ELECTRICAL SYSTEM FOR SHORT CIRCUITS AND MEGGER TEST FEEDERS AND BRANCH CIRCUIT WIRING. INSURE LOW IMPEDANCE GROUND PATH SYSTEM. PERFORM HIPOT TESTING WHEN REQUIRED BY LOCAL JURISDICTION.
23. CONTRACTOR SHALL COORDINATE ALL EQUIPMENT CONNECTIONS WITH EQUIPMENT SUPPLIER PRIOR TO ROUGH-IN. PROVIDE ADDITIONAL FUSED DISCONNECT SWITCHES AND CONTROLS IF OVERCURRENT PROTECTION OR CONTROLS ARE NOT INTEGRAL WITH UNITS.
24. FULL LOAD AMPS (FLA) SIZES, AS NOTED IN THESE DRAWINGS, ARE BASED ON SPECIFIED EQUIPMENT DATA. CONTRACTOR SHALL VERIFY NAMEPLATE FLA OF EQUIPMENT SUPPLIED AND COORDINATE ACCORDINGLY PER EQUIPMENT SUPPLIER'S RECOMMENDATIONS AND CODE REQUIREMENTS.
25. CONDUITS OR RACEWAYS INSTALLED IN AREAS WHERE ELEVATION CHANGES MAY CAUSE WATER OR MOISTURE TO ENTER THE ELECTRICAL EQUIPMENT THROUGH THE CONDUIT SHALL BE SEALED IN ACCORDANCE WITH NEC 300.5 (G).
26. MATERIALS SHALL BE NEW AND OF THE BEST QUALITY WITH MANUFACTURER'S NAME PRINTED THEREON. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH NEMA, ANSI, UNDERWRITER'S LABORATORY OR OTHER APPLICABLE STANDARDS AND RATED FOR HEAVY DUTY SERVICE.
27. SELECTION OF MATERIALS SHALL BE IN STRICT ACCORDANCE WITH THE DRAWINGS AND/OR SPECIFICATIONS.
28. THE SUBMITTALS SHALL BE NEATLY GROUPED AND ORGANIZED. PERTINENT INFORMATION SHALL BE HIGHLIGHTED, AND THE SPECIFIC PRODUCT SHALL BE IDENTIFIED. ALL SUBMITTALS SHALL BE COMPLETE, AND PRESENTED IN ONE PACKAGE. THE SUBMITTAL SHALL INCLUDE A COMPLETE LIST OF THE EQUIPMENT AND MATERIALS, INCLUDING THE MANUFACTURER'S NAME, PRODUCT SPECIFICATION, DESCRIPTIVE DATA, TECHNICAL LITERATURE, PERFORMANCE CHARTS, CATALOG CUTS, INSTALLATION INSTRUCTION, AND SPARE PART RECOMMENDATIONS FOR EACH DIFFERENT ITEM OF THE EQUIPMENT SPECIFIED.
29. VERIFY ALL CONDUIT FILL RATIOS, BOX FILLS, AND CONDUIT BENDS (MAX 360 DEGREES) ARE MET PER NEC REQUIREMENTS. INSTALL PULL BOXES AND DE-RATE CABLE AMPACITY AS NECESSARY.
30. CONTRACTOR TO READ ALL THE DRAWINGS IN THIS SET TO BECOME FAMILIARIZED WITH THE FULL ELECTRICAL SCOPE, INCLUDING BUT NOT LIMITED TO THE MECHANICAL, INSTRUMENTATION AND CIVIL DRAWINGS.
31. THESE DRAWINGS AND THE PROJECT SPECIFICATIONS ARE COMPLEMENTARY. WHERE THERE IS OVERLAP, THE MORE STRINGENT REQUIREMENT WILL TAKE PRECEDENCE.
32. CONTRACTOR SHALL VERIFY ALL CIRCUITS CONTAIN LESS THAN 5% VOLTAGE DROP. CONTRACTOR SHALL PROVIDE SHORT CIRCUIT ANALYSIS AND ARC FLASH STUDY, AS REQUIRED.
33. CONTRACTOR SHALL COORDINATE AND PERFORM WORK TO THE STANDARDS OF ALL APPLICABLE UTILITY COMPANIES, INCLUDING BUT NOT LIMITED TO UNDERGROUND ELECTRICAL LINES, GAS LINES AND WATER LINES. WHEN AN ISSUE OR DISCREPANCY ARISES, NOTIFY THE CITY AND ENGINEER IMMEDIATELY.
34. CONTRACTOR TO PROVIDE REQUIREMENTS FOR NFPA 70E, AS REQUIRED.
35. CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE CITY WITH ANY DISCREPANCIES FOUND DURING INSTALLATION OR REVIEW.

D:\Projects\2021\1192-19 Well No. 22\1192-19 Well No. 22 (L&S) - E.Dwg - 11/18/21 4:41:18 PM  
 XREF: 1192-19 Well No. 22 - E.Dwg

FRP No. 1192-19 WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS  
 ISSUED FOR CONSTRUCTION  
 11/18/2021 4:41:18 PM

 <p><b>DIALERT</b> DIAL TOLL FREE 811 AT LEAST TWO DAYS BEFORE YOU DIG UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA IMPORTANT NOTICE Section 4216/4217 of the Government Code requires a Dig Alert Identification Number be issued before a "Permit to Excavate" will be valid.</p>	 <p><b>PACE</b> Advanced Water Engineering 17520 Newhope Street, Suite 200   Fountain Valley, CA 92708 P: (714) 481-7300   www.pacewater.com</p>	 <p>REGISTERED PROFESSIONAL ENGINEER CHRIS NAJARIAN E 22545 EXP. 12/31/22 ELECTRICAL STATE OF CALIFORNIA</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>REVISIONS</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	NO.	DATE	REVISIONS										<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DESIGN:</th> <td>G.T.</td> </tr> <tr> <th>DRAWN:</th> <td>N.C.</td> </tr> <tr> <th>CHECKED:</th> <td>C.N.</td> </tr> <tr> <th>DATE:</th> <td>NOVEMBER 2021</td> </tr> </thead> </table>	DESIGN:	G.T.	DRAWN:	N.C.	CHECKED:	C.N.	DATE:	NOVEMBER 2021	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>UTIL. DIV.</th> <th>REVIEWED BY</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>TRAFFIC</td> <td> </td> <td> </td> </tr> <tr> <td>ENG. SERVICES</td> <td> </td> <td> </td> </tr> <tr> <td>STREET DESIGN</td> <td> </td> <td> </td> </tr> <tr> <td>MAINTENANCE</td> <td> </td> <td> </td> </tr> <tr> <td>RIGHT-OF-WAY</td> <td> </td> <td> </td> </tr> <tr> <td>P.T. &amp; L</td> <td> </td> <td> </td> </tr> <tr> <td>CONSTRUCTION</td> <td> </td> <td> </td> </tr> </tbody> </table>	UTIL. DIV.	REVIEWED BY	DATE	TRAFFIC			ENG. SERVICES			STREET DESIGN			MAINTENANCE			RIGHT-OF-WAY			P.T. & L			CONSTRUCTION			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>PREPARED UNDER THE SUPERVISION OF:</th> </tr> </thead> <tbody> <tr> <td>CHRIS NAJARIAN, P.E. DATE: _____</td> </tr> <tr> <td>R.C.E. NO. 22545 EXP. DATE: 12/31/22</td> </tr> <tr> <th>REVIEWED BY:</th> </tr> <tr> <td>DATE: _____</td> </tr> <tr> <td>R.C.E. NO. _____ EXP. DATE: _____</td> </tr> </tbody> </table>	PREPARED UNDER THE SUPERVISION OF:	CHRIS NAJARIAN, P.E. DATE: _____	R.C.E. NO. 22545 EXP. DATE: 12/31/22	REVIEWED BY:	DATE: _____	R.C.E. NO. _____ EXP. DATE: _____	 <p><b>CITY OF VERNON</b> PUBLIC WORKS DEPARTMENT</p>	<p><b>WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS</b> 4305 SANTA FE AVENUE VERNON, CA. 90058</p> <p><b>ELECTRICAL NOTES</b></p>	<p>SHEET NO. <b>E0.0</b></p> <p>DWG. NO. 34 OF 60</p>
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PLAN LEGEND		SINGLE LINE DIAGRAM AND SCHEMATIC LEGEND				ABBREVIATION LIST	
— EXPOSED CONDUIT	(J) ABOVE GROUND JUNCTION BOX	— — — FIELD WIRING	3-POSITION	CONTACT (N.O.)	LOCATION SYMBOL	A, AMP AMPERES	PL-1 PILOT LIGHT 1
— UNDERGROUND CONDUIT DUCTBANK	(LE) LEVEL ELEMENT	— PANEL WIRING	SELECTOR SWITCH (HAND-OFF-AUTO)	CONTACT (N.C.)	SHEET NOTE TAG	AM AMMETER	PFR PHASE/POWER FAIL RELAY
— UTILITY CONDUIT DUCTBANK	(LP) LEVEL PROBES	— COMMUNICATIONS WIRING	LOCKOUT STOP PUSHBUTTON	PUSHBUTTON (N.O.) MOMENTARY CLOSE	EDGE CONNECTOR	AC ALTERNATING CURRENT	PNL PANEL
— CONDUIT RUN CONCEALED IN CEILING, FLOOR, TRENCH OR IN WALLS	(LT) LEVEL TRANSPONDER	— CABLE (MULTICONDUCTOR SHIELDED)	PUSH-PULL EMERGENCY STOP PUSHBUTTON	PUSHBUTTON (N.C.) MOMENTARY OPEN	INSTRUMENTATION	AIC AMPS INTERRUPTING CAPACITY	POT POTENTIOMETER
— EXISTING CONDUIT	(PC) PHOTOCCELL	PILOT LIGHT (LETTER DENOTES COLOR)	DISCONNECT SWITCH (N.O.)	2-POSITION SELECTOR SWITCH	VFD VARIABLE FREQUENCY DRIVE	BAT BATTERY BC BATTERY CHARGER	PPM POWER PHASE MONITOR
— GEC GROUNDING ELECTRODE CONDUCTOR	(PS) PRESSURE SWITCH	PUSH-TO-TEST PILOT LIGHT (LETTER DENOTES COLOR)	DISCONNECT SWITCH (N.C.)	PHASE FAILURE RELAY	SPD SURGE PROTECTION DEVICE	C COMMON	PR PAIR CABLE
— OHE EXISTING OVERHEAD ELECTRIC	(TS) TEMPERATURE SWITCH	CONTROL RELAY	EARTH GROUND CONNECTION	TIME DELAY RELAY	ACTIVE HARMONIC FILTER	CB CIRCUIT BREAKER	PS PRESSURE SWITCH
— E EXISTING UNDERGROUND ELECTRIC	(T) THERMOSTAT	PRESSURE SWITCH (N.O.) CLOSES ON RISING PRESSURE	GROUND ROD AND WELL	LATCHING RELAY	3 PHASE MOTOR, INDICATING 10 HORSEPOWER	CNTL CONTROL	PT POTENTIAL TRANSFORMER
— FENCE	(ZS) INTRUSION ALARM SWITCH	PRESSURE SWITCH (N.C.) OPENS ON RISING PRESSURE	THERMAL OVERLOAD	CONTROL RELAY	CONDUIT STUB UP	CPT CONTROL POWER TRANSFORMER	PTT PUSH TO TEST
— CONDUIT TURNED UP (TOWARDS READER)	(JB) UNDERGROUND JUNCTION BOX	TIMING RELAY, (N.O.) CONTACT TIME TO CLOSE (ON DELAY TIMER)	FUSED TERMINAL BLOCK	INTRINSICALLY SAFE RELAY		CP CONTROL PANEL	PVC POLYVINYL CHLORIDE
— CONDUIT TURNED DOWN (INTO PAGE)	(MH) MANHOLE	TIMING RELAY, (N.C.) CONTACT TIME TO OPEN (ON DELAY TIMER)	NEUTRAL BUS	EDGE CONNECTORS		CR CONTROL RELAY, CORROSION RESISTANT	PWR POWER
FLOOR MOUNTED ETHERNET (10/100) OUTLET (RJ-45)	(HH) HANDHOLE	TIMING RELAY, (N.O.) CONTACT TIME TO OPEN (OFF DELAY TIMER)	GROUND BUS	INTERNAL CONTACT (N.O.)		CT CURRENT TRANSFORMER	RR RUN RELAY
TELEPHONE OUTLET (RJ-11)	(F) DISCONNECT SWITCH	TIMING RELAY, (N.C.) CONTACT TIME TO CLOSE (OFF DELAY TIMER)	HORN	INTERNAL CONTACT (N.C.)		DC DIRECT CURRENT	RV RUN RELAY
ETHERNET (10/100) OUTLET (RJ-45)	(F) FUSED DISCONNECT SWITCH	SAIL SWITCH (N.O.) CLOSES ON FLOW	BUZZER	BATTERY		DR DUPLEX RECEPTACLE	RVAT RV AUTO-TRANSFORMER
COMBINATION TELEPHONE/ETHERNET (10/100) OUTLET (RJ-11 & RJ-45)	(CB) ENCLOSED CIRCUIT BREAKER	SAIL SWITCH (N.C.) OPENS ON FLOW	TERMINAL BLOCK	CAPACITOR		DS DISCONNECT SWITCH	SSS SOLID-STATE STARTER
240V SIMPLEX RECEPTACLE (NUMBER DENOTES CIRCUIT AMPS)	(CB) COMBINATION MOTOR STARTER INDICATING MOTOR STARTER SIZE 2	FLOAT SWITCH (N.C.) OPENS ON RISING LEVEL	FIELD TERMINATION	SOLENOID		(E) EXISTING	SR RECEPTACLE
480V SIMPLEX RECEPTACLE (NUMBER DENOTES CIRCUIT AMPS)	(M) MOTOR STARTER	FLOAT SWITCH (N.O.) CLOSES ON RISING LEVEL	MAIN LUG ONLY	RESISTOR		EC EDGE CONNECTOR	SS SELECTOR SWITCH, SOFT STARTER
120V, 20A SIMPLEX RECEPTACLE	(O) PUSHBUTTON CONTROL STATION	LIMIT SWITCH (N.C.)	POWER DISTRIBUTION BLOCK	DIODE		EF EXHAUST FAN	SP SURGE PROTECTOR
120V, 20A DUPLEX RECEPTACLE	(S) CONDUIT SEAL-OFF FITTING	LIMIT SWITCH (N.O.)	COIL/INDUCTOR	METAL OXIDE VARISTOR		ETM ELAPSED TIME METER	SPD SURGE PROTECTOR DEVICE
120V, 20A QUADRAPLEX RECEPTACLE	(S) SOLENOID VALVE (ENERGIZED TO CLOSE)	LIMIT SWITCH (N.O.) HELD CLOSED	POWER TRANSFORMER	INDICATING FUSE HOLDER AMPERE SIZE SHOWN		F FUSE	SV SOLENOID VALVE
120V, 20A SPST SWITCH	(S) SOLENOID VALVE (ENERGIZED TO OPEN)	LIMIT SWITCH (N.C.) HELD OPEN	HEATER	LIGHTNING ARRESTER		FB FUSE BLOCK	SWBD SWITCHBOARD
MANUAL MOTOR STARTER	(B) BUTTERFLY VALVE	TEMPERATURE SWITCH (N.C.) OPENS ON RISING TEMPERATURE	MOTOR STARTER CONTACTOR COIL	CONDUIT DESIGNATION		(F) FUTURE	TB TERMINAL BLOCK
120V, 20A 3-WAY SWITCH	(P) PLUG VALVE	TEMPERATURE SWITCH (N.O.) CLOSES ON RISING TEMPERATURE	ELAPSED TIME METER	EQUIPMENT TAG REFERENCE		FLTR FILTER	TR TIME DELAY RELAY
120V, 20A 4-WAY SWITCH	(G) GATE VALVE	CIRCUIT BREAKER WITH DOOR OPERATED HANDLE	METER & CURRENT TRANSFORMER	I/O POINT REFERENCE PLC, I/O RACK, OR ENUNCIATOR PANEL		FS FLOAT SWITCH	TC TIMECLOCK
ANALYZER TRANSMITTER	(C) CONDUCTIVITY SWITCH	MOLDED CASE CIRCUIT BREAKER WITH THERMAL TRIP, UNO	WATT HOUR METER AND SOCKET	DRAWING REFERENCE		FVNR FULL VOLTAGE NON REVERSING	TM THERMAL MAGNETIC
FLOAT SWITCH						FVR FULL VOLTAGE REVERSING	TS TEMPERATURE SWITCH

NOTE: GENERAL LEGEND, PROJECT MAY NOT INCLUDE ALL SYMBOLS, REFERENCE SHEETS AND DETAILS FOR SUPPLEMENTAL LEGENDS.

D:\Projects\2021\1750 Hope Street\1750 Hope Street - 230a (LMS Tech) - Vernon 11.dwg

**DIG ALERT**  
 DIAL TOLL FREE 811  
 AT LEAST TWO DAYS BEFORE YOU DIG  
 UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA  
 IMPORTANT NOTICE  
 Section 4216/4217 of the Government Code require a Dig Alert Identification Number be issued before "Permit to Excavate" will be valid.

**PACE**  
 Advanced Water Engineering  
 17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708  
 P: (714) 481-7300 | www.pacewater.com

REGISTERED PROFESSIONAL ENGINEER  
 CIVIL ENGINEER  
 E 22545  
 EXP. 12/31/22  
 STATE OF CALIFORNIA

NO.	DATE	REVISIONS

LINE IS 2 INCHES AT FULL SCALE (IF NOT 2"=SCALE ACCORDINGLY)

DESIGN:	G.T.
DRAWN:	N.C.
CHECKED:	C.N.
DATE:	NOVEMBER 2021

UTIL. DIV.	REVIEWED BY	DATE
TRAFFIC		
ENG. SERVICES		
STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L		
CONSTRUCTION		

PREPARED UNDER THE SUPERVISION OF:  
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**CITY OF VERNON**  
 PUBLIC WORKS DEPARTMENT

**WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS**  
 4305 SANTA FE AVENUE VERNON, CA. 90058  
**ELECTRICAL LEGEND**

D:\Projects\2021\1750 Hope Street\1750 Hope Street - 230a (LMS Tech) - Vernon 11.dwg



PANEL "A"											
VOLTAGE:	120/240 VAC		VOLT AMPS						MAIN BKR:	150	A
SCCR:	10 KAIC								PANEL BUS:	225	A
LOAD DESCRIPTION	VA	CB	BKR	PHASE A	PHASE B	BKR	CB	VA	LOAD DESCRIPTION		
PLC PANEL	2400	30/1	1	3900		2		1500	OUTDOOR AIR CONDITIONER		
CHLORINE ROOM EXHAUST FAN	600	15/2	3		2100	4		1500	MOTOR OPERATED GATE		
	600		5	1400	6	15/2	800				
CATHODIC PROTECTION	600	20/1	7		1400	8		800			
SPARE		15/1	9	180		10	20/1	180	OUTDOOR GFCI RECEPTACLE (FENCE)		
MOTOR OPERATED VALVE "V-022123" (FIXED LOCK)	600	15/2	11		850	12	20/1	250	ELECTRICAL ROOM LIGHTS*		
	600		13	780	14	20/1	180	ELECTRICAL ROOM RECEPTACLE			
MOTOR HEATER (VIA VFD PANEL)	600	20/1	15		780	16	20/1	180	OUTDOOR GFCI RECEPTACLE (BLDG)		
OUTDOOR BUILDING LIGHTS*	45	20/1	17	170		18	20/1	125	CHLORINE ROOM LIGHTS*		
CHEMICAL INJECTION PUMP RECEP.	400	20/1	19		580	20	20/1	180	CHLORINE ROOM RECEPTACLE		
OUTDOOR WELL LIGHT*	44	15/1	21	44		22	20/1		SPARE		
SPARE		20/1	23		0	24	20/1		SPARE		
SPARE		20/1	25	0		26	20/1		SPARE		
SPARE		15/1	27		0	28	15/1		SPARE		
SPARE		15/1	29	0		30	15/1		SPARE		
				PHASE A	PHASE B						
VA/PHASE SUBTOTAL				6474	5710	1Φ, 3W					
A/LEG (SUBTOTAL)				54.0	47.6	10,000 AIC BREAKERS					
VA (SUBTOTAL)				12184		NEMA 1					
25% OF LARGEST INDUCTIVE LOAD				375	375						
GRAND TOTAL (AMPS)				53.9		* INDICATES LOAD CALCULATED AT 125%					
PERCENT CAPACITY				35.9%		MOUNTED IN MCC					

**NOTES:**

- BREAKERS SHALL BE SIZED IN ACCORDANCE WITH AVAILABLE FAULT CURRENT. WHERE A FULLY RATED SYSTEM IS NOT POSSIBLE, THE PANELBOARD SHALL BE SERIES RATED IN ACCORDANCE WITH NEC 110.22(C) AND 240.86(B).
- PROVIDE UPDATED, COMPLETE, AND ACCURATE TYPED PANELBOARD CIRCUIT DIRECTORIES AT THE COMPLETION OF WORK.
- CIRCUIT BREAKERS SHALL BE THERMAL MAGNETIC, TRIP INDICATING.
- MULTI-POLE CIRCUIT BREAKERS SHALL BE EQUIPPED WITH AN INTERNAL COMMON TRIP MECHANISM.
- CIRCUIT BREAKERS SHALL BE OF THE SAME MANUFACTURER AS THE PANELBOARD.
- PANELBOARDS SHALL BE BOLT-ON TYPE.
- BREAKER SHALL HAVE FIXED LOCKS WHEN REQUIRED BY NEC CODE.
- PANELBOARDS SHALL BE PROVIDED WITH SPARE BREAKERS AS INDICATED.
- BOTH ENDS OF CONDUCTORS SHALL BE LABELED WITH THE PANEL NAME AND CIRCUIT.
- EQUIPMENT FED FROM PANELBOARDS SHALL BE LABELED WITH THEIR CIRCUIT IN ACCORDANCE WITH NEC 110.22 (A).

ISSUED FOR CONSTRUCTION

Dimension 1: 1/8" = 1' (Scale = 1:480) Ver = 23.0a (LMS Tech); Version = 1  
Xref: 1626-3024r - E.dwg



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811  
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BEFORE YOU DIG  
UNDERGROUND SERVICE ALERT  
OF SOUTHERN CALIFORNIA  
IMPORTANT NOTICE  
Section 4216/4217 of the Government  
Code requires a Dig Alert identification  
Number be issued before  
"Permit to Excavate" will be valid.



**PACE**  
Advanced Water Engineering  
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708  
P: (714) 481-7300 | www.pacewater.com



REGISTERED PROFESSIONAL ENGINEER  
CHRIS NAJARIAN  
E 22545  
EXP. 12/31/22  
ELECTRICAL  
STATE OF CALIFORNIA

NO.	DATE	REVISIONS

LINE IS 2 INCHES  
AT FULL SCALE  
(IF NOT 2"=SCALE ACCORDINGLY)

DESIGN: G.T.  
DRAWN: N.C.  
CHECKED: C.N.  
DATE: NOVEMBER 2021

UTIL. DIV.	REVIEWED BY	DATE
TRAFFIC		
ENG. SERVICES		
STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L		
CONSTRUCTION		



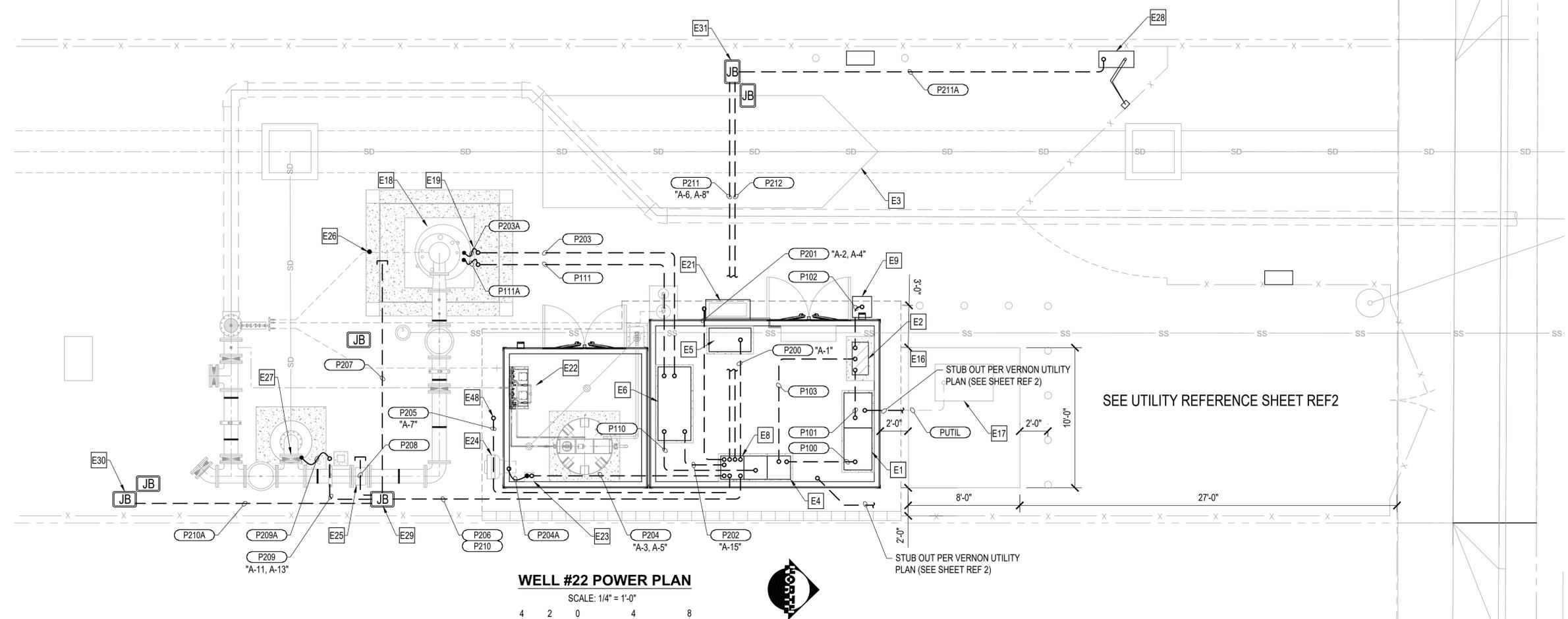
**CITY OF VERNON**  
PUBLIC WORKS  
DEPARTMENT

**WELL NO. 22  
EQUIPMENT AND  
SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058

**PANEL SCHEDULE**

SHEET NO.	E1.1
DWG. NO.	37 OF 60

\\B20\engr\proj\2021\1192-19\Well No. 22\Sheet E1.1\Panel Schedule.dwg - 11/30/21 4:45:47 PM



**WELL #22 POWER PLAN**

SCALE: 1/4" = 1'-0"

**CONSTRUCTION NOTES:**

- E1 SERVICE ENTRANCE SECTION, "SES", 480V, 800A, 3 PHASE, 4 WIRE, NEMA 1, 66" W x 90" H x 24" D.
- E2 CONDUIT STUB UP LOCATION. STUB UPS SHALL BE LOCATED WITHIN 28" x 14" AREA CENTERED ON 38" x 24" CONCRETE PAD.
- E3 PORTABLE STANDBY GENERATOR 480V, 3Ø, 4W, 400 KW, 500 KVA, 600 A, 0.8 PF, CAMLOCK CONNECTIONS, TIER 4F, TOWABLE, ON TRAILER HITCH, CUMMINS OR ENGINEER APPROVED EQUAL, 288" L x 102" W.
- E4 MOTOR CONTROL CENTER "MCC-PS", 480V, 800A, 3 PHASE, 3 WIRE, NEMA 1, TYPE ALLEN BRADLEY CENTERLINE 2100, EATON FREEDOM OR ENGINEER APPROVED EQUAL, 60" W x 90" H x 20" D.
- E5 PUMP STATION PLC PANEL, PAINTED STEEL, HEAVY DUTY, FREESTANDING, NEMA 12, TYPE HUBBELL OR ENGINEER APPROVED EQUAL, 36" W x 90" H x 20" D.
- E6 VARIABLE FREQUENCY DRIVE, FOR WELL PUMP, 480V, 350 HP, ACTIVE FRONT END DRIVE, IP 54, TYPE ALLEN BRADLEY 755TL OR ENGINEER APPROVED EQUAL, 63" W x 90" H x 28" D.
- E8 PANELBOARD "A", 120/240V, SINGLE PHASE, 3 WIRE, 30 CIRCUITS, 225 AMP FRAME, 150 AMP MAIN BREAKER, BOLT ON TYPE, MOUNTED INSIDE MCC-PS.
- E9 GENERATOR TAP BOX, 800 AMP, 600 V, 3 PHASE, 3 POLE, NEMA 3R, STANCHION MOUNTED, CAMLOCK, TYPE SQUARE D SPQTB608RS OR ENGINEER APPROVED EQUAL.
- E16 REFERENCE UTILITY DRAWINGS FOR INSTALLATION REQUIREMENTS ON CABLING/CONDUIT, JUNCTION BOXES, ETC. FROM THE EXISTING UTILITY POLE TO THE SERVICE ENTRANCE.
- E17 UTILITY TRANSFORMER, PER CITY OF VERNON REQUIRMENTS, 480V, PAD MOUNTED, SEE DETAIL "A" - SHEET E7.2, FOR REFERENCE.
- E18 BOOSTER PUMP "PMP-022100" PER MECHANICAL PLANS AND SPECIFICATIONS. GROUND PUMP MOTOR CASING.
- E19 STUB UP CONDUIT 6" ABOVE GROUND, MOUNT TO CONCRETE PAD.

- E21 AIR CONDITIONER, OUTDOOR UNIT, 240V, SINGLE PHASE, COORDINATE TYPE WITH BUILDING MANUFACTURER. CONNECT TO NEMA 3R, OUTDOOR DISCONNECT SWITCH.
- E22 CHEMICAL INJECTION PUMPS, PMP-022101 AND PMP-022102, PER MECHANICAL SPECIFICATIONS, 120V, PLUG INTO RECEPTACLE, SEE LIGHTING AND RECEPTACLE PLAN.
- E23 MOTOR STARTER FOR EXHAUST FAN, 240 VAC, 1 HP, SINGLE PHASE, NEMA 4X, WALL MOUNTED, TYPE GREENHECK, PART NUMBER MS-1P, OR ENGINEER APPROVED EQUAL.
- E24 EXHAUST FAN, SINGLE PHASE, NEMA 4X, PER MECHANICAL PLANS.
- E25 FLOW METER "FIT-022140", PER MECHANICAL SPECIFICATIONS, 120 VAC, 4-20mA, REMOTE TRANSMITTER FIELD MOUNTED ON STANCHION NEAR PIPE.
- E26 FLOW METER "FIT-022141", PER MECHANICAL SPECIFICATIONS, PROVIDED BY CITY, COORDINATE INSTALLATION WITH DEVICE SPECIFIED REQUIREMENTS.
- E27 ELECTRICALLY ACTUATED VALVE, V-022123, 240V, SINGLE PHASE, INSTALL WARNING LABEL ON VALVE ACTUATOR MOTOR ASSEMBLY GIVING THE LOCATION OF THE CIRCUIT BREAKER PROVIDING POWER.
- E28 MOTORIZED GATE OPERATOR, 240V, SINGLE PHASE, HEAVY DUTY, INDUSTRIAL, COMPATIBLE WITH KEY PADS, AUX. RELAY CONTACTS.
- E29 UNDERGROUND POWER PULL BOX "PB-P1", 11" X 18", MAINTAIN 6" MINIMUM DISTANCE FROM FENCE, SEE DETAIL "B" AND "C", SHEET E7.1.
- E30 UNDERGROUND POWER PULL BOX "PB-P2", 11" X 18", MAINTAIN 6" MINIMUM DISTANCE FROM FENCE, SEE DETAIL "B" AND "C", SHEET E7.1.
- E31 UNDERGROUND POWER PULL BOX "PB-P3", 11" X 18", MAINTAIN 6" MINIMUM DISTANCE FROM FENCE, SEE DETAIL "B" AND "C", SHEET E7.1.
- E48 CATHODIC PROTECTION RECTIFIER APPROXIMATE LOCATION. SEE SHEETS CP1.0 - CP1.5 FOR DETAILS.

**NOTES:**

1. DRAWINGS ARE DIAGRAMMATIC ONLY. THE EXACT LOCATION OF EQUIPMENT, MOUNTING HEIGHTS, METHODS OF SUPPORT AND CONDUIT RUNS SHALL BE COORDINATED AND DETERMINED IN THE FIELD.
2. AS SURVEYED CONDUIT RUNS SHOULD BE COMPLETED WITHIN THE CODE REQUIRED 360 DEGREE BEND LIMIT. IF FOR ANY REASON THIS CANNOT BE ACHIEVED, A PULL OR JUNCTION BOX MUST BE INSERTED IN THE IMPACTED CONDUIT RUN BY THE CONTRACTOR.
3. CONTRACTOR SHALL COORDINATE BUILDING CIRCUITS, AND UNDERGROUND VS ABOVEGROUND CONDUIT ROUTING WITH BUILDING MANUFACTURER FOR STUB UP LOCATIONS AND ABOVE GROUND CONDUIT ROUTING OPTIONS.
4. GATE MOTOR SHALL BE INSTALLED PER MANUFACTURER REQUIREMENTS. INSTALL LOOPS, PHOTO SENSORS, AND ENTRY/EXIT KEYPAD PER PLANS AND MANUFACTURER REQUIREMENTS.
5. CONTRACTOR SHALL MOUNT MCC AND SES AT LEAST 42" APART, IN ACCORDANCE WITH WORKING SPACE REQUIREMENTS OF NEC TABLE 110.26(A)(1).
6. TOWABLE GENERATOR SHALL BE PROVIDED BY THE CITY AND BE EQUIPPED WITH DETACHABLE TRAILER HITCH TO ALLOW FOR CLEARANCES WHILE PARKED.
7. TEMPORARY CABLES TO THE GENERATOR SHALL BE INSTALLED AND PROTECTED IN ACCORDANCE WITH MANUFACTURER REQUIREMENTS AND NEC 590.

EXISTING POWER POLE

ISSUED FOR CONSTRUCTION

**DIAL ALERT**  
DIAL TOLL FREE 811  
AT LEAST TWO DAYS BEFORE YOU DIG  
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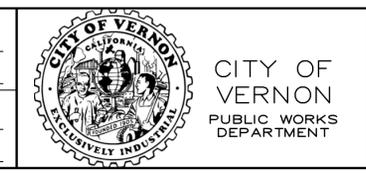
REGISTERED PROFESSIONAL ENGINEER  
CITY OF VERNON, CALIFORNIA  
E 22545  
EXP. 12/31/22  
STATE OF CALIFORNIA

NO.	DATE	REVISIONS

DESIGN: G.T.	CHECKED: C.N.	DATE: NOVEMBER 2021
DRAWN: N.C.		

UTIL. DIV.	REVIEWED BY	DATE
TRAFFIC		
ENG. SERVICES		
STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L		
CONSTRUCTION		

PREPARED UNDER THE SUPERVISION OF:  
CHRIS NAJARIAN, P.E. DATE: 12/31/22  
R.C.E. NO. 22545 EXP. DATE: 12/31/22  
REVIEWED BY: DATE: EXP. DATE:



**WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058  
**ELECTRICAL POWER PLAN**

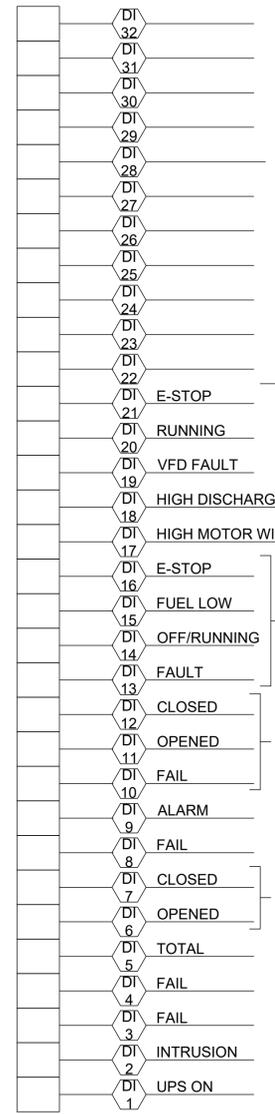




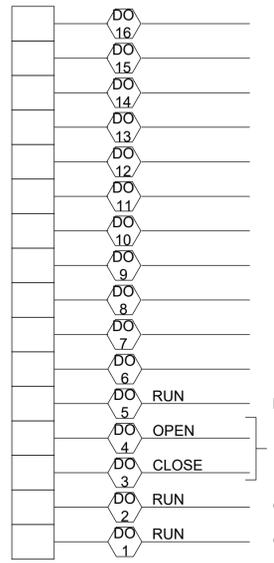




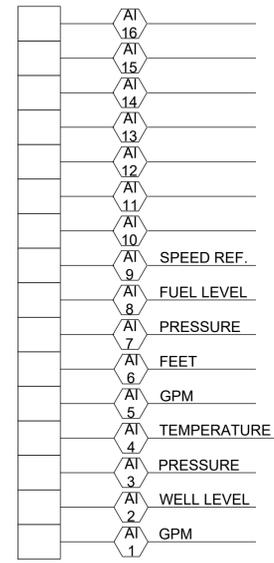
DIGITAL INPUT MODULE



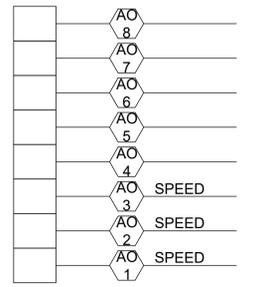
DIGITAL OUTPUT MODULE



ANALOG INPUT MODULE



ANALOG OUTPUT MODULE



VFD

PORTABLE EMERGENCY GENERATOR

GATE MOTOR CONTROLLER (LS-022310)

POWER METER

24VDC POWER SUPPLY

P-TO-W VALVE POSITION SENSOR (V-022123)

FLOW METER (FE-022140)

CL2 DOSING PUMP (PMP-022102)

CL2 DOSING PUMP (PMP-022101)

INTRUSION ALARM (YAS-022171)

UPS ON UNINTERRUPTIBLE POWER SUPPLY

PORTABLE EMERGENCY GENERATOR

P-TO-W VALVE (V-022123)

CL2 DOSING PUMP (PMP-022102)

CL2 DOSING PUMP (PMP-022101)

VFD

PORTABLE EMERGENCY GENERATOR

SYSTEM PRESSURE GAUGE (PIT-022152)

NaOCL ULTRASONIC LEVEL INDICATOR (LI-022181)

FLOW METER (FE-022140)

VFD TEMPERATURE SENSOR (TE-022172)

PUMP PRESSURE GAUGE (PIT-022150)

LEVEL TRANSMITTER (LT-022180)

FLUSH FLOW METER (FE-022141)

VFD

CL2 DOSING PUMP (PMP-022102)

CL2 DOSING PUMP (PMP-022101)

NOTES:

- CONTRACTOR TO VERIFY FACTORY-WIRED I/O AND WIRE IN FIELD I/O.
- PROVIDE MINIMUM 20% SPARE ON ALL I/O CARDS.
- ALL I/O SHALL BE PROTECTED WITH FUSES AND INTERPOSING RELAYS.

ISSUED FOR CONSTRUCTION

D:\Projects\1192-19 Well No. 22 Equipment and Site Improvements\1192-19 Well No. 22 Equipment and Site Improvements.dwg, 11/15/2021 10:52:27 AM

**DIGALERT**  
 DIAL TOLL FREE  
**811**  
 AT LEAST TWO DAYS  
 BEFORE YOU DIG  
 UNDERGROUND SERVICE ALERT  
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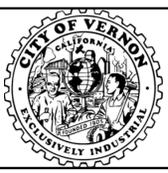
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DESIGN: *G.T.*  
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UTIL. DIV.  
 TRAFFIC  
 ENG. SERVICES  
 STREET DESIGN  
 MAINTENANCE  
 RIGHT-OF-WAY  
 P.T. & L  
 CONSTRUCTION

REVIEWED BY	DATE

PREPARED UNDER THE SUPERVISION OF:  
 CHRIS NAJARIAN, P.E. DATE: \_\_\_\_\_  
 R.C.E. NO. 22545 EXP. DATE: 12/31/22  
 REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
 R.C.E. NO. \_\_\_\_\_ EXP. DATE: \_\_\_\_\_



**CITY OF VERNON**  
 PUBLIC WORKS  
 DEPARTMENT

**WELL NO. 22  
 EQUIPMENT AND  
 SITE IMPROVEMENTS**  
 4305 SANTA FE AVENUE VERNON, CA. 90058

**PLC IO DIAGRAM**

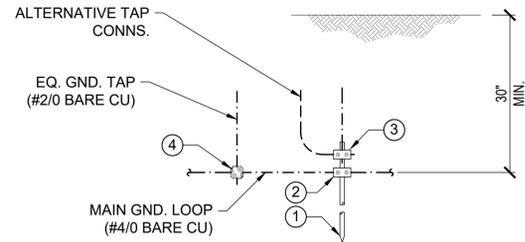
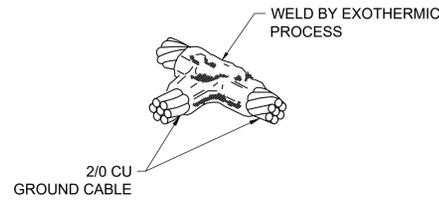
SHEET NO.  
**E5.0**  
 DWG. NO.  
 43 OF 60



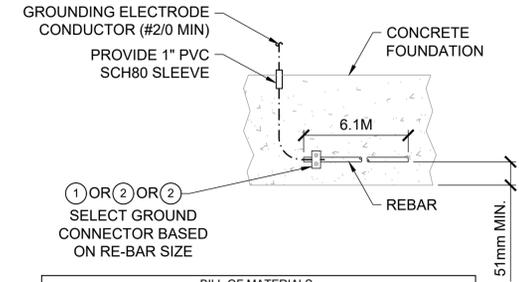


**NOTES:**

1. STRIP BACK INSULATION TO MAKE CONNECTION.



BILL OF MATERIALS		
NO.	DESCRIPTION	QTY
1	GROUND ROD, 3/4" DIA. x 10', COPPER-CLAD STEEL	1
2	GROUND ROD CONNECTOR (5/8"-3/4", 2/0 SOL-250) BURNDY #GAR6429 OR EQUAL.	1
3	GROUND ROD CONNECTOR (5/8"-3/4", #4 SOL-210) BURNDY #GAR6426 OR EQUAL.	1
4	GROUND CABLE CONNECTOR (#2/0-250 TO #4-#2/0) BURNDY #GX2926 OR EQUAL.	1



BILL OF MATERIALS		
NO.	DESCRIPTION	QTY
1	#4 RE-BAR, 1/2" DIA. - USE GND. CONN. BURNDY #GAR1126	1
2	#5 OR #6 RE-BAR, 5/8" OR 3/4" DIA. - USE GND. CONN. BURNDY #GAR6426	1
3	#7 OR #8 RE-BAR, 7/8" OR 1" DIA. - USE GND. CONN. BURNDY #GAR1426	1

**GROUNDING CONNECTION**

N.T.S.

**A**

**GROUNDING ROD CONNECTION DETAIL**

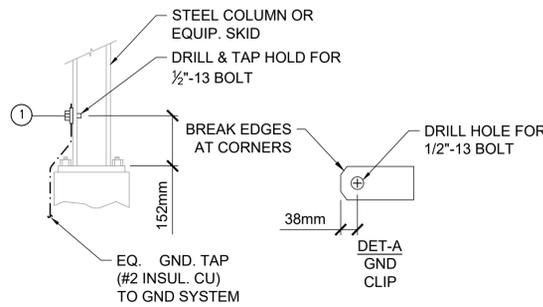
N.T.S.

**B**

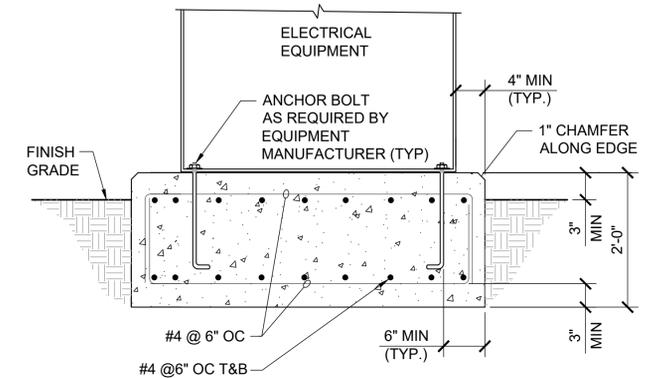
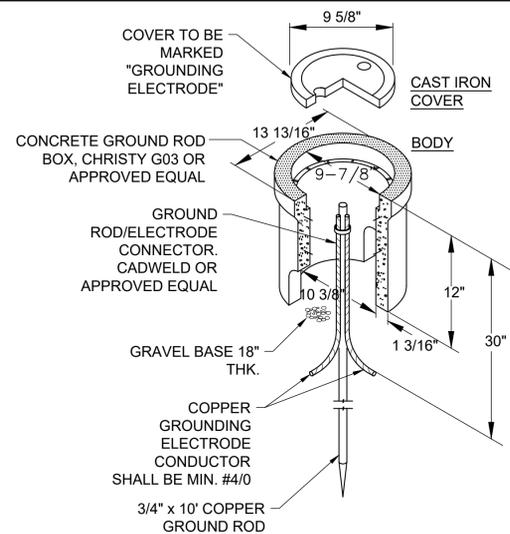
**GROUND TO REBAR**

N.T.S.

**C**



BILL OF MATERIALS		
NO.	DESCRIPTION	QTY
1	SERVIT POST CONNECTOR, 2/C, 1/2"-13 LONG STUD, #2-#2/0 W/ NUT & LOCKWASHER, BURNDY#K2C25B1	1
2	GROUND CLIP, MILD STEEL, 5" x 3" x 1/4" FIELD FABRICATE - SEE DET-A	1



- NOTES:**
1. EQUIPMENT BASE TOP SHALL BE LEVEL.
  2. PRIOR TO EQUIPMENT BASE INSTALLATION, COMPACT SOIL UNDER AND 6" BEYOND THE BASE TO 95% RELATIVE COMPACTION.

**STEEL COLUMN OR EQUIPMENT SKID GROUNDING**

N.T.S.

**D**

**CONCRETE GROUND ROD INSPECTION DETAIL**

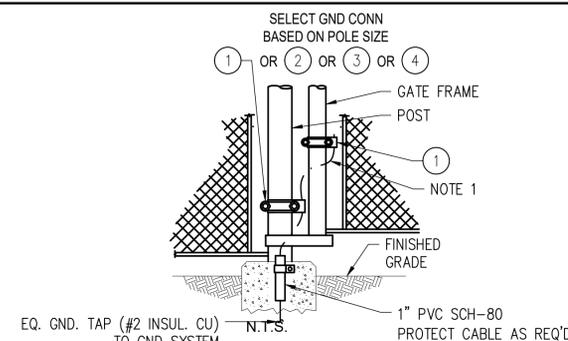
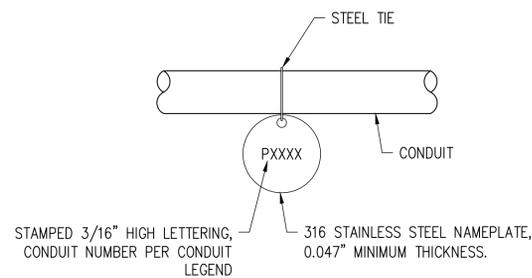
N.T.S.

**E**

**EQUIPMENT PAD DETAIL**

N.T.S.

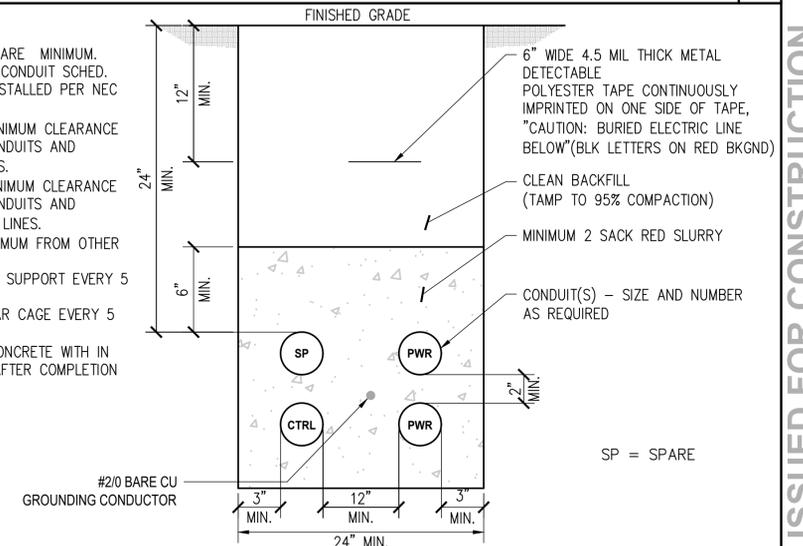
**F**



BILL OF MATERIALS		
NO.	DESCRIPTION	QTY
1	GROUND CONNECTOR, 1/C (1.25-2", #4-#4/0) BURNDY #GAR3903 OR EQUAL.	1
2	GROUND CONNECTOR, 1/C (2.5-3.5", #4-#4/0) BURNDY #GAR3904 OR EQUAL.	1
3	GROUND CONNECTOR, 1/C (6", #4-#4/0) BURNDY #GAR3906 OR EQUAL.	1

**NOTES:**

1. ALL DIMENSIONS ARE MINIMUM. SEE PLANS AND CONDUIT SCHED.
2. BARE COPPER INSTALLED PER NEC 250.52 (A)(3).
3. MAINTAIN 24" MINIMUM CLEARANCE FROM POWER CONDUITS AND GAS/SEWER LINES.
4. MAINTAIN 12" MINIMUM CLEARANCE FROM POWER CONDUITS AND WATER/CONTROL LINES.
5. MAINTAIN 2" MINIMUM FROM OTHER CONDUITS.
6. INSTALL CONDUIT SUPPORT EVERY 5 FEET MINIMUM.
7. INSTALL #4 REBAR CAGE EVERY 5 FEET MINIMUM.
8. REPLACE SOIL/CONCRETE WITH IN KIND MATERIAL AFTER COMPLETION



**CONDUIT MARKING DETAIL**

N.T.S.

**G**

**GROUND TO FENCE DETAIL**

N.T.S.

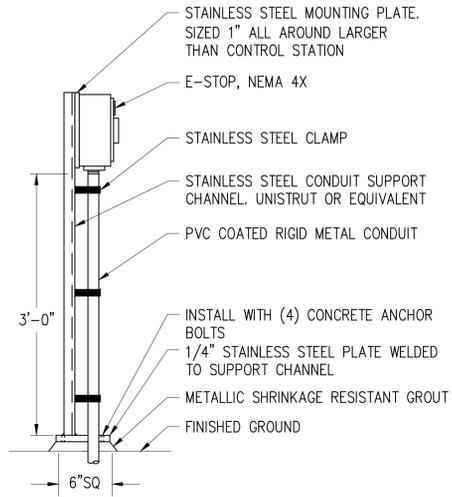
**H**

**TYPICAL CONDUIT TRENCH DETAIL**

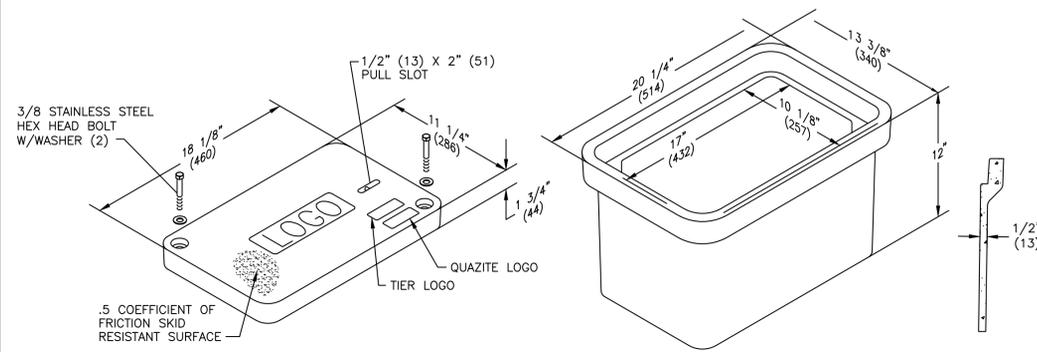
N.T.S.

**J**

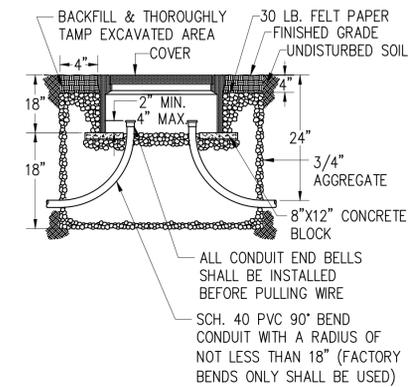
Dimension 1: 1/16" = 1.5mm; 1/8" = 3.2mm; 1/4" = 6.4mm; 3/8" = 9.6mm; 1/2" = 12.7mm; 5/8" = 15.9mm; 3/4" = 19.1mm; 7/8" = 22.2mm; 1" = 25.4mm; 1 1/8" = 29.5mm; 1 1/4" = 31.8mm; 1 3/8" = 34.9mm; 1 1/2" = 38.1mm; 1 5/8" = 41.3mm; 1 3/4" = 44.5mm; 1 7/8" = 47.6mm; 2" = 50.8mm; 2 1/8" = 54.0mm; 2 1/4" = 57.1mm; 2 3/8" = 60.3mm; 2 1/2" = 63.5mm; 2 5/8" = 66.7mm; 2 3/4" = 69.9mm; 2 7/8" = 73.0mm; 3" = 76.2mm; 3 1/8" = 79.4mm; 3 1/4" = 82.6mm; 3 3/8" = 85.8mm; 3 1/2" = 89.0mm; 3 5/8" = 92.2mm; 3 3/4" = 95.4mm; 3 7/8" = 98.6mm; 4" = 101.6mm; 4 1/8" = 104.8mm; 4 1/4" = 108.0mm; 4 3/8" = 111.2mm; 4 1/2" = 114.4mm; 4 5/8" = 117.6mm; 4 3/4" = 120.8mm; 4 7/8" = 124.0mm; 5" = 127.0mm; 5 1/8" = 130.2mm; 5 1/4" = 133.4mm; 5 3/8" = 136.6mm; 5 1/2" = 139.8mm; 5 5/8" = 143.0mm; 5 3/4" = 146.2mm; 5 7/8" = 149.4mm; 6" = 152.4mm; 6 1/8" = 155.6mm; 6 1/4" = 158.8mm; 6 3/8" = 162.0mm; 6 1/2" = 165.2mm; 6 5/8" = 168.4mm; 6 3/4" = 171.6mm; 6 7/8" = 174.8mm; 7" = 177.8mm; 7 1/8" = 181.0mm; 7 1/4" = 184.2mm; 7 3/8" = 187.4mm; 7 1/2" = 190.6mm; 7 5/8" = 193.8mm; 7 3/4" = 197.0mm; 7 7/8" = 200.2mm; 8" = 203.2mm; 8 1/8" = 206.4mm; 8 1/4" = 209.6mm; 8 3/8" = 212.8mm; 8 1/2" = 216.0mm; 8 5/8" = 219.2mm; 8 3/4" = 222.4mm; 8 7/8" = 225.6mm; 9" = 228.6mm; 9 1/8" = 231.8mm; 9 1/4" = 235.0mm; 9 3/8" = 238.2mm; 9 1/2" = 241.4mm; 9 5/8" = 244.6mm; 9 3/4" = 247.8mm; 9 7/8" = 251.0mm; 10" = 254.0mm; 10 1/8" = 257.2mm; 10 1/4" = 260.4mm; 10 3/8" = 263.6mm; 10 1/2" = 266.8mm; 10 5/8" = 270.0mm; 10 3/4" = 273.2mm; 10 7/8" = 276.4mm; 11" = 282.6mm; 11 1/8" = 285.8mm; 11 1/4" = 289.0mm; 11 3/8" = 292.2mm; 11 1/2" = 295.4mm; 11 5/8" = 298.6mm; 11 3/4" = 301.8mm; 11 7/8" = 305.0mm; 12" = 304.8mm; 12 1/8" = 308.0mm; 12 1/4" = 311.2mm; 12 3/8" = 314.4mm; 12 1/2" = 317.6mm; 12 5/8" = 320.8mm; 12 3/4" = 324.0mm; 12 7/8" = 327.2mm; 13" = 330.2mm; 13 1/8" = 333.4mm; 13 1/4" = 336.6mm; 13 3/8" = 339.8mm; 13 1/2" = 343.0mm; 13 5/8" = 346.2mm; 13 3/4" = 349.4mm; 13 7/8" = 352.6mm; 14" = 357.0mm; 14 1/8" = 360.2mm; 14 1/4" = 363.4mm; 14 3/8" = 366.6mm; 14 1/2" = 369.8mm; 14 5/8" = 373.0mm; 14 3/4" = 376.2mm; 14 7/8" = 379.4mm; 15" = 384.0mm; 15 1/8" = 387.2mm; 15 1/4" = 390.4mm; 15 3/8" = 393.6mm; 15 1/2" = 396.8mm; 15 5/8" = 400.0mm; 15 3/4" = 403.2mm; 15 7/8" = 406.4mm; 16" = 412.8mm; 16 1/8" = 416.0mm; 16 1/4" = 419.2mm; 16 3/8" = 422.4mm; 16 1/2" = 425.6mm; 16 5/8" = 428.8mm; 16 3/4" = 432.0mm; 16 7/8" = 435.2mm; 17" = 441.6mm; 17 1/8" = 444.8mm; 17 1/4" = 448.0mm; 17 3/8" = 451.2mm; 17 1/2" = 454.4mm; 17 5/8" = 457.6mm; 17 3/4" = 460.8mm; 17 7/8" = 464.0mm; 18" = 473.4mm; 18 1/8" = 476.6mm; 18 1/4" = 479.8mm; 18 3/8" = 483.0mm; 18 1/2" = 486.2mm; 18 5/8" = 489.4mm; 18 3/4" = 492.6mm; 18 7/8" = 495.8mm; 19" = 505.2mm; 19 1/8" = 508.4mm; 19 1/4" = 511.6mm; 19 3/8" = 514.8mm; 19 1/2" = 518.0mm; 19 5/8" = 521.2mm; 19 3/4" = 524.4mm; 19 7/8" = 527.6mm; 20" = 538.4mm; 20 1/8" = 541.6mm; 20 1/4" = 544.8mm; 20 3/8" = 548.0mm; 20 1/2" = 551.2mm; 20 5/8" = 554.4mm; 20 3/4" = 557.6mm; 20 7/8" = 560.8mm; 21" = 573.6mm; 21 1/8" = 576.8mm; 21 1/4" = 580.0mm; 21 3/8" = 583.2mm; 21 1/2" = 586.4mm; 21 5/8" = 589.6mm; 21 3/4" = 592.8mm; 21 7/8" = 596.0mm; 22" = 609.6mm; 22 1/8" = 612.8mm; 22 1/4" = 616.0mm; 22 3/8" = 619.2mm; 22 1/2" = 622.4mm; 22 5/8" = 625.6mm; 22 3/4" = 628.8mm; 22 7/8" = 632.0mm; 23" = 645.6mm; 23 1/8" = 648.8mm; 23 1/4" = 652.0mm; 23 3/8" = 655.2mm; 23 1/2" = 658.4mm; 23 5/8" = 661.6mm; 23 3/4" = 664.8mm; 23 7/8" = 668.0mm; 24" = 681.6mm; 24 1/8" = 684.8mm; 24 1/4" = 688.0mm; 24 3/8" = 691.2mm; 24 1/2" = 694.4mm; 24 5/8" = 697.6mm; 24 3/4" = 700.8mm; 24 7/8" = 704.0mm; 25" = 717.6mm; 25 1/8" = 720.8mm; 25 1/4" = 724.0mm; 25 3/8" = 727.2mm; 25 1/2" = 730.4mm; 25 5/8" = 733.6mm; 25 3/4" = 736.8mm; 25 7/8" = 740.0mm; 26" = 753.6mm; 26 1/8" = 756.8mm; 26 1/4" = 760.0mm; 26 3/8" = 763.2mm; 26 1/2" = 766.4mm; 26 5/8" = 769.6mm; 26 3/4" = 772.8mm; 26 7/8" = 776.0mm; 27" = 792.0mm; 27 1/8" = 795.2mm; 27 1/4" = 798.4mm; 27 3/8" = 801.6mm; 27 1/2" = 804.8mm; 27 5/8" = 808.0mm; 27 3/4" = 811.2mm; 27 7/8" = 814.4mm; 28" = 828.0mm; 28 1/8" = 831.2mm; 28 1/4" = 834.4mm; 28 3/8" = 837.6mm; 28 1/2" = 840.8mm; 28 5/8" = 844.0mm; 28 3/4" = 847.2mm; 28 7/8" = 850.4mm; 29" = 864.0mm; 29 1/8" = 867.2mm; 29 1/4" = 870.4mm; 29 3/8" = 873.6mm; 29 1/2" = 876.8mm; 29 5/8" = 880.0mm; 29 3/4" = 883.2mm; 29 7/8" = 886.4mm; 30" = 900.0mm; 30 1/8" = 903.2mm; 30 1/4" = 906.4mm; 30 3/8" = 909.6mm; 30 1/2" = 912.8mm; 30 5/8" = 916.0mm; 30 3/4" = 919.2mm; 30 7/8" = 922.4mm; 31" = 938.4mm; 31 1/8" = 941.6mm; 31 1/4" = 944.8mm; 31 3/8" = 948.0mm; 31 1/2" = 951.2mm; 31 5/8" = 954.4mm; 31 3/4" = 957.6mm; 31 7/8" = 960.8mm; 32" = 974.4mm; 32 1/8" = 977.6mm; 32 1/4" = 980.8mm; 32 3/8" = 984.0mm; 32 1/2" = 987.2mm; 32 5/8" = 990.4mm; 32 3/4" = 993.6mm; 32 7/8" = 996.8mm; 33" = 1014.0mm; 33 1/8" = 1017.2mm; 33 1/4" = 1020.4mm; 33 3/8" = 1023.6mm; 33 1/2" = 1026.8mm; 33 5/8" = 1030.0mm; 33 3/4" = 1033.2mm; 33 7/8" = 1036.4mm; 34" = 1056.0mm; 34 1/8" = 1059.2mm; 34 1/4" = 1062.4mm; 34 3/8" = 1065.6mm; 34 1/2" = 1068.8mm; 34 5/8" = 1072.0mm; 34 3/4" = 1075.2mm; 34 7/8" = 1078.4mm; 35" = 1098.0mm; 35 1/8" = 1101.2mm; 35 1/4" = 1104.4mm; 35 3/8" = 1107.6mm; 35 1/2" = 1110.8mm; 35 5/8" = 1114.0mm; 35 3/4" = 1117.2mm; 35 7/8" = 1120.4mm; 36" = 1140.0mm; 36 1/8" = 1143.2mm; 36 1/4" = 1146.4mm; 36 3/8" = 1149.6mm; 36 1/2" = 1152.8mm; 36 5/8" = 1156.0mm; 36 3/4" = 1159.2mm; 36 7/8" = 1162.4mm; 37" = 1184.0mm; 37 1/8" = 1187.2mm; 37 1/4" = 1190.4mm; 37 3/8" = 1193.6mm; 37 1/2" = 1196.8mm; 37 5/8" = 1200.0mm; 37 3/4" = 1203.2mm; 37 7/8" = 1206.4mm; 38" = 1232.0mm; 38 1/8" = 1235.2mm; 38 1/4" = 1238.4mm; 38 3/8" = 1241.6mm; 38 1/2" = 1244.8mm; 38 5/8" = 1248.0mm; 38 3/4" = 1251.2mm; 38 7/8" = 1254.4mm; 39" = 1284.0mm; 39 1/8" = 1287.2mm; 39 1/4" = 1290.4mm; 39 3/8" = 1293.6mm; 39 1/2" = 1296.8mm; 39 5/8" = 1300.0mm; 39 3/4" = 1303.2mm; 39 7/8" = 1306.4mm; 40" = 1344.0mm; 40 1/8" = 1347.2mm; 40 1/4" = 1350.4mm; 40 3/8" = 1353.6mm; 40 1/2" = 1356.8mm; 40 5/8" = 1360.0mm; 40 3/4" = 1363.2mm; 40 7/8" = 1366.4mm; 41" = 1416.0mm; 41 1/8" = 1419.2mm; 41 1/4" = 1422.4mm; 41 3/8" = 1425.6mm; 41 1/2" = 1428.8mm; 41 5/8" = 1432.0mm; 41 3/4" = 1435.2mm; 41 7/8" = 1438.4mm; 42" = 1488.0mm; 42 1/8" = 1491.2mm; 42 1/4" = 1494.4mm; 42 3/8" = 1497.6mm; 42 1/2" = 1500.8mm; 42 5/8" = 1504.0mm; 42 3/4" = 1507.2mm; 42 7/8" = 1510.4mm; 43" = 1560.0mm; 43 1/8" = 1563.2mm; 43 1/4" = 1566.4mm; 43 3/8" = 1569.6mm; 43 1/2" = 1572.8mm; 43 5/8" = 1576.0mm; 43 3/4" = 1579.2mm; 43 7/8" = 1582.4mm; 44" = 1632.0mm; 44 1/8" = 1635.2mm; 44 1/4" = 1638.4mm; 44 3/8" = 1641.6mm; 44 1/2" = 1644.8mm; 44 5/8" = 1648.0mm; 44 3/4" = 1651.2mm; 44 7/8" = 1654.4mm; 45" = 1704.0mm; 45 1/8" = 1707.2mm; 45 1/4" = 1710.4mm; 45 3/8" = 1713.6mm; 45 1/2" = 1716.8mm; 45 5/8" = 1720.0mm; 45 3/4" = 1723.2mm; 45 7/8" = 1726.4mm; 46" = 1784.0mm; 46 1/8" = 1787.2mm; 46 1/4" = 1790.4mm; 46 3/8" = 1793.6mm; 46 1/2" = 1796.8mm; 46 5/8" = 1800.0mm; 46 3/4" = 1803.2mm; 46 7/8" = 1806.4mm; 47" = 1864.0mm; 47 1/8" = 1867.2mm; 47 1/4" = 1870.4mm; 47 3/8" = 1873.6mm; 47 1/2" = 1876.8mm; 47 5/8" = 1880.0mm; 47 3/4" = 1883.2mm; 47 7/8" = 1886.4mm; 48" = 1944.0mm; 48 1/8" = 1947.2mm; 48 1/4" = 1950.4mm; 48 3/8" = 1953.6mm; 48 1/2" = 1956.8mm; 48 5/8" = 1960.0mm; 48 3/4" = 1963.2mm; 48 7/8" = 1966.4mm; 49" = 2024.0mm; 49 1/8" = 2027.2mm; 49 1/4" = 2030.4mm; 49 3/8" = 2033.6mm; 49 1/2" = 2036.8mm; 49 5/8" = 2040.0mm; 49 3/4" = 2043.2mm; 49 7/8" = 2046.4mm; 50" = 2112.0mm; 50 1/8" = 2115.2mm; 50 1/4" = 2118.4mm; 50 3/8" = 2121.6mm; 50 1/2" = 2124.8mm; 50 5/8" = 2128.0mm; 50 3/4" = 2131.2mm; 50 7/8" = 2134.4mm; 51" = 2200.0mm; 51 1/8" = 2203.2mm; 51 1/4" = 2206.4mm; 51 3/8" = 2209.6mm; 51 1/2" = 2212.8mm; 51 5/8" = 2216.0mm; 51 3/4" = 2219.2mm; 51 7/8" = 2222.4mm; 52" = 2296.0mm; 52 1/8" = 2299.2mm; 52 1/4" = 2302.4mm; 52 3/8" = 2305.6mm; 52 1/2" = 2308.8mm; 52 5/8" = 2312.0mm; 52 3/4" = 2315.2mm; 52 7/8" = 2318.4mm; 53" = 2392.0mm; 53 1/8" = 2395.2mm; 53 1/4" = 2398.4mm; 53 3/8" = 2401.6mm; 53 1/2" = 2404.8mm; 53 5/8" = 2408.0mm; 53 3/4" = 2411.2mm; 53 7/8" = 2414.4mm; 54" = 2504.0mm; 54 1/8" = 2507.2mm; 54 1/4" = 2510.4mm; 54 3/8" = 2513.6mm; 54 1/2" = 2516.8mm; 54 5/8" = 2520.0mm; 54 3/4" = 2523.2mm; 54 7/8" = 2526.4mm; 55" = 2616.0mm; 55 1/8" = 2619.2mm; 55 1/4" = 2622.4mm; 55 3/8" = 2625.6mm; 55 1/2" = 2628.8mm; 55 5/8" = 2632.0mm; 55 3/4" = 2635.2mm; 55 7/8" = 2638.4mm; 56" = 2736.0mm; 56 1/8" = 2739.2mm; 56 1/4" = 2742.4mm; 56 3/8" = 2745.6mm; 56 1/2" = 2748.8mm; 56 5/8" = 2752.0mm; 56 3/4" = 2755.2mm; 56 7/8" = 2758.4mm; 57" = 2856.0mm; 57 1/8" = 2859.2mm; 57 1/4" = 2862.4mm; 57 3/8" = 2865.6mm; 57 1/2" = 2868.8mm; 57 5/8" = 2872.0mm; 57 3/4" = 2875.2mm; 57 7/8" = 2878.4mm; 58" = 2984.0mm; 58 1/8" = 2987.2mm; 58 1/4" = 2990.4mm; 58 3/8" = 2993.6mm; 58 1/2" = 2996.8mm; 58 5/8" = 3000.0mm; 58 3/4" = 3003.2mm; 58 7/8" = 3006.4mm; 59" = 3112.0mm; 59 1/8" = 3115.2mm; 59 1/4" = 3118.4mm; 59 3/8" = 3121.6mm; 59 1/2" = 3124.8mm; 59 5/8" = 3128.0mm; 59 3/4" = 3131.2mm; 59 7/8" = 3134.4mm; 60" = 3256.0mm; 60 1/8" = 3259.2mm; 60 1/4" = 3262.4mm; 60 3/8" = 3265.6mm; 60 1/2" = 3268.8mm; 60 5/8" = 3272.0mm; 60 3/4" = 3275.2mm; 60 7/8" = 3278.4mm; 61" = 3400.0mm; 61 1/8" = 3403.2mm; 61 1/4" = 3406.4mm; 61 3/8" = 3409.6mm; 61 1/2" = 3412.8mm; 61 5/8" = 3416.0mm; 61 3/4" = 3419.2mm; 61 7/8" = 3422.4mm; 62" = 3552.0mm; 62 1/8" = 3555.2mm; 62 1/4" = 3558.4mm; 62 3/8" = 3561.6mm; 62 1/2" = 3564.8mm; 62 5/8" = 3568.0mm; 62 3/4" = 3571.2mm; 62 7/8" = 3574.4mm; 63" = 3704.0mm; 63 1/8" = 3707.2mm; 63 1/4" = 3



NOTES:  
INSTALL OUTSIDE OF HAZARDOUS AREA, NEAR BLOWER MOTORS.



- NOTES:
- 11 X 18" POLYMER CONCRETE PULL BOX, TYPE QUAZITE, PG STYLE, TIER RATED LEVEL 22, BOLTED COVER.
  - UNDERGROUND POWER PULL BOX COVERS SHALL BE LABELED "POWER", INCLUDE 2 BOLTS, TIER RATED LEVEL 22, TYPE QUAZITE, PART NUMBER PG1118HH0084, OR ENGINEER APPROVED EQUAL.
  - UNDERGROUND CONTROL PULL BOX COVERS SHALL BE LABELED "CONTROL", INCLUDE 2 BOLTS, TIER RATED LEVEL 22, TYPE QUAZITE, PART NUMBER PG1118HH0014, OR ENGINEER APPROVED EQUAL.
  - UNDERGROUND PULL BOXES FOR CONTROL AND POWER SHALL BE 12" DEEP, TIER RATED LEVEL 22, STANDARD OPEN BOTTOM, GASKETED, TYPE QUAZITE, PART NUMBER PG1118G12, OR ENGINEER APPROVED EQUAL.



**E-STOP MOUNT**

N.T.S.

**A**

**UNDERGROUND PULL BOX DETAIL - CONTROL AND POWER**

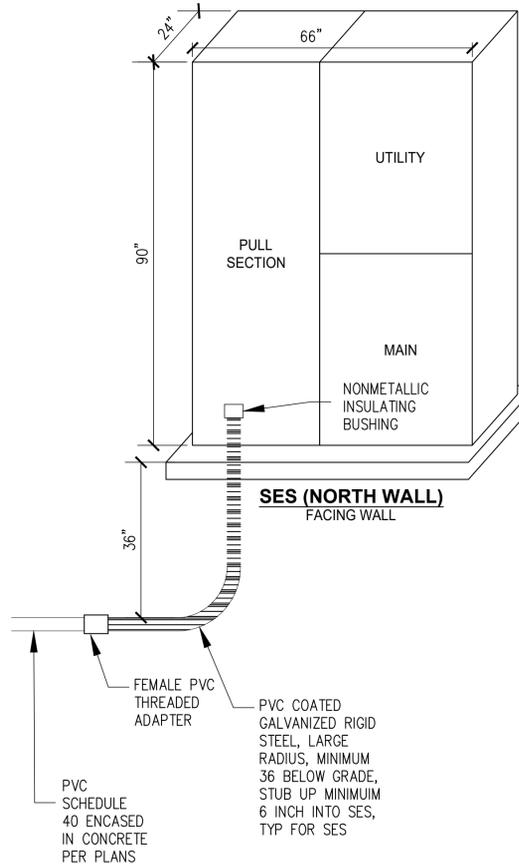
N.T.S.

**B**

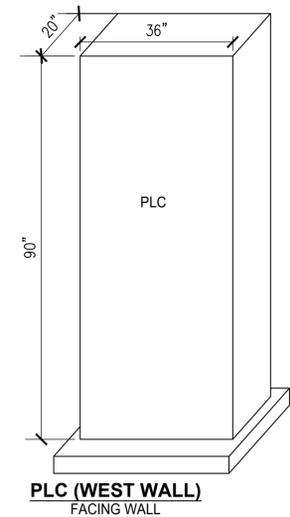
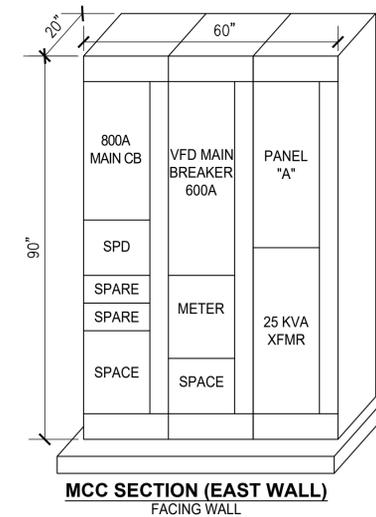
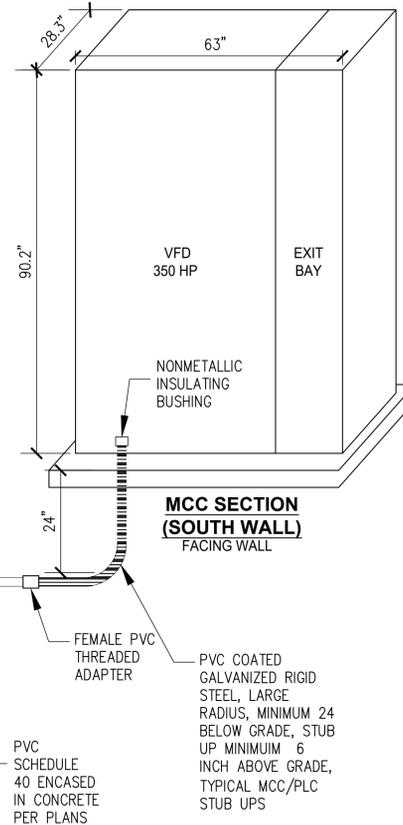
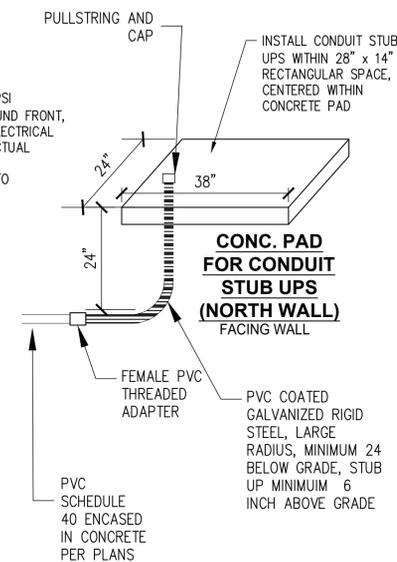
**UNDERGROUND PULL BOX CONDUIT DETAIL**

N.T.S.

**C**



EXTEND 4" THICK 2500PSI CONCRETE PAD 2" AROUND FRONT, BACK, AND SIDES OF ELECTRICAL EQUIPMENT. CONFIRM ACTUAL DIMENSIONS WITH GEAR MANUFACTURER PRIOR TO INSTALLATION. (TYP)

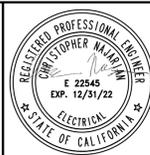
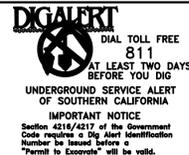


**SWITCH GEAR, CONDUIT STUB UP CONCRETE PAD, VFD, AND MCC ELEVATION**

N.T.S.

**D**

Dimension 1: 1/8" = 1" (P/S) Scale = 1/4" = 1' (L/M/T Feet); Version = 1  
Xref: 8020-5024r - E.dwg



NO.	DATE	REVISIONS

UTIL. DIV. TRAFFIC ENG. SERVICES STREET DESIGN MAINTENANCE RIGHT-OF-WAY P.T. & L CONSTRUCTION	REVIEWED BY	DATE

PREPARED UNDER THE SUPERVISION OF:	
CHRIS NAJARIAN, P.E.	DATE
R.C.E. NO. 22545	EXP. DATE: 12/31/22
REVIEWED BY:	DATE
R.C.E. NO. _____	EXP. DATE: _____



CITY OF VERNON  
PUBLIC WORKS DEPARTMENT

**WELL NO. 22  
EQUIPMENT AND  
SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058  
**ELECTRICAL DETAILS 2**

SHEET NO.  
**E7.1**  
DWG. NO.  
47 OF 60

FRP No.1192-19 WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS

ISSUED FOR CONSTRUCTION

P:\8020\engineering\8020 Well 22\electrical\DETAILS 2 - by rmm on 11/03/21 14:58:55 PM

8'-0" x 10'-0" TRANSFORMER PAD W/5'-0" x 8'-6" ENCLOSURE x 42" DEEP

MATERIAL LIST- K810-SB42-21

ITEM	PART NO.	DESCRIPTION	CAGE NO./ LOCATE	WEIGHT/ MOUNT
1	SB586-B42-21	43 1/2" BOTTOM SECTION W/ MONO FOOTING	CG-SB586-B42-21	9,500 lbs
2	PD96120-T6-21	6" TRANSFORMER PAD W/ F3048-PB-ANG FRAME CAST-IN	CG-PD96120-T6-21	4,900 lbs
3	12-20-22 20-10-419	3048 POLYMER CONCRETE COVER MARK "RIVERSIDE ELECTRIC" (6) 1/2" x 2-1/2" P.H.S.S. BOLTS w/CAPTIVE WASHER		
4	KNOCK OUT	16" x 20" K.O. x 3-1/2" DEEP	BOTTOM SECTION	(8) SHELL
6	55-10-416	1/2" P-35-T INSERT WITH CLEAN-OUT HOLE	TRANSFORMER PAD	(6) FRAME
7	55-10-830	1" GALVANIZED COIL THREAD INSERT	BOTTOM SECTION	(4) CORE
8	55-20-404	4 TON x 4-3/4" GALV. RISS FOR HANDLING	BOTTOM SECTION TRANSFORMER PAD	(4) SURFACE & CORE (4) TABLE

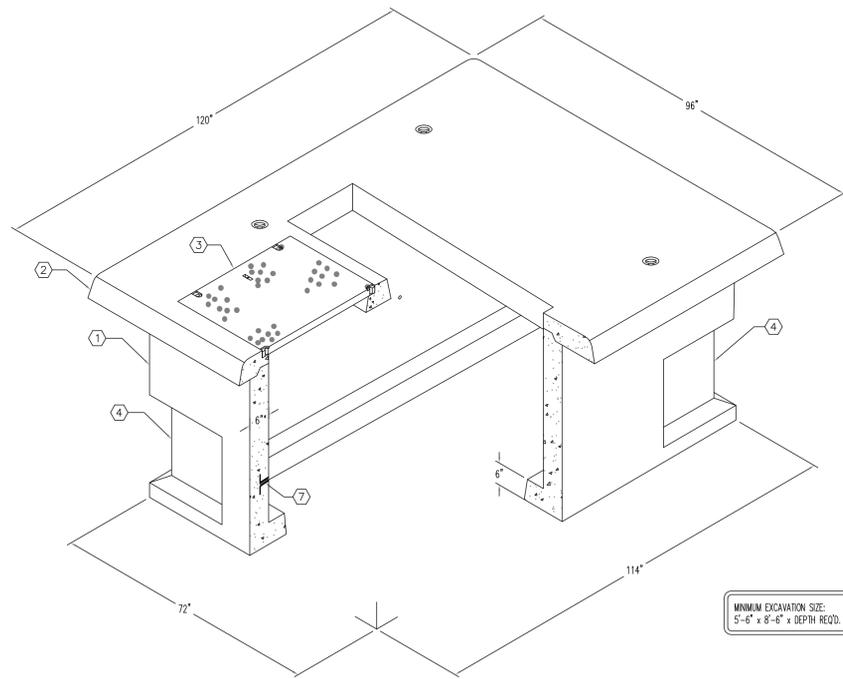
NOTES:

- TRANSFORMER PAD AND ENCLOSURE ARE DESIGNED FOR PARKWAY LOADING PER CALCS. USING 5,500 PSI. COMPRESSIVE STRENGTH CONCRETE.
- COVER IS DESIGNED FOR PARKWAY LOADING.
- VAULT TO BE PLACED ON A MIN. 6" BASE OF CRUSHER RUN FOR EVEN LOAD DISTRIBUTION AND EASE OF INSTALLATION.

THE FOLLOWING MATERIAL TO BE SHIPPED WITH EACH VAULT:  
(a) 7/8" x 1 3/4" CONSEAL GASKET (45 FT. REQ'D.)

ORDERING INFORMATION:

K810-SB42-21 FOR ASSEMBLY AS SHOWN.  
APPROVED FOR RIVERSIDE UGS-721, SB-4.  
TOTAL WEIGHT OF ASSEMBLY AS SHOWN IS 14,400 Lbs.

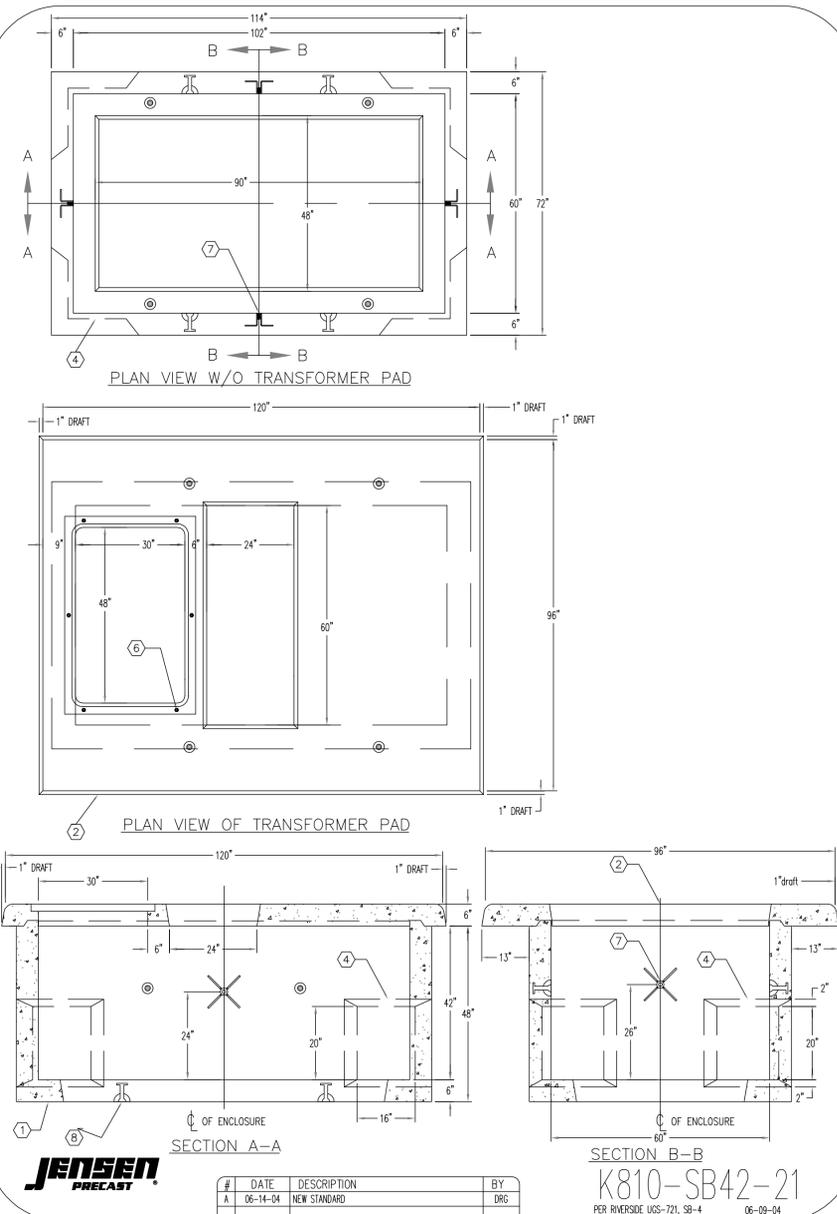


K810-SB42-21  
PER RIVERSIDE UGS-721, SB-4 06-09-04

MINIMUM EXCAVATION SIZE:  
5'-6" x 8'-6" x DEPTH REQ'D.

GENERAL NOTE

- CONCRETE TRANSFORMER PAD DETAILS SHOWN FOR REFERENCE. INSTALLATION AND EQUIPMENT SHALL BE PER THE REQUIREMENTS OF CITY OF VERNON PUBLIC UTILITIES.

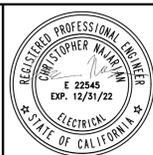


#	DATE	DESCRIPTION	BY
A	06-14-04	NEW STANDARD	DRG

K810-SB42-21  
PER RIVERSIDE UGS-721, SB-4 06-09-04

UTILITY TRANSFORMER PAD DETAILS

N.T.S.



NO.	DATE	REVISIONS

LINE IS 2 INCHES AT FULL SCALE (IF NOT 2"=SCALE ACCORDINGLY)  
DESIGN: CHRIS NAJARIAN  
DRAWN: RYAN C.  
CHECKED: DUNCAN S. LEE  
DATE: NOVEMBER 2021

UTIL. DIV. TRAFFIC ENG. SERVICES STREET DESIGN MAINTENANCE RIGHT-OF-WAY P.T. & L CONSTRUCTION

REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
PREPARED UNDER THE SUPERVISION OF: CHRIS NAJARIAN, P.E. DATE: \_\_\_\_\_ R.C.E. NO. 22545 EXP. DATE: 12/31/22  
REVIEWED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
R.C.E. NO. \_\_\_\_\_ EXP. DATE: \_\_\_\_\_

CITY OF VERNON PUBLIC WORKS DEPARTMENT



CITY OF VERNON PUBLIC WORKS DEPARTMENT

WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS 4305 SANTA FE AVENUE VERNON, CA. 90058  
ELECTRICAL DETAILS 3  
SHEET NO. E7.2  
DWG. NO. 48 OF 60

ISSUED FOR CONSTRUCTION

FRP No.1192-19 WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS

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INSTRUMENT IDENTIFICATION LETTERS (FSS)					LINE NUMBERING		GENERAL INSTRUMENT OR FUNCTION SYMBOLS					ABBREVIATIONS					
FIRST - LETTER (F)		SUCCEEDING - LETTERS (SS)			EQUIPMENT NUMBERING		VALVE SYMBOLS					MECHANICAL EQUIPMENT					
A	ANALYSIS		ALARM				00" - INFLT - 001 (EXAMPLE)	DISCRETE INSTRUMENTS	FIELD MOUNTED	PRIMARY LOCATION ACCESSIBLE TO OPERATOR	PRIMARY LOCATION INACCESSIBLE TO OPERATOR	AUXILIARY LOCATION ACCESSIBLE TO OPERATOR	HARDWARE INTERLOCK	ACP	ACCESS CONTROL PANEL	OCA	OPEN-CLOSE-AUTO
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE		F SS - PP TT NN (EXAMPLE)	SHARED DISPLAY SHARED CONTROL					DCS "SOFT" INTERLOCK	AE	ANALYTICAL SENSOR	OCR	OPEN-CLOSE-REMOTE
C	CONDUCTIVITY			CONTROLLER			EXAMPLE: LT-03121 = RAS/WAS PUMP STATION LEVEL TRANSDUCER #1	COMPUTER FUNCTION						AI	ANALOG INPUT	OIT	OPERATOR INTERFACE TERMINAL
D	DENSITY	DIFFERENTIAL					PROCESS LOCATION (PP)	PROGRAMMABLE LOGIC CONTROL						AIT	ANALYTICAL INDICATOR TRANSMITTER	OO	ON/OFF (MAINTAINED)
E	VOLTAGE		SENSOR, PRIMARY ELEMENT				SERIES LOCATION (TT)							AMP	AMPERE	OOA	ON-OFF-AUTO
F	FLOW RATE	RATIO (FRACTION)					FLUID CODE ABBREVIATION							AO	ANALOG OUTPUT	OOR	ON-OFF-REMOTE
G	GAUGE, GENERAL		CLASS VIEWING DEVICE				EQUIPMENT ABBREVIATIONS							AT	ANALYTICAL TRANSMITTER	OSC	OPEN-STOP-CLOSE
H	HAND				HIGH, OPENED								ATS	AUTOMATIC TRANSFER SWITCH	PE	PRESSURE SENSOR	
I	CURRENT (ELEC.)		INDICATING, INDICATOR										BLR	BLOWER	PG	PRESSURE GAUGE	
J	POWER		SCAN										CB	CIRCUIT BREAKER	PH	POTENTIAL OF HYDROGEN	
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE			CONTROL STATION								CBD	COARSE BUBBLE DIFFUSER	PI	PRESSURE INDICATOR / PULSE INPUT	
L	LEVEL		LIGHT		LOW, CLOSED								CE	CONDUCTIVITY SENSOR (TDS)	PID	PROPORTIONAL-INTEGRAL-DERIVATIVE	
M	MOISTURE, MOTION	MOMENTARY			MIDDLE								CFR	CHEMICAL FEEDER	PIT	PRESSURE INDICATOR TRANSMITTER	
N	INTRUSION, STATUS	MOMENTARY	STATUS	USER'S CHOICE	USER'S CHOICE								CG	COMBUSTIBLE GASES	PLC	PROGRAMMABLE LOGIC CONTROLLER	
O	OPERATOR, TORQUE		ORIFICE, RESTRICTION		USER'S CHOICE								CHV	CHECK VALVE	PMP	PUMP	
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION										CL2	CHLORINE	PNL	PANEL	
Q	QUANTITY	INTEGRATE, TOTALIZE											CMP	COMPACTOR	PO	PULSE OUTPUT	
R	RESET, RADIATION		RECORD OR PRINT										CON	CONVEYOR	PPG	POUNDS PER GALLON	
S	SPEED, FREQUENCY	SAFETY		SWITCH	SLOW								CWC	COMPACTOR/WASHER/CONVEYOR	PPH	POUNDS PER HOUR	
T	TEMPERATURE		TRANSDUCER, TRANSMITTER	TEST									DCS	DISTRIBUTED CONTROL SYSTEM	PPM	PARTS PER MILLION	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION								DI	DIGITAL INPUT	PRESS	PRESSURE	
V	VIBRATION, MECH. ANALYSIS			VALVE, DAMPER LOUVER									DO	DISSOLVED OXYGEN / DIGITAL OUTPUT	PRV	PRESSURE RELIEF OR REDUCING VALVE	
W	WEIGHT, FORCE		WELL										DRY	BIOSOLIDS DRYER	PSH	PRESSURE SWITCH HIGH	
X	SWITCH	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED								DSS	DISTRIBUTION SWITCHBOARD SECTION	PSI	POUNDS PER SQUARE INCH	
Y	EVENT, STATE, PRESENCE	Y AXIS	UNCLASSIFIED	RELAY, COMPUTE, CONVERT									DWG	DRAWING	PSL	PRESSURE SWITCH LOW	
Z	POSITION, DIMENSION Z AXIS			DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT									EDT	EDUCTOR TUBE	PT	PRESSURE TRANSMITTER	
LINE CODES					INSTRUMENT NUMBERING		VALVE ACTUATORS					RELIEF DEVICES					
MAJOR PROCESS LINE					FIRST LETTER (INSTRUMENT ID)		DIAPHRAGM ACTUATOR					AIR/PRESSURE RELIEF					
MINOR PROCESS LINE					SUCCEEDING LETTERS (INSTRUMENT ID)		MOTOR ACTUATOR					VACUUM RELIEF					
AIR					xx - DEVICE FUNCTION		SOLENOID ACTUATOR					RUPTURE DISK FOR PRESSURE RELIEF					
ELECTRICAL					EQUIPMENT NUMBER		CYLINDER ACTUATOR					RUPTURE DISK FOR VACUUM RELIEF					
PLC TO SCADA COMMUNICATION							REGULATORS					PIPING SYMBOLS					
ALARM PRIORITY LEVEL							PRESSURE REDUCING					Y STRAINER					
							BACK PRESSURE					BLIND FLANGE					
							REGULATOR WITH EXTERNAL PILOT					PRESSURE DIAPHRAGM SEAL					
							DIFFERENTIAL PRESSURE					CONCENTRIC REDUCER					
							EXHAUST FAN					ECCENTRIC REDUCER					
							DECANTER					ECCENTRIC REDUCER					
							POSITIVE DISPLACEMENT PUMP					ELECTRICAL					
							NOTE: ALL PRESSURE GAUGES AND OTHER SMALL PROCESS MECHANICAL INSTRUMENT EQUIPMENT SHALL BE SUPPLIED WITH ISOLATION VALVES AND ADDITIONAL APPURTENANCES (E.G. PRESSURE PULSATION DAMPENERS/SNUBBERS) AS REQUIRED FOR PROPER OPERATION					SENSOR OR CONTROL					
												PLC TO SCADA COMMUNICATION					
												ALARM PRIORITY LEVEL					

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**DIALERT**  
DIAL TOLL FREE 811  
AT LEAST TWO DAYS BEFORE YOU DIG  
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA  
IMPORTANT NOTICE  
Section 4216/4217 of the Government Code requires a Dig Alert Identification Number be issued before "Permit to Excavate" will be valid.

**PACE**  
Advanced Water Engineering  
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708  
P: (714) 481-7300 | www.pacewater.com

REGISTERED PROFESSIONAL ENGINEER  
DUNCAN S. LEE  
No. C44825 Exp. 03-31-22  
CIVIL  
STATE OF CALIFORNIA

NO.	DATE	REVISIONS

DESIGN:	DRAWN:	CHECKED:	DATE:
D.S.L.	M.S.A./J.S./R.C.	D.S.L.	SEPTEMBER 2021

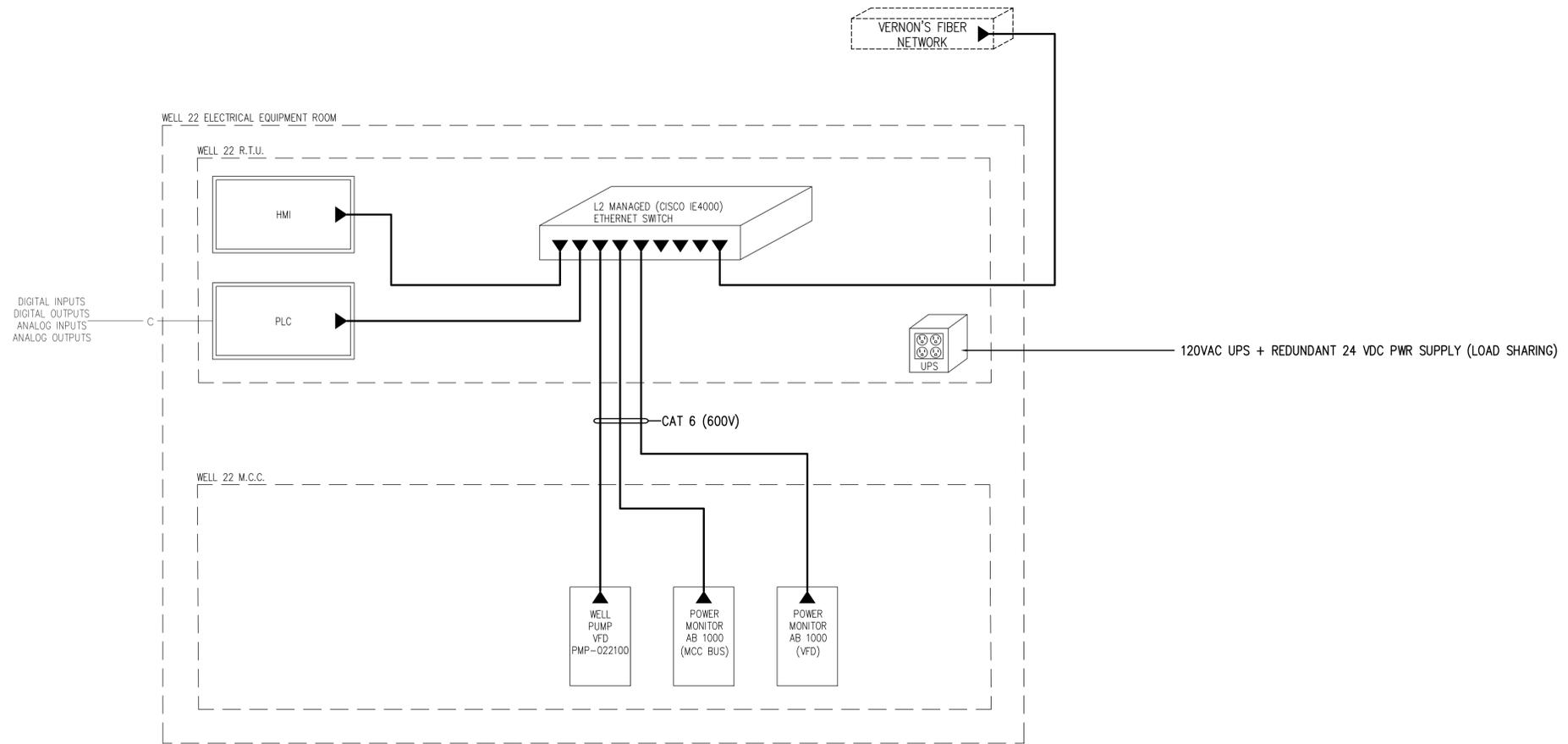
UTIL. DIV.	REVIEWED BY:	DATE:
TRAFFIC		
ENG. SERVICES		
STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L.		
CONSTRUCTION		

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DUNCAN S. LEE, P.E.  
R.C.E. NO. C44825 EXP. DATE: 03-31-22  
REVIEWED BY:  
R.C.E. NO. EXP. DATE:

**CITY OF VERNON**  
PUBLIC UTILITIES DEPARTMENT

**WELL NO. 22**  
**EQUIPMENT AND**  
**SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058

**SHEET NO. 10.0**  
DWG. NO. 49 OF 60



**NOTES**

1. FUTURE FIREWALL DEVICE TO BE PROVIDED BY THE CITY OF VERNON.

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 Author: 6626 - PDU/Long 6626-56247.rvt  
 Date: 03/31/22

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 DRAWN: *M.S.A. / J.S. / R.C.*  
 CHECKED: *D.S.L.*  
 DATE: *SEPTEMBER 2021*

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DUNCAN S. LEE, P.E. R.C.E. NO. <u>C44825</u> EXP. DATE: <u>03-31-22</u>
REVIEWED BY: DATE: R.C.E. NO. _____ EXP. DATE: _____



CITY OF VERNON  
 PUBLIC UTILITIES  
 DEPARTMENT

**WELL NO. 22  
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 4305 SANTA FE AVENUE VERNON, CA. 90058

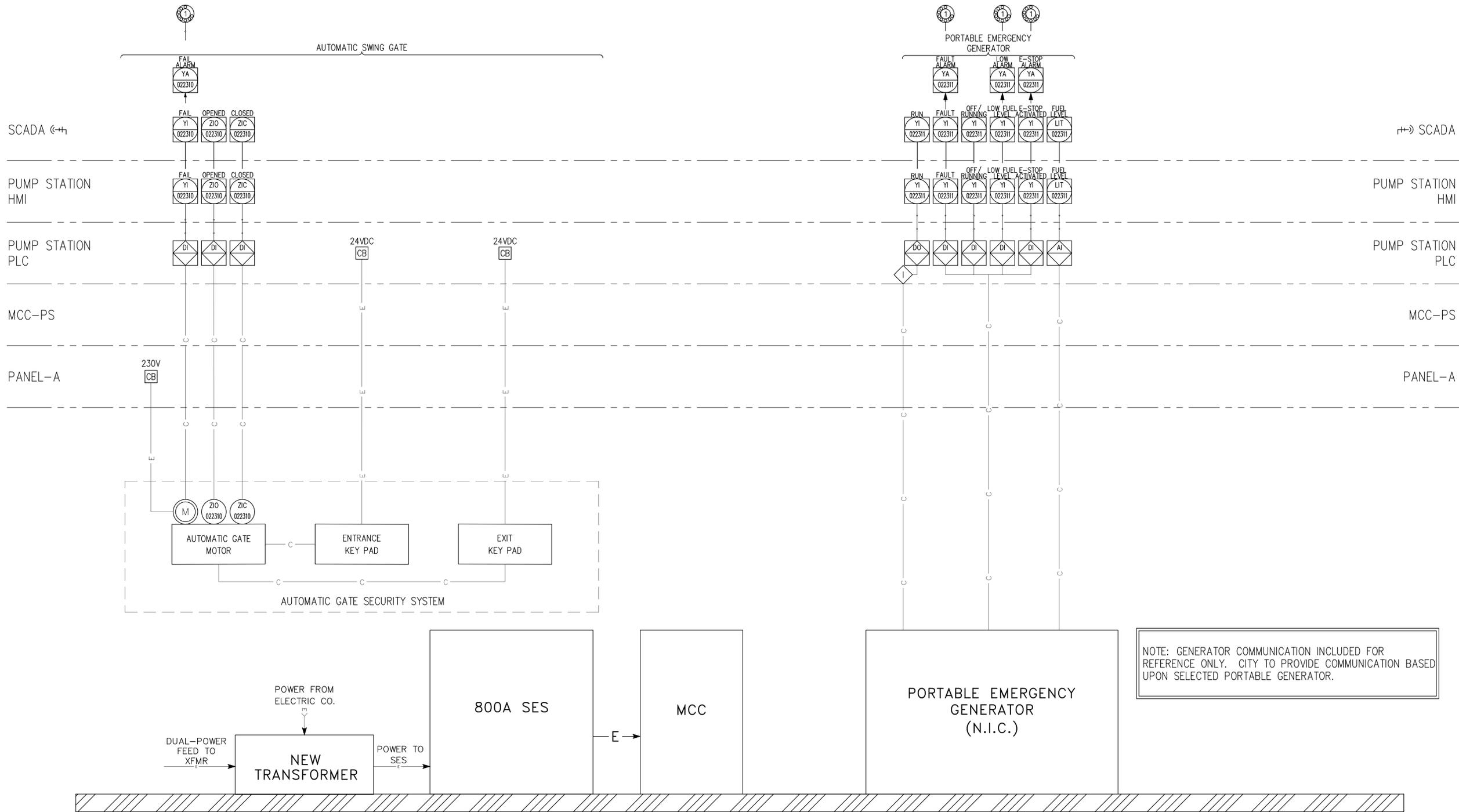
**NETWORK DIAGRAM**

SHEET NO. **11.0**  
 DWG. NO. **50 OF 60**

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CITY OF VERNON  
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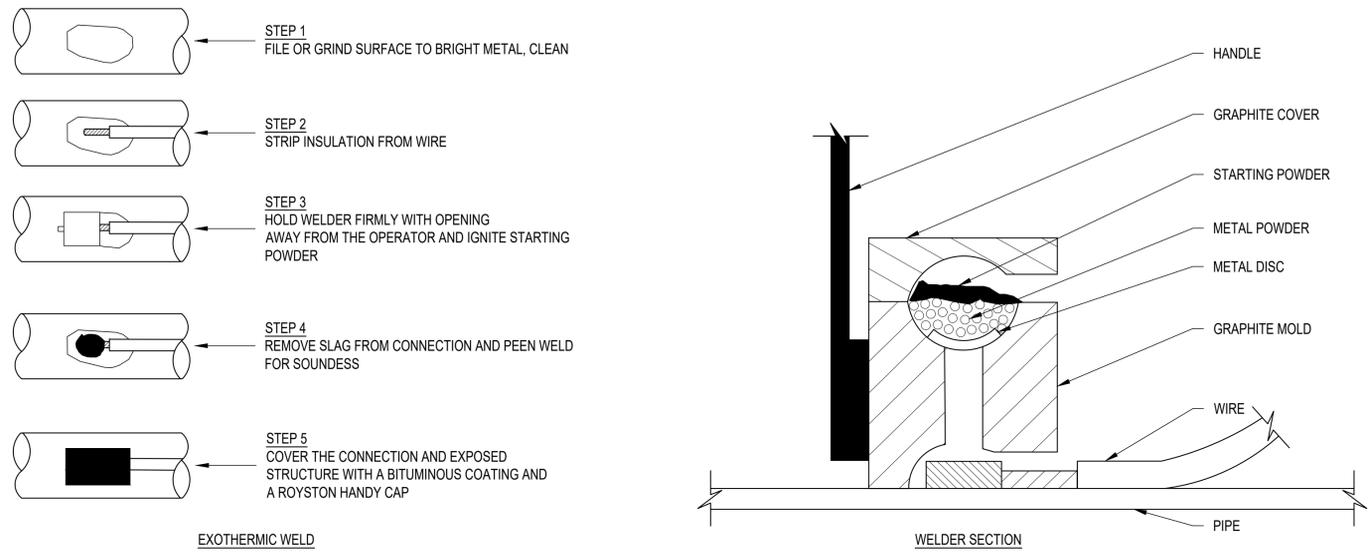
**WELL NO. 22  
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 SITE IMPROVEMENTS**  
 4305 SANTA FE AVENUE VERNON, CA. 90058  
**SES AND GENERATOR**

SHEET NO. **121**  
 DWG. NO. **52 OF 60**





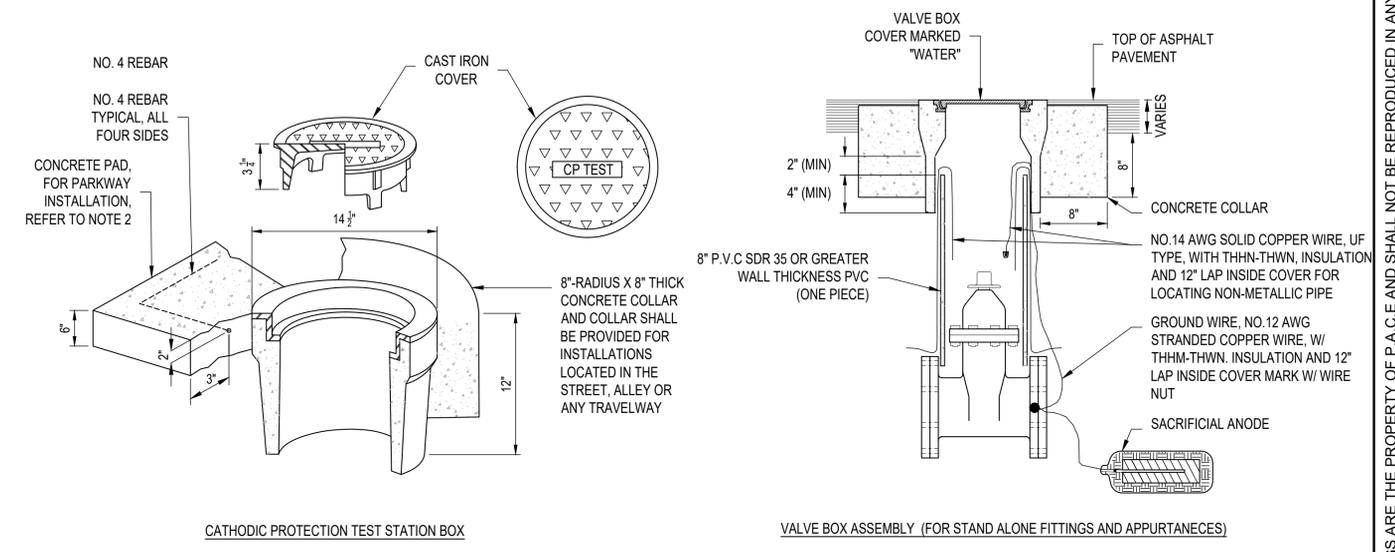




EXOTHERMIC WELD

NOTES:

1. WELDER SHOWN IS FOR HORIZONTAL SURFACES ONLY. FOR VERTICAL SURFACES, A SIDE WELDER IS REQUIRED WHILE PIN BRAZING IS ALLOWED.
2. ALL WIRE WELDS SHALL BE A MINIMUM OF 3" APART.
3. STANDARD WELD CARTRIDGES SHALL BE USED FOR STEEL SURFACES. FOR DUCTILE IRON, THE WELD SHALL BE XF-19 ALLOY OR EQUIVALENT. USE APPROPRIATE SIZED CHARGES AND MOLDS FOR THE WIRE GAGE AND POSITION.
4. EXTEND ROYBOND 747 COATING 3" ONTO PIPE COATING OR AROUND WELD AREA.
5. USE COPPER SLEEVES AS RECOMMENDED BY THE EXOTHERMIC WELD MANUFACTURED FOR THE WIRE TO BE WELDED.
6. USE THE APPROPRIATE WELD MOLDS FOR HORIZONTAL AND VERTICAL APPLICATION. THIS DETAIL ILLUSTRATES THE USE OF A HORIZONTAL WELD CONFIGURATION.



CATHODIC PROTECTION TEST STATION BOX

VALVE BOX ASSEMBLY (FOR STAND ALONE FITTINGS AND APPURTENANCES)

NOTES:

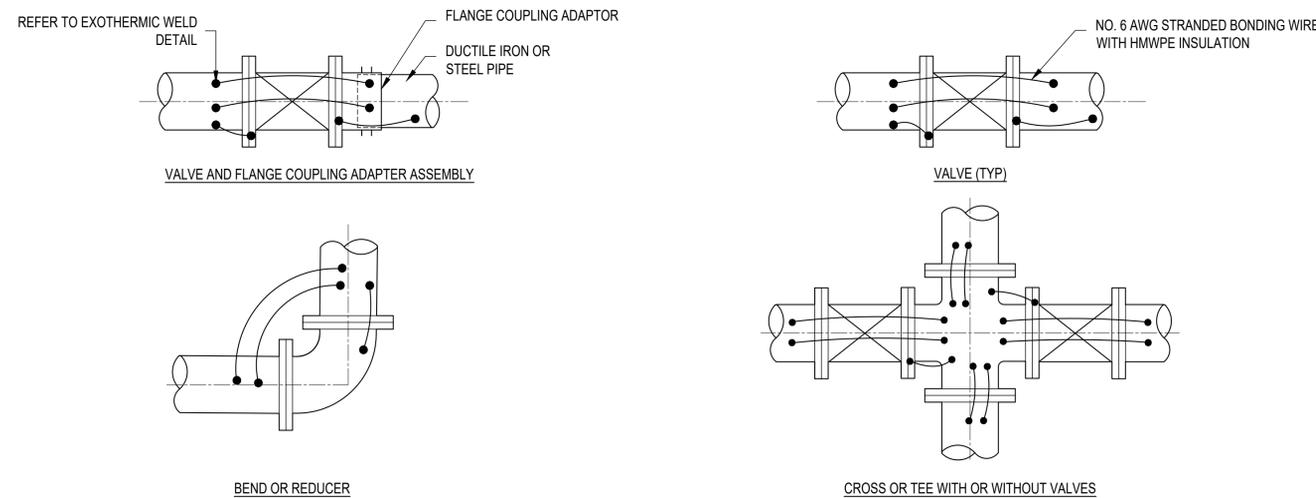
1. TEST STATION BOX IS TO BE LOCATED BEHIND THE CURB, OFF THE PAVED ROADWAY OR AS SHOWN ON THE APPROVED PLANS. DO NOT PLACE IN PARKING SPACES OR DRIVEWAYS.
2. PROVIDE 24" X 24" X 6" THICK REINFORCED CONCRETE PAD AROUND TEST BOX AT UNPAVED SITES.
3. CATHODIC PROTECTION TEST BOX SHALL BE H-20 TRAFFIC RATED, CHRISTY G-5 OR EQUAL.
4. BODY WEIGHT SHALL BE 54 LB MINIMUM. COVER WEIGHT SHALL BE 12 LB MINIMUM.
5. TOP OF VALVE BOX SHALL BE FLUSH WITH TOP OF PAVEMENT WITH A MINUS 1/2" MAX TOLERANCE.
6. RADIO LOCATION TAPE OR COPPER WIRE SHALL BE SECURELY TAPED TO THE INSIDE OF VALVE BOX.

EXOTHERMIC WELD DETAIL

N.T.S. A

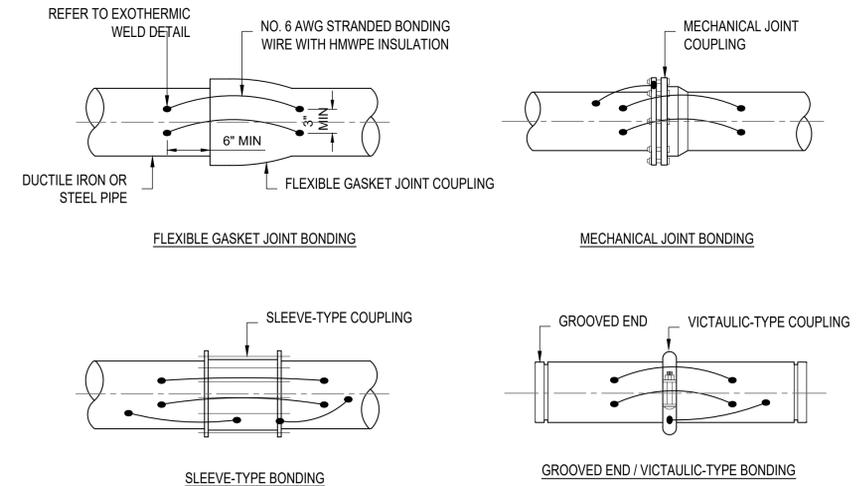
CATHODIC PROTECTION TEST STATION BOX AND VALVE ASSEMBLY FOR STAND ALONE FITTINGS AND APPURTENANCES

N.T.S. B



NOTES:

1. BOND WIRE SHALL BE NO. 6 AWG STRANDED HMWPE WIRE INSULATION UNLESS OTHER WISE SPECIFIED.
2. ALUMINO-THERMIC WELDS SHALL BE A MINIMUM OF 3" APART, AND 6" AWAY FROM RUBBER GASKET JOINTS.
3. BOND WIRE SHALL LAY FLAT WITH SLACK AGAINST THE PIPE, OR FITTING WITHOUT BRIDGING OVER FLANGES, COUPLINGS OR JOINTS.
4. FOR PIPE DIAMETERS 20" OR LESS, 2 BONDS CABLES ARE REQUIRED. 3 CABLE BONDS ARE REQUIRED FOR PIPE DIAMETERS LARGER THAN 20".
5. DO NOT BOND ACROSS INSULATING FLANGES OR ELECTRICAL ISOLATION DEVICES.
6. APPLY NO-OX-ID "A SPECIAL WW" GREASE AND WRAP ALL BURIED, NON-EPOXY COATED SURFACES I.E. FLANGES, COUPLINGS, ETC.



NOTES:

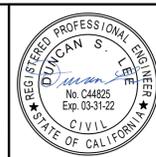
1. BOND WIRE SHALL BE NO. 6 AWG STRANDED HMWPE WIRE INSULATION UNLESS OTHER WISE SPECIFIED.
2. ALUMINO-THERMIC WELDS SHALL BE A MINIMUM OF 3" APART, AND 6" AWAY FROM RUBBER GASKET JOINTS.
3. BOND WIRE SHALL LAY FLAT WITH SLACK AGAINST THE PIPE, OR FITTING WITHOUT BRIDGING OVER FLANGES, COUPLINGS OR JOINTS.
4. DO NOT PLACE EXOTHERMIC OR PIN BRAZE WELD ON THE BELL OF THE PIPE.
5. FOR REMOVABLE PORTION OF MECHANICAL JOINT, SLEEVE COUPLING, GROOVED NED, AND OTHER FLEXIBLE JOINT, WELD BOND WIRE BEFORE INSTALLATION TO AVOID DAMAGING THE RUBBER GASKET.
6. FOR PIPE DIAMETERS OF 20" OR LESS, 2 CABLE BONDS ARE REQUIRED. 3 CABLE BONDS ARE REQUIRED FOR PIPE DIAMETERS LARGER THAN 20".
7. DO NOT BOND ACROSS INSULATING FLANGES OR ELECTRICAL ISOLATION DEVICES.
8. APPLY NO-OX-ID "A SPECIAL WW" GREASE AND WRAP ALL BURIED, NON EPOXY COATED SURFACES I.E. FLANGES, COUPLINGS, ETC.

BURIED RUBBER GASKET RIGID JOINT BONDING DETAIL

N.T.S. C

BURIED RUBBER GASKET FLEXIBLE JOINT BONDING DETAIL

N.T.S. D



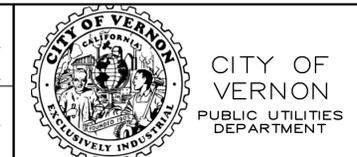
NO.	DATE	REVISIONS

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DRAWN: M.S.A. / J.S. / R.C.  
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DATE: SEPTEMBER 2021

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P.T. & L		
CONSTRUCTION		

PREPARED UNDER THE SUPERVISION OF:	DATE
DUNCAN S. LEE, P.E.	
R.C.E. NO. C44825	EXP. DATE: 03-31-22
REVIEWED BY:	DATE
R.C.E. NO. _____	EXP. DATE: _____



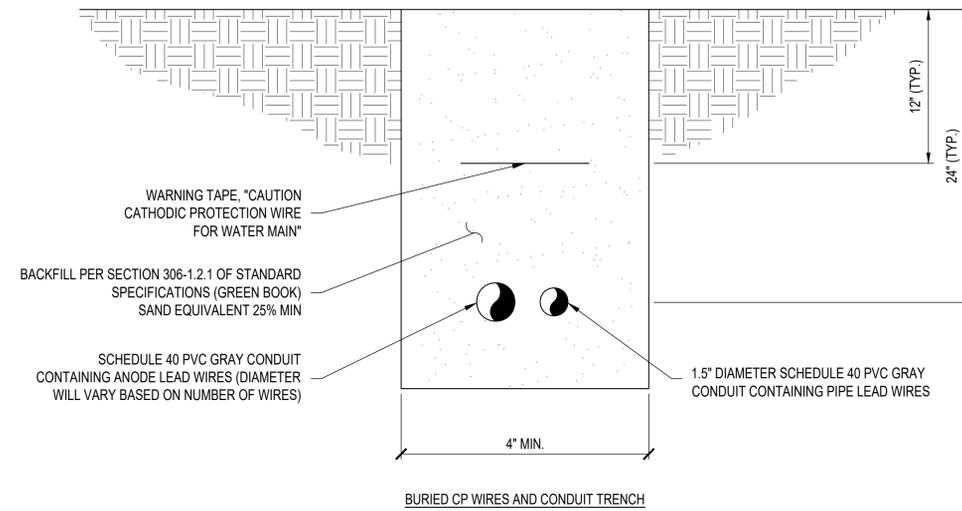
**WELL NO. 22  
EQUIPMENT AND  
SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058

**CATHODIC PROTECTION DETAILS 4**

SHEET NO. CP13  
DWG. NO. 56 OF 60

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**NOTES:**

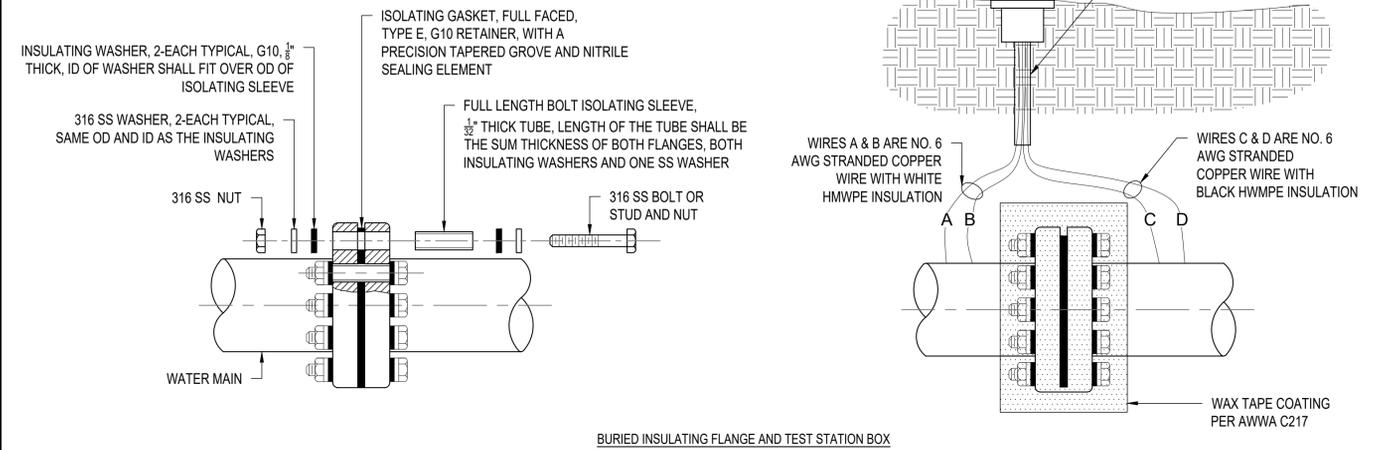
1. WIRES SHALL BE SLEEVED IN SCHEDULE 40 PVC GRAY CONDUITS.
2. CONNECT PIPE LEAD WIRES AND ANODE LEAD WIRES TO SEPARATE TERMINALS IN ANODE CP TEST STATION.
3. PROVIDE PVC SWEEP 90° BEND AT THE CP TEST STATION END.

**BURIED CP WIRES AND CONDUIT TRENCH**

N.T.S A

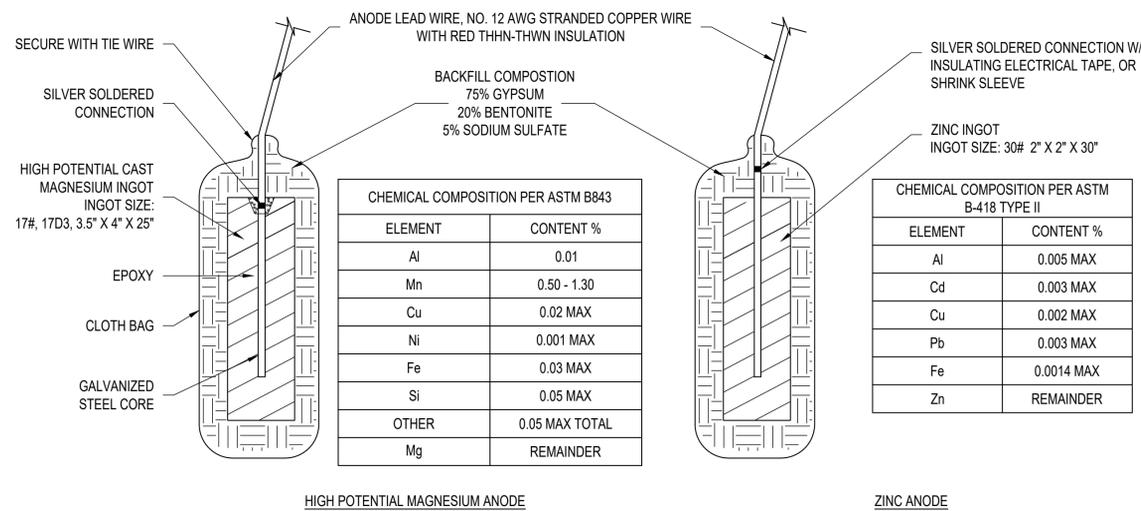
**BURIED INSULATING FLANGE**

N.T.S B



**NOTES:**

1. WHITE AND BLACK WIRES SHALL BE SEPARATELY SLEEVED IN SCHEDULE 40 PVC GRAY CONDUITS.
2. CONNECT PIPE LEAD WIRES TO SEPARATE TERMINALS IN ANODE CP TEST STATION.
3. DO NOT COAT OR SPRAY INSULATING COMPONENTS WITH GREASE.
4. COAT FLANGES AND HARDWARE WITH WAX TAPE IN ACCORDANCE WITH AWWA C217, EXTEND THE WAX TAPE A MINIMUM OF 6" ONTO PIPE CYLINDER IN EACH DIRECTION. THE COATING SHALL BE 70 MIL MINIMUM OVER SMOOTH SURFACES AND 140 MIL MINIMUM OVER IRREGULAR OR SHARP SURFACES.
5. ALL WIRES AND CONDUITS SHALL BE PERPENDICULAR TO THE WATER MAIN AND TERMINATE AT THE CP TEST STATION BOX.



**NOTES:**

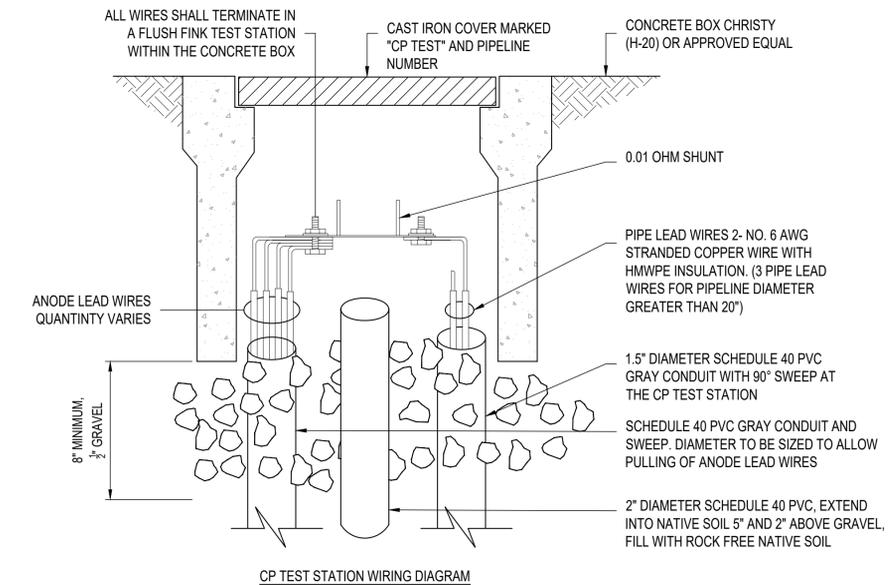
1. ANODE LEAD WIRES SHALL BE SLEEVED IN SCHEDULE 40 PVC GRAY CONDUITS.
2. CONNECT PIPE LEAD WIRES AND ANODE LEAD WIRES TO SEPARATE TERMINALS IN ANODE CP TEST STATION.
3. DO NOT LIFT OR HANDLE THE ANODE WITH THE ANODE LEAD WIRE.

**HIGH POTENTIAL MAGNESIUM ANODES AND ZINC ANODES**

N.T.S C

**SACRIFICIAL ANODE CP TEST STATION WIRING DIAGRAM (3-WIRE CP TEST STATION ASSEMBLY)**

N.T.S D



**NOTES:**

1. SACRIFICIAL ANODE CP TEST STATION IS NOT REQUIRED FOR STAND ALONE FITTINGS AND APPURTENANCES.
2. LEAD WIRES SHALL BE SLEEVED IN SCHEDULE 40 PVC GRAY CONDUITS.
3. ALL WIRES SHALL HAVE SLACK TO EXTEND 18" ABOVE THE RIM OF THE CP TEST STATION BOX. WIRES SHALL BE BUNDLED IN THE CP TEST STATION BOX.

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REGISTERED PROFESSIONAL ENGINEER  
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Exp. 03-31-22  
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STATE OF CALIFORNIA

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DESIGN:	D.S.L.
DRAWN:	M.S.A. / J.S. / R.C.
CHECKED:	D.S.L.
DATE:	SEPTEMBER 2021

UTIL. DIV.	REVIEWED BY:	DATE:
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STREET DESIGN		
MAINTENANCE		
RIGHT-OF-WAY		
P.T. & L		
CONSTRUCTION		

PREPARED UNDER THE SUPERVISION OF:	
DUNCAN S. LEE, P.E.	DATE: 03-31-22
R.C.E. NO. C44825	EXP. DATE: 03-31-22
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	DATE:
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**CITY OF VERNON**  
PUBLIC UTILITIES DEPARTMENT

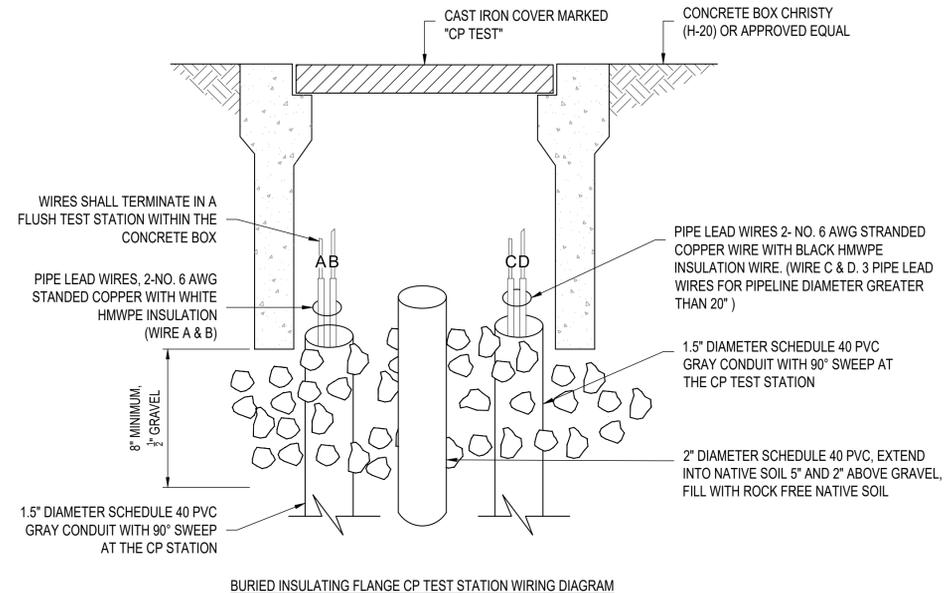
**WELL NO. 22**  
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4305 SANTA FE AVENUE VERNON, CA. 90058

**CATHODIC PROTECTION DETAILS 5**

SHEET NO. **CP14**  
DWG. NO. 57 OF 60

ISSUED FOR CONSTRUCTION

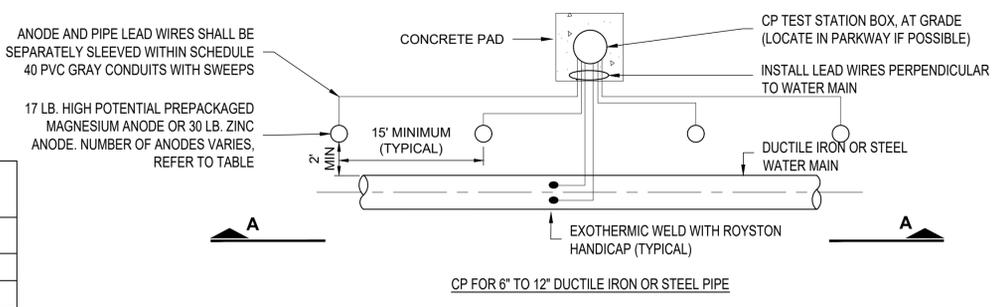
THESE DRAWINGS ARE THE PROPERTY OF P.A.C.E AND SHALL NOT BE REPRODUCED IN ANY MANNER NOR USED FOR CONSTRUCTION UNLESS STAMPED 'ISSUED FOR CONSTRUCTION'



- NOTES:**
- LEAD WIRES SHALL BE SLEEVED IN SCHEDULE 40 PVC GRAY CONDUITS.
  - ALL WIRES SHALL HAVE SLACK TO EXTEND 18" ABOVE THE RIM OF THE CP TEST STATION BOX. WIRES SHALL BE BUNDLED IN THE CP TEST STATION BOX.
  - IF COLORED HMWPE IS UNAVAILABLE, COLORED HEAT SHRINK SLEEVES 2' LONG AND 3' ON CENTER SHALL BE APPLIED. ALL WIRES WITHIN CP TEST STATION BOX SHALL BE THE COLOR CODE DESIGNATED.

LENGTH OF PIPE (6"-12")	# OF ANODES
20'-50'	1
51'-100'	2
101'-150'	3
151'-200'	4
201'-250'	5

**TABLE**



- NOTES:**
- CP TEST STATION IS NOT REQUIRED FOR STAND ALONE FITTINGS AND APPURTENANCES OR FOR PIPE LENGTHS < 50'.
  - PROVIDE CONTINUITY JOINT BONDING FOR ALL CONTINUOUS SECTIONS OF DUCTILE IRON OR STEEL PIPE, FITTINGS AND APPURTENANCES.
  - LEAD WIRES SHALL BE SLEEVED IN SCHEDULE 40 PVC GRAY CONDUITS.
  - COVER ALL EXOTHERMIC WELDS WITH ROYBOND 747 AND ROYSTON HANDY CAP.
  - ALL NUTS, BOLTS, AND WASHERS SHALL BE GRADE 316 STAINLESS STEEL.
  - APPLY NP-OX-ID "A" SPECIAL WW" GREASE PROTECTIVE WRAP ON ALL BURIED FITTINGS.
  - FITTINGS, VALVES, AND RESTRAINED JOINT DEVICES, SHALL BE ENCASED IN POLYETHYLENE PER AWWA C105.
  - FOR PIPE SIZES > 12" DIAMETER, OR LENGTHS > 250', THE CATHODIC PROTECTION SYSTEM SHALL BE CUSTOM DESIGNED.

**BURIED INSULATING FLANGE CP TEST STATION WIRING DIAGRAM**

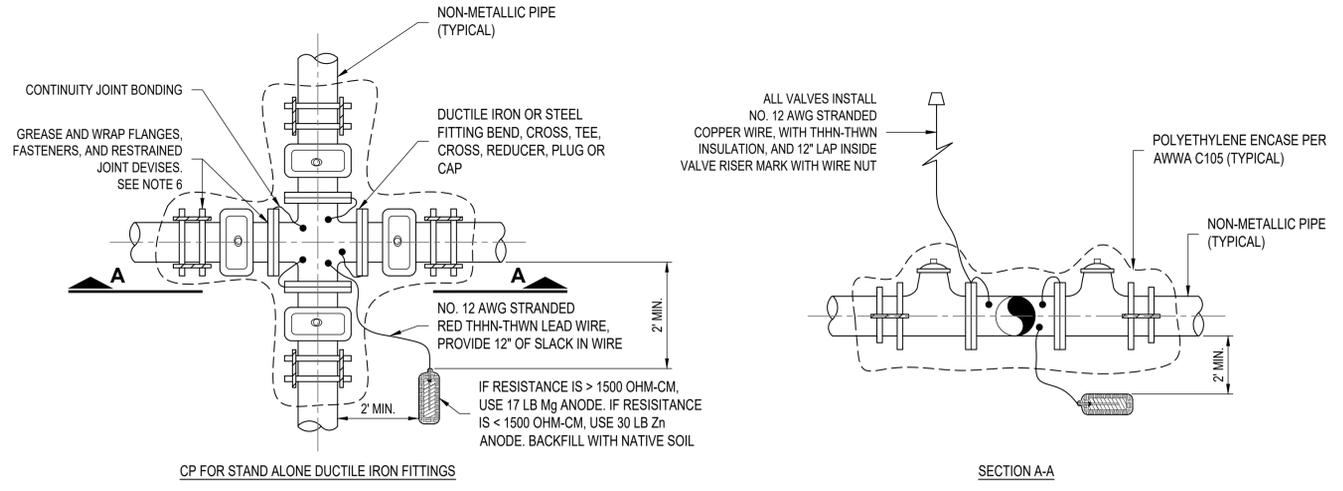
N.T.S.

A

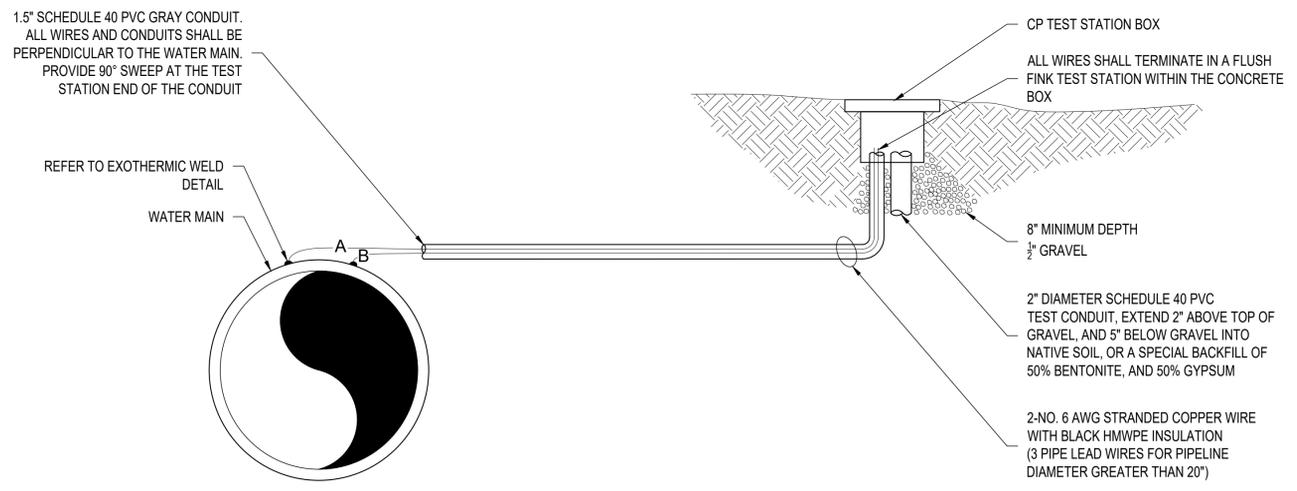
**CATHODIC PROTECTION FOR 6" TO 12" DUCTILE IRON OR STEEL PIPE**

N.T.S.

B



- NOTES:**
- CP TEST STATION NOT REQUIRED FOR STAND ALONE FITTINGS AND APPURTENANCES, BUT UTILIZES A VALVE BOX ASSEMBLY INSTEAD.
  - PROVIDE CONTINUITY JOINT BONDING FOR ALL CONTINUOUS SECTIONS OF DUCTILE IRON OR STEEL FITTINGS AND APPURTENANCES.
  - SEE EXOTHERMIC WELD DETAIL FOR EXOTHERMIC WELD ANODE LEAD WIRE TO FITTING.
  - COVER ALL EXOTHERMIC WELDS WITH ROYBOND 747 AND A ROYSTON HANDY CAP.
  - ALL NUTS, BOLTS, AND WASHERS SHALL BE GRADE 316 STAINLESS STEEL.
  - APPLY NP-OX-ID "A" SPECIAL WW" GREASE AND PROTECTIVE WRAP ON ALL BURIED FITTINGS.
  - FITTINGS, VALVES, AND RESTRAINED JOINT DEVICES, SHALL BE ENCASED IN POLETHYLENE PER AWWA C105.
  - EXOTHERMIC WELDS SHALL NOT DAMAGE LININGS OF PIPE, FITTINGS, OR APPURTENANCES. PRODUCT WITH DAMAGED LINING SHALL BE REMOVED FROM THE JOB SITE.



- NOTES:**
- PROVIDE WIRE SLACK TO EXTEND EACH WIRE 18" ABOVE THE RIM OF THE CP TEST STATION BOX. WIRES SHALL BE BUNDLED IN THE CP TEST STATION BOX.
  - PROVIDE PVC 90° SWEEP AT CP TEST STATION BOX.

**CATHODIC PROTECTION FOR 6" TO 12" DUCTILE IRON OR STEEL PIPE**

N.T.S.

C

**2-WIRE CP TEST STATION ASSEMBLY**

N.T.S.

D

**DIALERT**  
DIAL TOLL FREE 811  
AT LEAST TWO DAYS BEFORE YOU DIG  
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA  
IMPORTANT NOTICE  
Section 4216/4217 of the Government Code requires a Dig Alert Identification Number be issued before "Permit to Excavate" will be valid.

**PACE**  
Advanced Water Engineering  
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708  
P: (714) 481-7300 | www.pacewater.com

REGISTERED PROFESSIONAL ENGINEER  
DUNCAN S. LEE  
No. C44825  
Exp. 03-31-22  
CIVIL  
STATE OF CALIFORNIA

NO.	DATE	REVISIONS

LINE IS 2 INCHES AT FULL SCALE (IF NOT 2"=SCALE ACCORDINGLY)	UTIL. DIV. TRAFFIC ENG. SERVICES STREET DESIGN MAINTENANCE RIGHT-OF-WAY P.T. & L CONSTRUCTION
DESIGN: D.S.L.	CHECKED: D.S.L.
DRAWN: M.S.A./J.S./R.C.	DATE: SEPTEMBER 2021

REVIEWED BY:	DATE:

PREPARED UNDER THE SUPERVISION OF:	DATE:
DUNCAN S. LEE, P.E.	03-31-22

REVIEWED BY:	DATE:
R.C.E. NO.:	EXP. DATE:

**CITY OF VERNON**  
PUBLIC UTILITIES DEPARTMENT

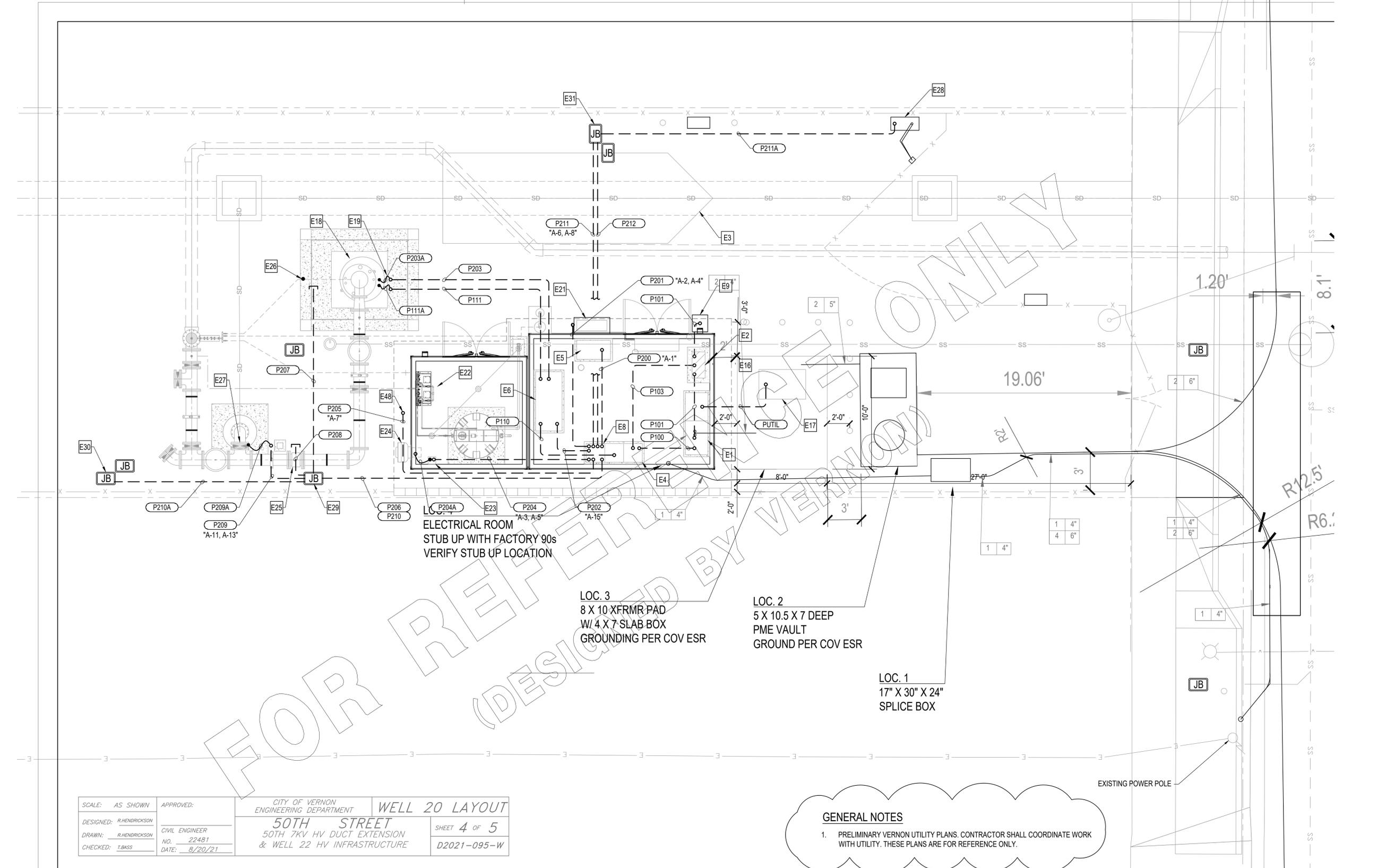
**WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS**  
4305 SANTA FE AVENUE VERNON, CA. 90058  
**CATHODIC PROTECTION DETAILS 6**

SHEET NO. **CP15**  
DWG. NO. 58 OF 60

THESE DRAWINGS ARE THE PROPERTY OF P.A.C.E AND SHALL NOT BE REPRODUCED IN ANY MANNER NOR USED FOR CONSTRUCTION UNLESS STAMPED "ISSUED FOR CONSTRUCTION"

ISSUED FOR CONSTRUCTION





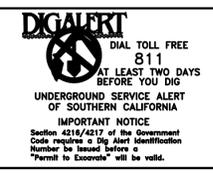
FOR REFERENCE ONLY (DESIGNED BY VERNON)

SCALE: AS SHOWN	APPROVED:	CITY OF VERNON ENGINEERING DEPARTMENT	<b>WELL 20 LAYOUT</b>
DESIGNED: R.HENDRICKSON	CIVIL ENGINEER	50TH STREET 50TH 7KV HV DUCT EXTENSION & WELL 22 HV INFRASTRUCTURE	SHEET 4 OF 5
DRAWN: R.HENDRICKSON	NO. 22481		D2021-095-W
CHECKED: T.BASS	DATE: 8/20/21		

**GENERAL NOTES**

- PRELIMINARY VERNON UTILITY PLANS. CONTRACTOR SHALL COORDINATE WORK WITH UTILITY. THESE PLANS ARE FOR REFERENCE ONLY.

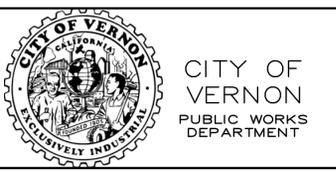
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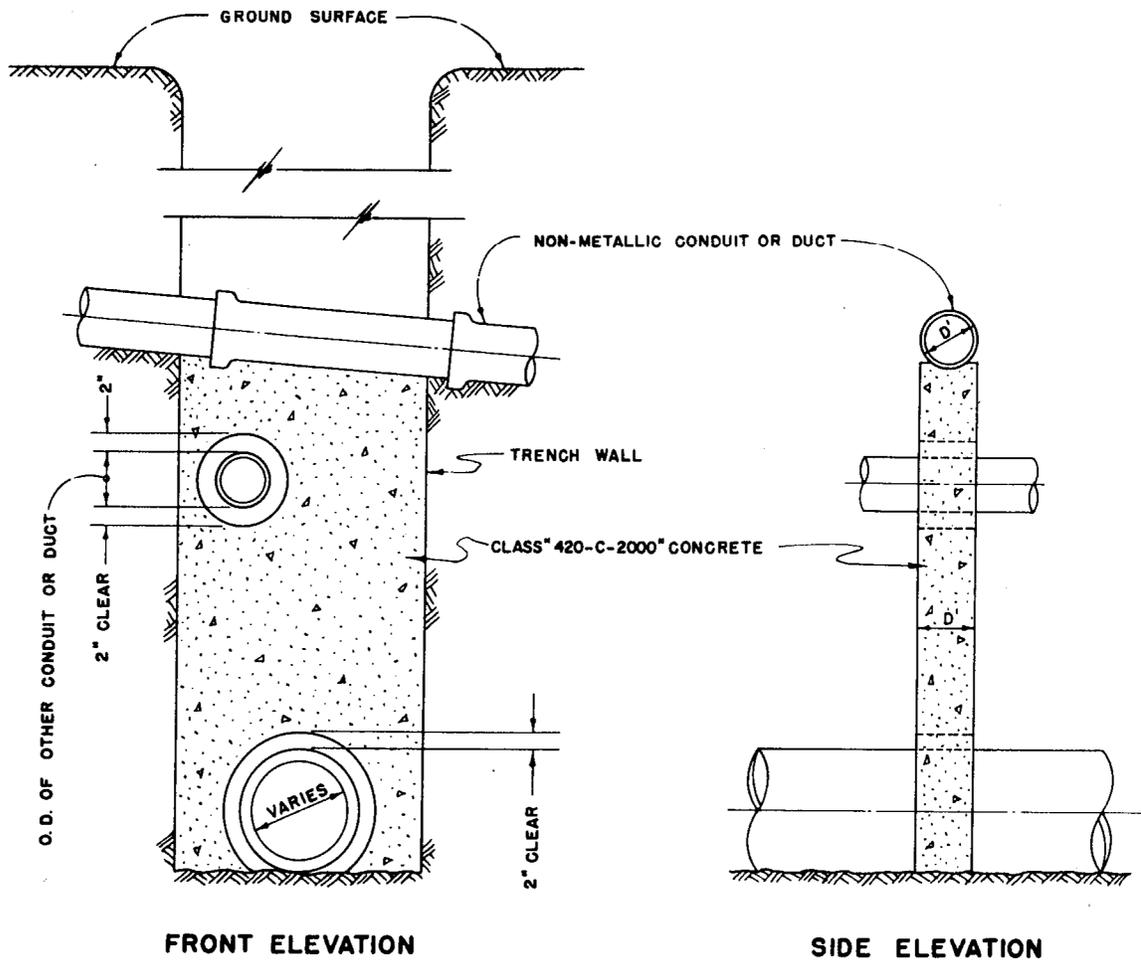
NO.	DATE	REVISIONS

DESIGN: G.T.	UTIL. DIV.
DRAWN: N.C.	TRAFFIC
CHECKED: C.N.	ENG. SERVICES
DATE: NOVEMBER 2021	STREET DESIGN
	MAINTENANCE
	RIGHT-OF-WAY
	P.T. & L
	CONSTRUCTION

REVIEWED BY:	DATE:	PREPARED UNDER THE SUPERVISION OF:
		CHRIS NAJARIAN, P.E.
		R.C.E. NO. 22545 EXP. DATE: 12/31/22
		REVIEWED BY:
		R.C.E. NO. EXP. DATE:



<b>WELL NO. 22 EQUIPMENT AND SITE IMPROVEMENTS</b> 4305 SANTA FE AVENUE VERNON, CA. 90058	SHEET NO. <b>REF2</b>
UTILITY REFERENCE SHEET II	DWG. NO. 60 OF 60



**CONCRETE SUPPORT WALL FOR NON-METALLIC  
CONDUITS OR DUCTS**

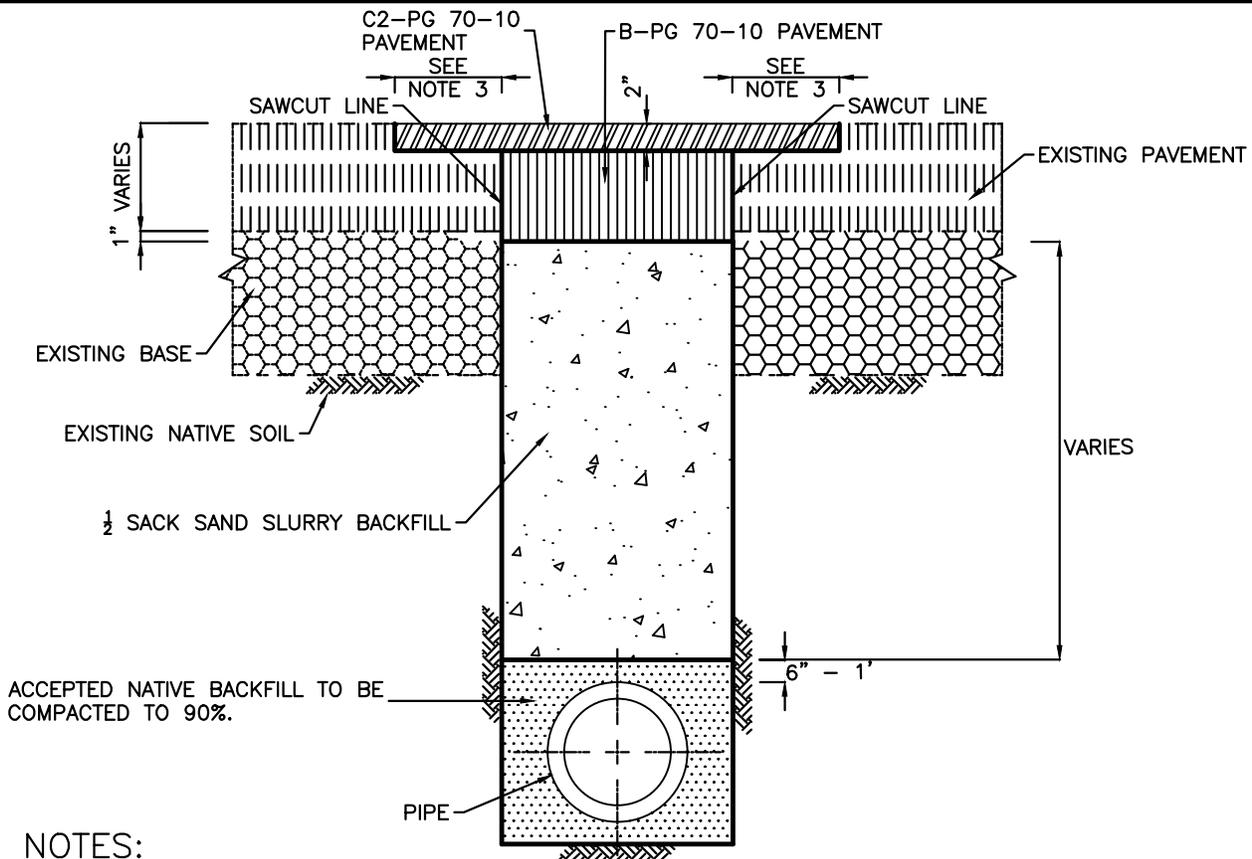
- NOTES:**
1. THE SUPPORT WALL SHALL HAVE A FIRM BEARING ON THE SUBGRADE AND AGAINST THE SIDES OF THE EXCAVATION.
  2. AT LEAST 2" CLEAR DISTANCE SHALL BE MAINTAINED BETWEEN THE SUPPORT WALL AND ANY CONDUITS OR DUCTS PARALLEL TO THE TRENCH.
  3. TO PREVENT THE OCCURRENCE OF UNEQUAL PRESSURES DURING BACKFILLING, OPENINGS MAY BE PROVIDED IN THE SUPPORT WALL. THE VOLUME OF THE OPENINGS SHALL NOT EXCEED  $\frac{1}{2}$  THE VOLUME OF THE SUPPORT WALL.

**PIPE SUPPORTS ACROSS TRENCHES  
CITY OF VERNON, CALIFORNIA  
ENGINEERING DEPARTMENT**

APRIL , 1985

REVISED: APRIL, 1985  
REVISED CONC. CLASS

STANDARD PLAN  
**SVI466**



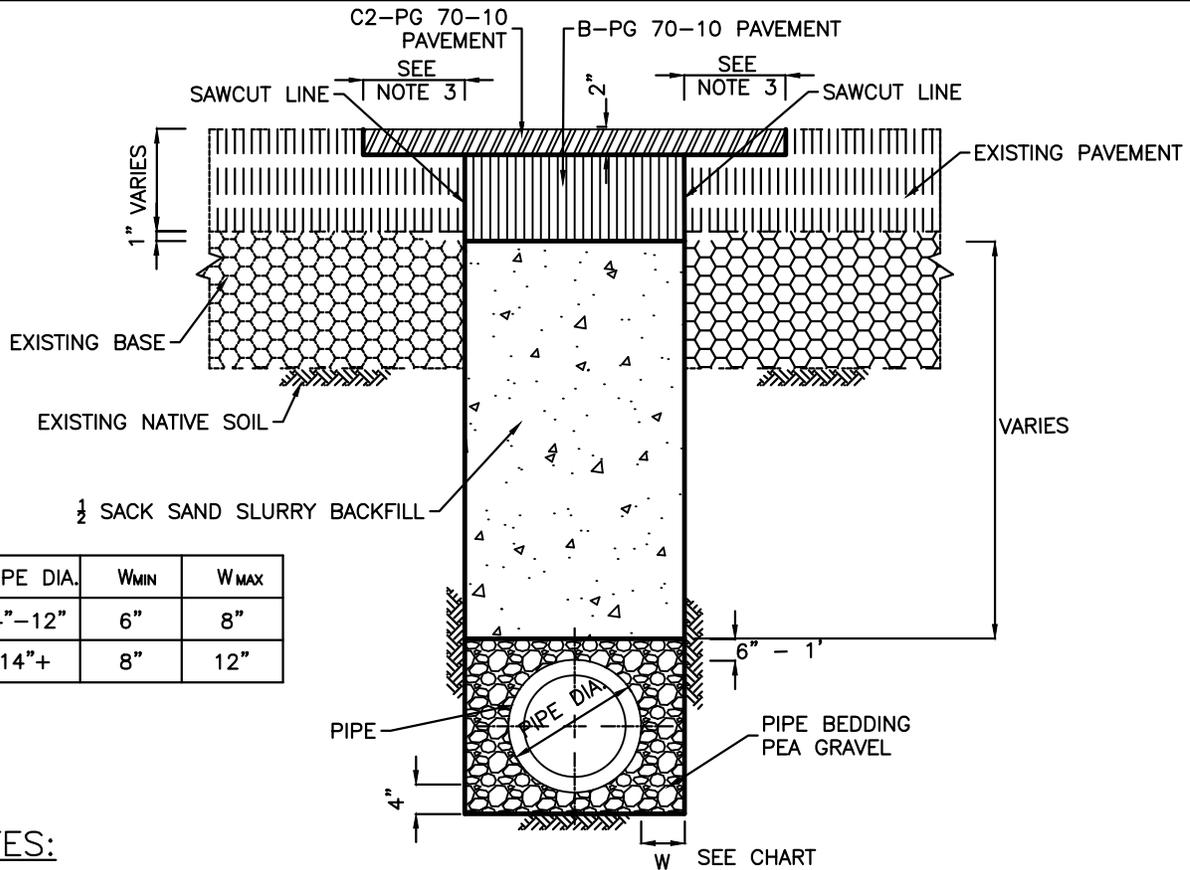
**NOTES:**

1. NEW PAVEMENT THICKNESS SHALL BE 1 INCH BELOW THE EXISTING TO A MAXIMUM OF 10 INCHES, UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
2. ASPHALT CONCRETE SHALL BE B-PG70-10. TACK COAT SHALL BE APPLIED PER LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREENBOOK).
3. FINISHED ASPHALT CONCRETE SHALL BE C2-PG70-10, 2" THICK, UNIFORM COLD PLANE MINIMUM 1 FOOT FROM SAWCUT LINE OR PER CITY ENGINEER'S APPROVAL, AND PAVED FLUSH WITH ADJACENT PAVEMENT WITHIN SAME DAY AS NEW A.C. PLACEMENT.
4. DAMAGED AND UNDERMINED PAVEMENT SHALL BE REMOVED BY SAW CUTTING FULL DEPTH PARALLEL TO TRENCH AND REPLACED WITH ASPHALT CONCRETE PER ABOVE AT NO COST TO THE CITY.
5. FOR CONCRETE STREETS THE WIDTH OF CONCRETE TO BE REPLACED SHALL EITHER BE FROM COLD JOINT LINE TO COLD JOINT LINE OR APPROVED TRENCH WIDTH WITH CONCRETE DOWELS (MIN. #4 BARS) PLACED EVERY 3 FT STAGGERED.
6. IF THE SAWCUT LINE IS 3 FEET OR LESS FROM GUTTER LINE OR COLD JOINT THE A.C. PAVEMENT OR CONCRETE SHALL BE REMOVED TO GUTTER LINE OR COLD JOINT.
7. ALL TRAFFIC SIGNAL LOOPS, DOTS, LANE LINES, CROSSWALKS, LEGENDS, AND OTHER PAINTED MARKINGS ARE TO BE REPLACED IN KIND BY THE CONTRACTOR.
8. AN ENCROACHMENT PERMIT SHALL BE OBTAINED FROM THE CITY OF VERNON PUBLIC WORKS DEPARTMENT PRIOR TO ANY ENCROACHMENT OR CONSTRUCTION WITHIN A CITY OF VERNON RIGHT-OF-WAY.
9. THE CONTRACTOR SHALL OBTAIN AN UNDERGROUND SERVICE ALERT TICKET AND OBTAIN A CALIFORNIA COMMISSION OF OCCUPATIONAL SAFETY AND HEALTH (DOSH) PERMIT IF THE TRENCH IS GREATER THAN 5 FEET DEEP PRIOR TO THE COMMENCEMENT OF WORK.
10. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING AND MAINTAINING ALL TRAFFIC CONTROLS AND SIGNAGE PER THE LATEST VERSION OF THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CA MUTCD) OR THE CALIFORNIA JOINT UTILITY TRAFFIC CONTROL MANUAL (CJUTCM) DURING ENTIRE PROJECT.
11. NO STOCK PILING OF CONSTRUCTION MATERIALS OR EQUIPMENT SHALL BE ALLOWED OVER NIGHT IN THE PUBLIC RIGHT-OF-WAY UNLESS APPROVED BY THE CITY ENGINEER.
12. ALL NECESSARY STEEL PLATES SHALL BE PROVIDED AT THE JOB SITE PRIOR TO ANY REMOVALS. PLATES SHALL BE SKID RESISTANT, RECESSED AND SECURED FROM ANY MOVEMENT.
13. ALL TRENCHES SHALL BE BACKFILLED WITH 1/2 SACK SAND SLURRY UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
14. THE CONSTRUCTION SHALL COMPLY WITH CITY STANDARDS AND THE GREENBOOK.

REVISIONS		
DATE	DESCRIPTION	INITIALS
5/30/18	UPDATED NOTE 12.	MA
7/5/18	UPDATED NOTES 7, 8, & 10.	MB

**TYPICAL TRENCH  
PAVING SECTION**  
CITY OF VERNON, PUBLIC WORKS DEPARTMENT  
JULY 2018

STANDARD PLAN  
**V2264**  
1 OF 2



PIPE DIA.	W <sub>MIN</sub>	W <sub>MAX</sub>
4"-12"	6"	8"
14"+	8"	12"

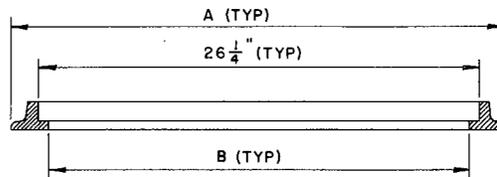
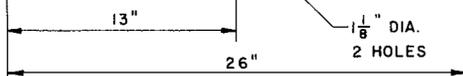
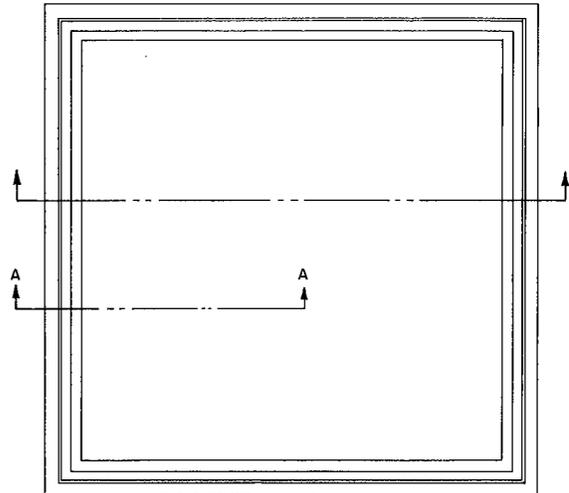
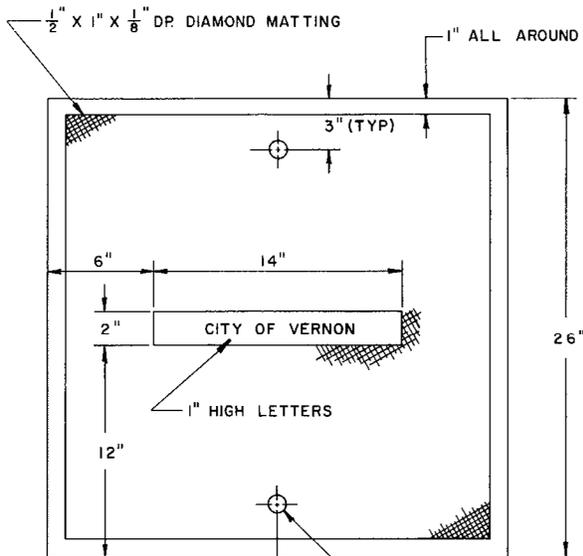
**NOTES:**

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2. ASPHALT CONCRETE SHALL BE B-PG70-10. TACK COAT SHALL BE APPLIED PER LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREENBOOK).
3. FINISHED ASPHALT CONCRETE SHALL BE C2-PG70-10, 2" THICK, UNIFORM COLD PLANE MINIMUM 1 FOOT FROM SAWCUT LINE OR PER CITY ENGINEER'S APPROVAL, AND PAVED FLUSH WITH ADJACENT PAVEMENT WITHIN SAME DAY AS NEW A.C. PLACEMENT.
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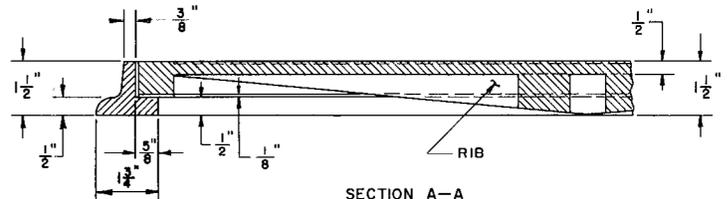
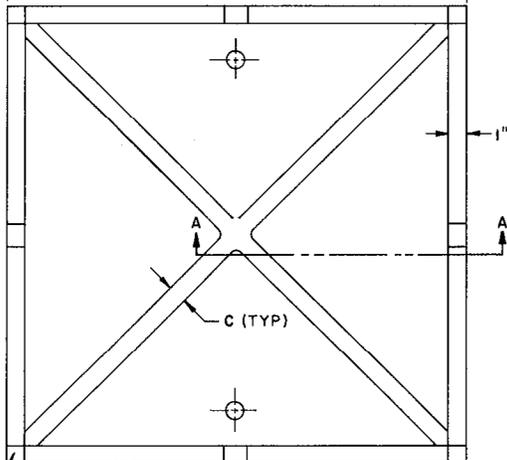
REVISIONS		
DATE	DESCRIPTION	INITIALS
5/30/18	UPDATED NOTE 12.	MA
7/5/18	UPDATED NOTES 7, 8, & 10.	MB

**TYPICAL TRENCH PAVING SECTION  
FOR SEWER LATERAL**  
CITY OF VERNON, PUBLIC WORKS DEPARTMENT  
JULY 2018

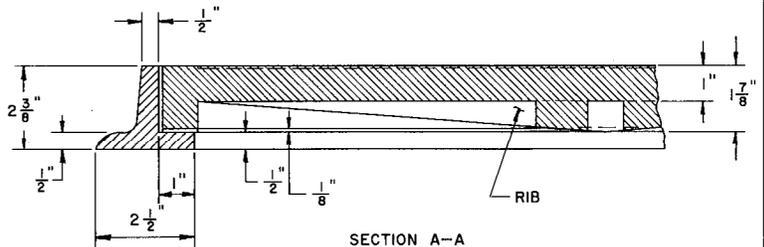
STANDARD PLAN  
**V2264**  
2 OF 2



SECTION  
FRAME



SECTION A-A  
LIGHT WEIGHT



SECTION A-A  
HEAVY TRAFFIC

**NOTES:**

1. CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30.
2. BEARING SURFACE SHALL BE MACHINED AND THE COVER SHALL SEAT FIRMLY INTO FRAME WITHOUT ROCKING.
3. FRAME AND COVER SHALL BE PAINTED OR DIPPED IN A COMMERCIAL QUALITY ASPHALTUM PAINT.

	A	B	C
HEAVY TRAFFIC	29 1/4"	24 1/4"	5/8"
LIGHT WEIGHT	28 1/2"	25"	1/2"

# STANDARD FRAME & COVER FOR WATER SERVICE

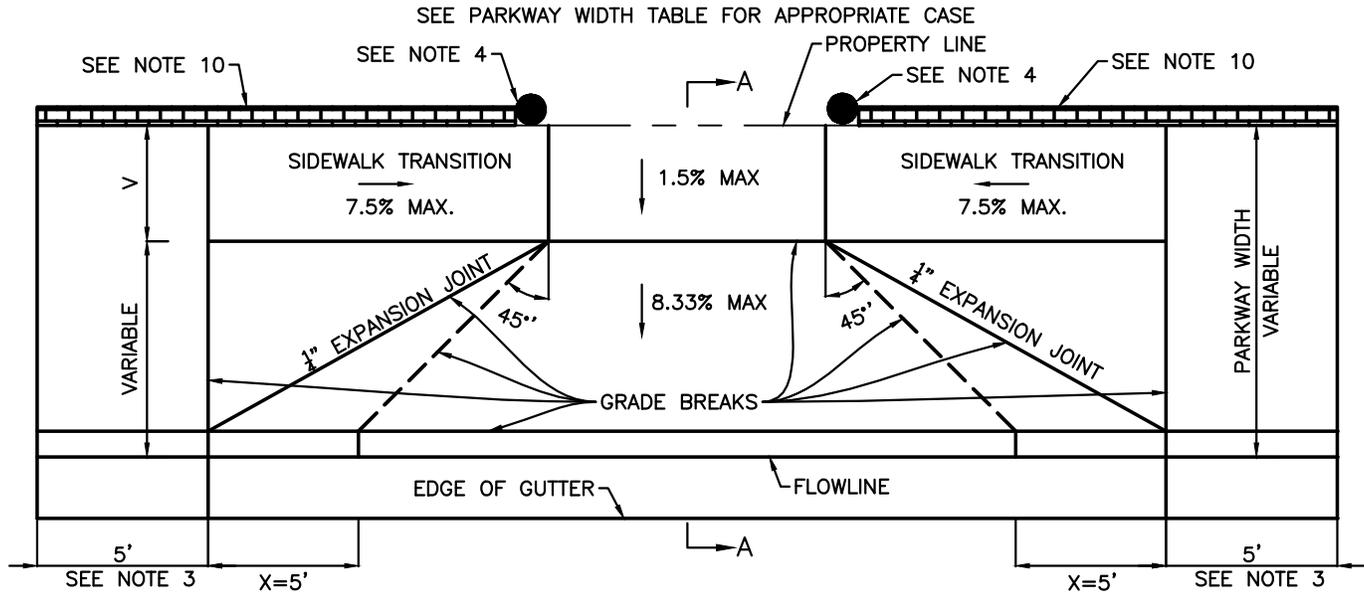
CITY OF VERNON, CALIFORNIA

ENGINEERING DEPARTMENT

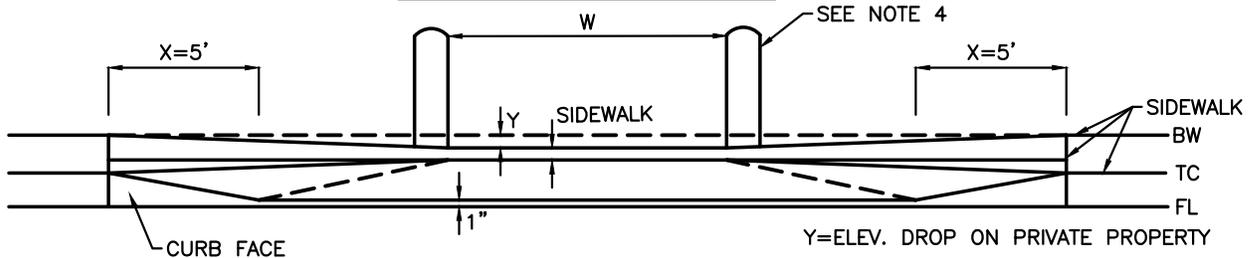
JULY, 1969

STANDARD PLAN  
WV1830

### CASE 1 - PLAN VIEW



### CASE 1 - ELEVATION



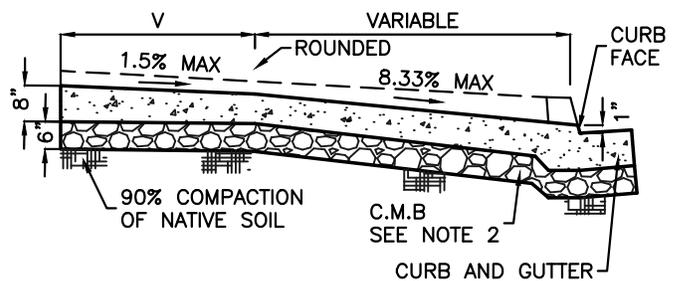
NOT TO SCALE

PARKWAY WIDTH TABLE

PARKWAY WIDTH	Y			
	6" CURB	8" CURB	10" CURB	
LESS THAN 8'	REFER TO CASE 2			
V=4'	8'	2.2"	4.2"	6.2"
	9'	1.4"	3.4"	5.4"
	10'	0.7"	2.7"	4.7"
	11'	0.0	1.9"	3.9"
	12'	0.0	1.2"	3.2"

\* REFER TO CASE 2

CASE 1 - SECTION AA



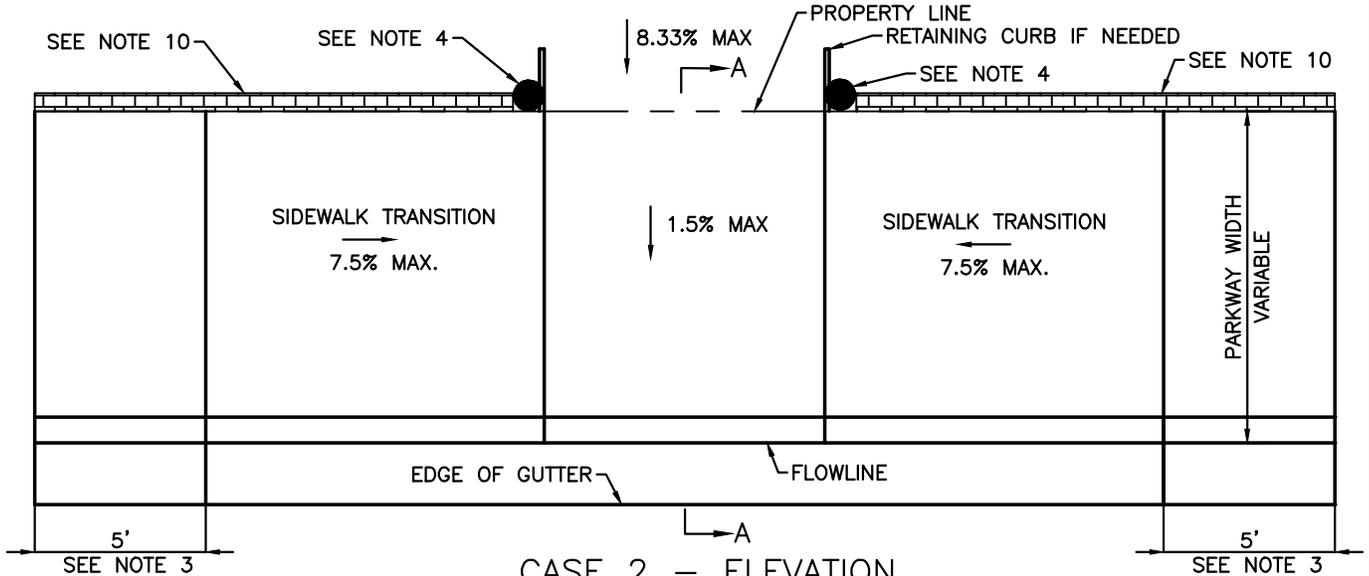
REVISIONS		
DATE	DESCRIPTION	INITIALS
8/15	MODIFIED CASE #1 & CASE#2 DRIVEWAY	BM
2/16	MODIFIED CASE #1 & CASE#2 DRIVEWAY	FS
7/18	UPDATED	MB

**STANDARD DRIVEWAY**  
CITY OF VERNON, PUBLIC WORKS DEPARTMENT  
JULY 2018

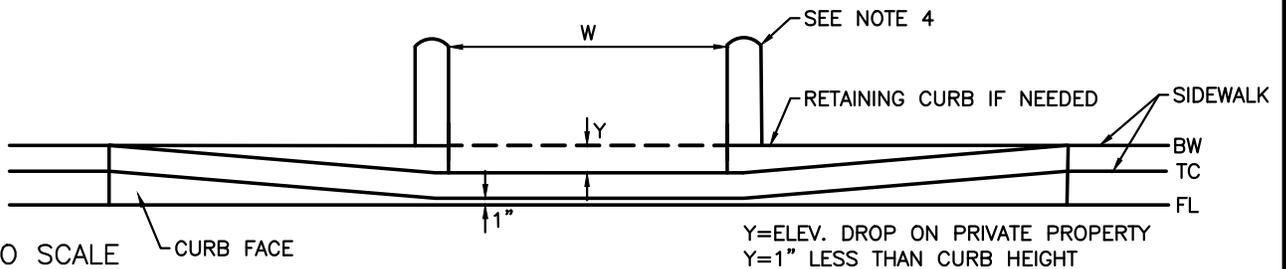
STANDARD PLAN  
**PV 693**  
1 OF 2

## CASE 2 – PLAN VIEW

SEE THE TABLE ON PAGE 1 OF 2 FOR APPROPRIATE CASE



## CASE 2 – ELEVATION

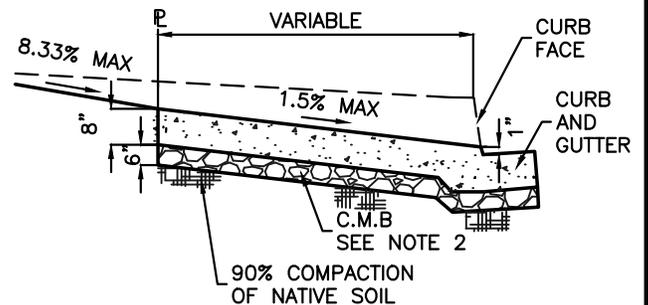


NOT TO SCALE

### NOTES:

1. USE CLASS 520-C-2500 CEMENT CONCRETE.
2. DRIVEWAY APRON SHALL BE POURED MONOLITHICALLY WITH CURB AND GUTTER. 6" OF C.M.B SHALL BE PLACED UNDER THE DRIVEWAY, CURB AND GUTTER.
3. ADJACENT SIDEWALKS 5' ON EITHER END OF DRIVEWAY SHALL BE POURED 8" THICK
4. 10" DIA. PIPE BARRIER MIN. SCHEDULE 30 PER CITY STD. V2122 SHALL BE INSTALLED AS NEEDED TO PROTECT IMPROVEMENTS.
- ALL CONCRETE SHALL BE ONE COURSE, STEEL TROWEL & MEDIUM HAIR BROOM FINISH. NO TOPPING PERMITTED.
6. DRIVEWAYS MAY BE OPENED TO TRAFFIC:
  - A. IN 48 HOURS WITH HIGH STRENGTH CEMENT
  - B. IN 5 DAYS WITH STANDARD CLASS 520-C-2500 MIX.
7. ENDS OF DRIVEWAYS TO BE NOT LESS THAN 5' FROM NEAREST FIRE HYDRANT, METER BOX OR VALVE AND 12' FROM UTILITY POLE.
8. 1/4" EXPANSION JOINT FELT SHALL BE PLACED ALONG THE TX.
9. DRIVEWAY ENTRANCE WIDTH (W) SHALL BE:
  - A. 25' MIN FOR NON-TRUCK USE.
  - B. 40' MIN FOR TRUCK USE.
10. 30" CONCRETE OR MASONRY WALL PER STD. V2122 OR VARIABLE HEIGHT CURB IF WROUGHT IRON FENCE OR LANDSCAPING IS INSTALLED.

## CASE 2 – SECTION AA



REVISIONS		
DATE	DESCRIPTION	INITIALS
8/15	MODIFIED CASE #1 & CASE#2 DRIVEWAY	BM
2/16	MODIFIED CASE #1 & CASE#2 DRIVEWAY	FS
7/18	UPDATED	MB

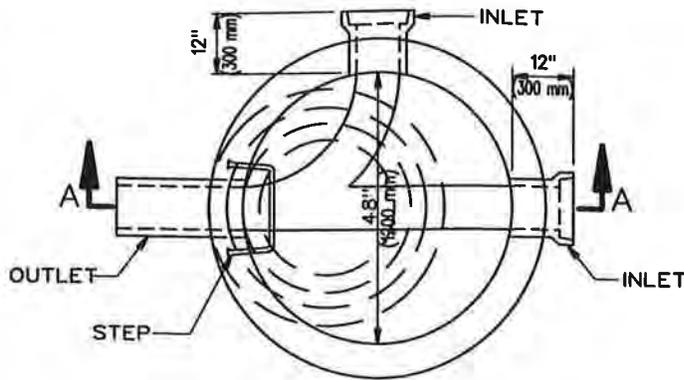
## STANDARD DRIVEWAY

CITY OF VERNON, PUBLIC WORKS DEPARTMENT  
JULY 2018

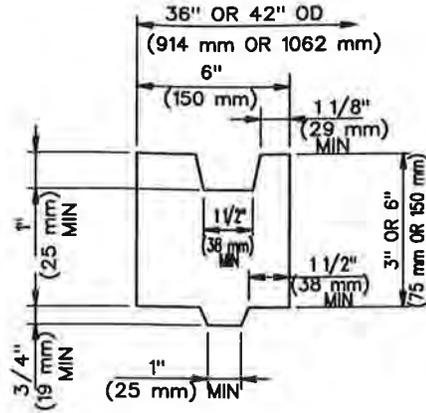
STANDARD PLAN

PV 693

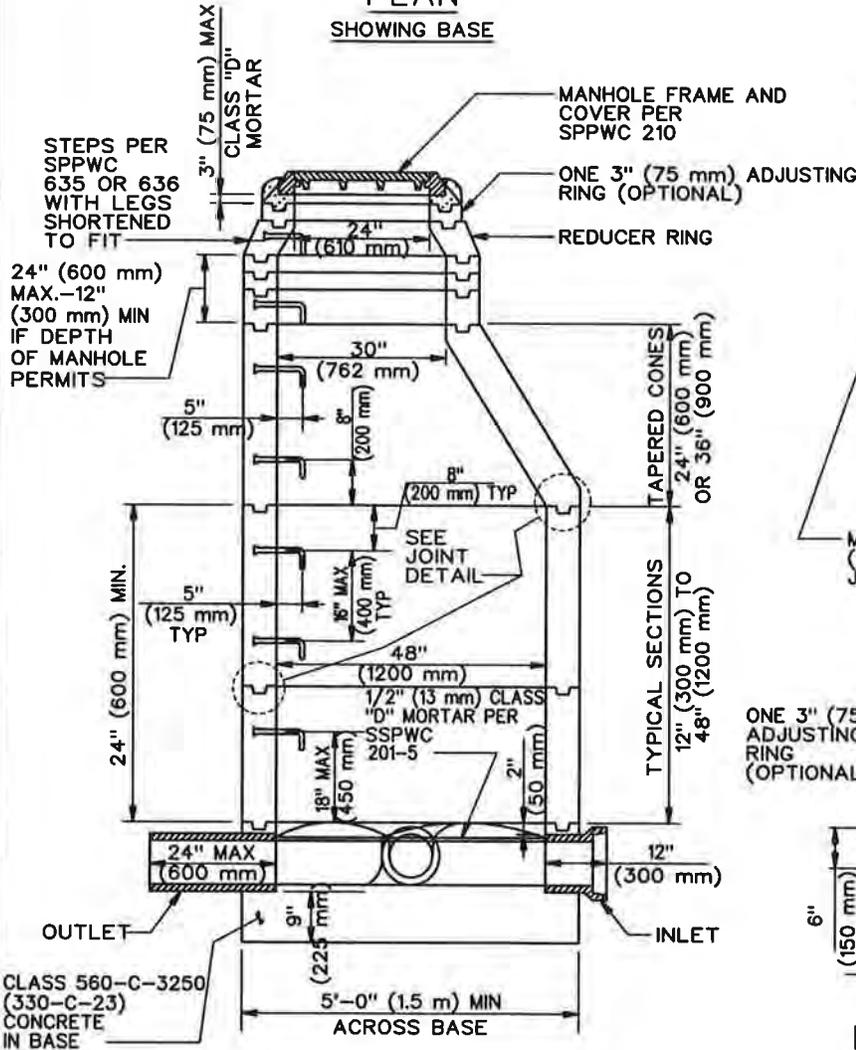
2 OF 2



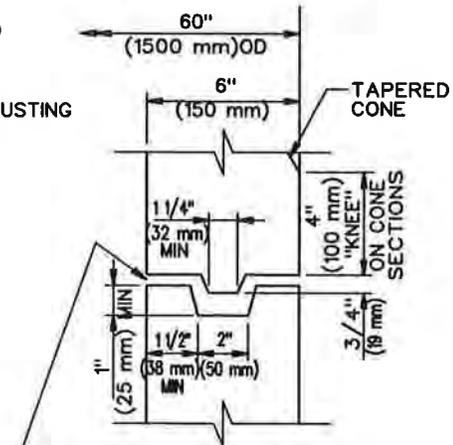
**PLAN**  
SHOWING BASE



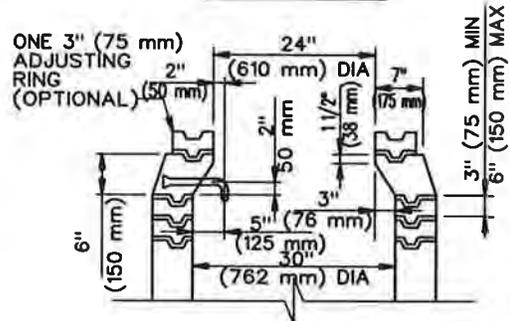
**ADJUSTING RING DETAIL**



**SECTION A-A**



**JOINT DETAIL**  
NON-REINFORCED



**REDUCER RING AND ADJUSTING RINGS**

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1993, 1995, 2009, 2021

**PRECAST CONCRETE  
SEWER MANHOLE**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

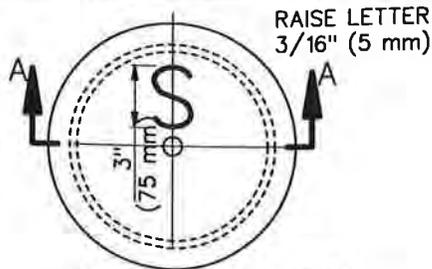
STANDARD PLAN

**200-4**

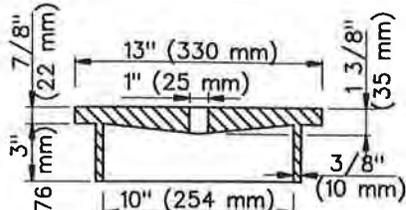
SHEET 1 OF 2

NOTES:

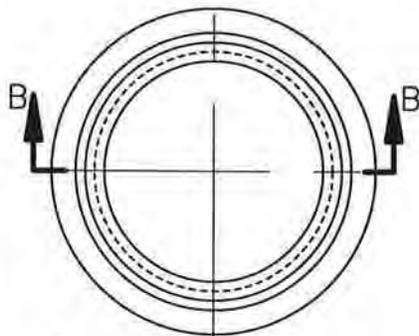
1. EXCEPT AS NOTED HEREON, THE PRECAST UNITS SHALL BE MANUFACTURED AND TESTED IN ACCORDANCE WITH ASTM C478 (C478M). AS AN ALTERNATE CURING METHOD, THE UNITS MAY BE CURED USING SATURATED STEAM FOR A MINIMUM OF 12 HOURS FOLLOWED BY 6 DAYS OF WATER CURING OR MEMBRANE CURING. IF THE UNITS ARE CURED BY THE ALTERNATE METHOD, THEY SHALL NOT BE SHIPPED PRIOR TO 8 DAYS AFTER CASTING NOR UNTIL THE CONCRETE HAS ATTAINED A STRENGTH OF 3500 PSI (25 MPa)
2. MANHOLE STEPS SHALL CONFORM TO SPPWC 635 TYPE 1 OR 3 OR SPPWC 636. THE MANHOLE STEPS SHALL BE UNIFORMLY SPACED AT A MAXIMUM OF 16" (400 mm). THE LOWEST STEP SHALL BE PLACED NOT LESS THAN 8" (200 mm) NOR MORE THAN 18" (450 mm) ABOVE THE SHELF. THE STEPS SHALL PROJECT 5" (125 mm) INSIDE THE MANHOLE.
3. RISER SECTIONS MAY BE REINFORCED OR UNREINFORCED. REINFORCED SECTIONS SHALL BE REINFORCED IN ACCORDANCE WITH ASTM C478 (C478M) AND SHALL HAVE A MINIMUM WALL THICKNESS OF 5" (125 mm). UNREINFORCED RISER SECTIONS SHALL HAVE A MINIMUM WALL THICKNESS OF 6" (150 mm).
4. THE 24" x 48" (600 mm x 1200 mm) ECCENTRIC CONES MAY BE REINFORCED OR UNREINFORCED. IF REINFORCED, THE WALL THICKNESS SHALL BE NOT LESS THAN 5" (125 mm). IF UNREINFORCED, THE WALL THICKNESS SHALL NOT BE LESS THAN 6" (150 mm).
5. JOINTS SHALL BE TONGUE AND GROOVE. JOINTS FOR REINFORCED STRUCTURES SHALL CONFORM WITH ASTM C478 (C478M) SECTION 14.
6. PRECAST UNITS SHALL BE ASSEMBLED USING CLASS "B" MORTAR.
7. IF 30" (762 mm) DIAMETER MANHOLE FRAME AND COVER IS REQUIRED, IT SHALL BE INSTALLED WHERE THE REDUCER RING IS SHOWN IN THE SECTION.
8. FOR REINFORCED PRECAST STRUCTURES, ALL REINFORCEMENT SHALL HAVE A MINIMUM OF 2" (50 mm) OF COVER OVER THE STEEL ON THE INSIDE FACE.
9. THE TOP OPENING OF THE MANHOLE AND THE STEPS SHALL BE PLACED DIRECTLY OVER THE OUTLET OF THE STRUCTURE EXCEPT AS OTHERWISE NOTED ON PLANS.
10. CONCRETE BASE AND STUB WALLS SHALL BE POURED IN ONE OPERATION TO A POINT 2" (50 mm) ABOVE THE INLET AND OUTLET PIPES. ALL PIPES SHALL BE RIGIDLY SUPPORTED BY TEMPORARY PIERS OR OTHER METHODS DURING THE OPERATION. CONCRETE SHALL SET FOR 24 HOURS BEFORE PLACING PRECAST UNITS.



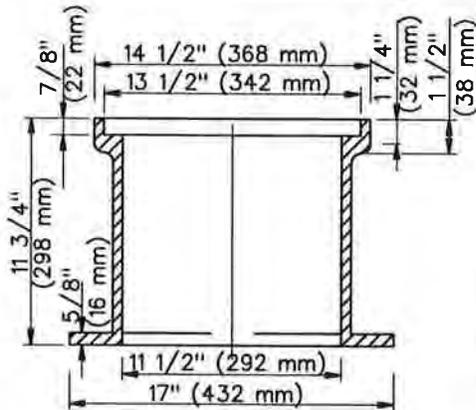
ACCESS COVER



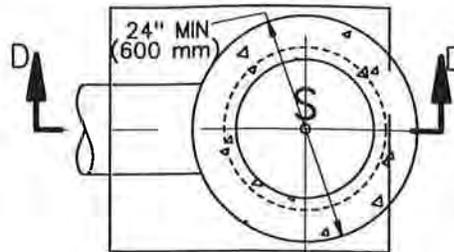
SECTION A-A



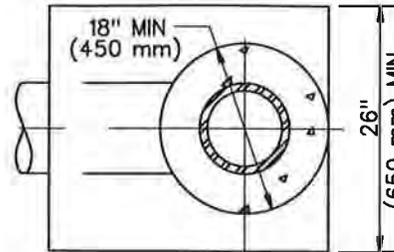
ACCESS FRAME



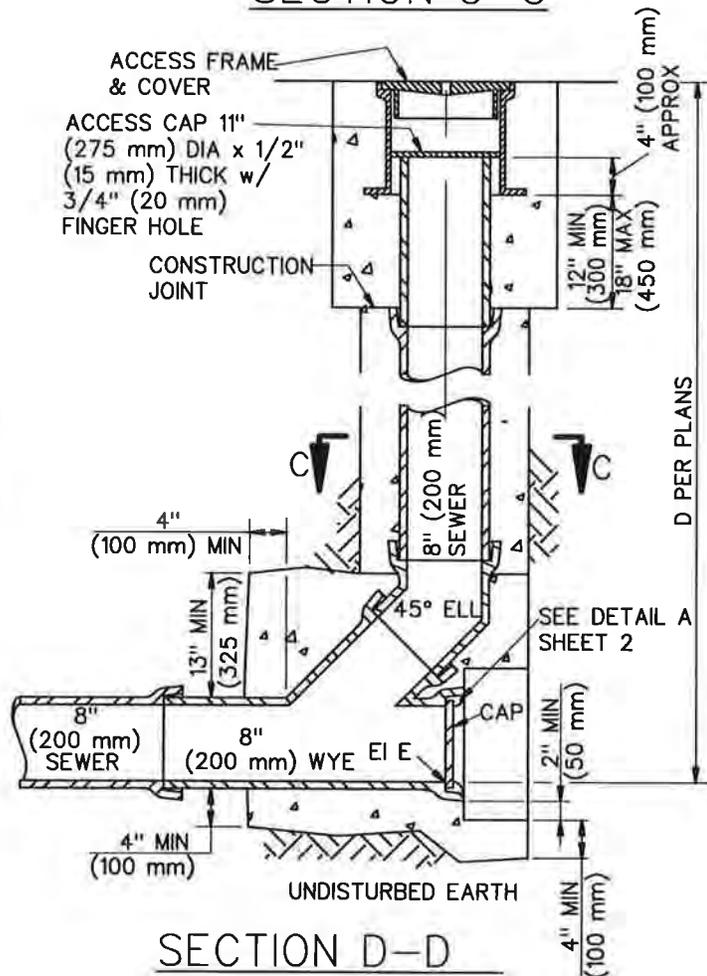
SECTION B-B



PLAN



SECTION C-C



SECTION D-D

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1993  
REV. 2005, 2009, 2021

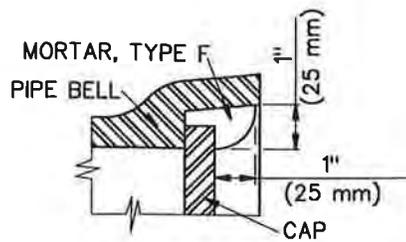
TERMINAL CLEANOUT STRUCTURE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

204-3

SHEET 1 OF 2



DETAIL A

**NOTES:**

1. VALUES OF DIMENSION D AND ELEVATION E SHALL BE AS SHOWN ON THE PLANS.
2. PIPE AND FITTINGS, UNLESS OTHERWISE NOTED, SHALL BE OF THE SAME MATERIALS AS THE SEWER, UNLESS APPROVED ADAPTORS ARE USED, AND MAY BE ANY OF THE FOLLOWING:
  - A. VC PIPE
  - B. PE PIPE
  - C. ABS SOLID WALL PIPE
  - D. ABS COMPOSITE PIPE
  - E. PVC PLASTIC PIPE
3. PIPE AND FITTINGS SHALL BE BEDDED AND ENCASED IN CONCRETE AS SHOWN. CONCRETE SHALL BE CLASS 450-C-2000 (265-C-14). JOIN AND ALIGN PIPE AND FITTINGS BEFORE PLACING CONCRETE. MAINTAIN ALIGNMENT WHILE PLACING AND ALLOWING CONCRETE TO SET.
4. THE ACCESS FRAME, COVER AND CAP SHALL BE CAST IRON. FINGER HOLES MAY BE DRILLED OR BLOCKED OUT PRIOR TO CASTING. FINGER HOLES SHALL NOT BE PUNCHED OUT.
5. THE CONTRACTOR MAY PLACE EITHER CIRCULAR OR SQUARE CONCRETE PIPE WALL SUPPORTS.

EXHIBIT B2

TECHNICAL SPECIFICATIONS AND PLANS FOR REPAVING 50<sup>TH</sup> STREET BETWEEN

SOTO STREET AND BOYLE AVENUE

SPECIFIC FOR THIS PROJECT

SPECIFIC FOR THIS PROJECT

50<sup>TH</sup> STREET BETWEEN SOTO ST. AND BOYLE AVE. ST. IMPROVEMENTS

GENERAL

B-1.01 Scope of Work – This project consists of a 4” deep removal and replacement of the existing asphalt pavement. New asphalt shall consist a latex modified asphalt concrete overlay (C2-PG-70-10) installed on one lift. In addition, the project may include the removal and replacement of damaged curb and gutter. To finalize, the streets shall be repainted according to the latest Caltrans standards as noted on the project plans.

B-1.02 Contract Plans – The details and the exact limits for the asphalt and concrete work in this project are shown on the City of Vernon Contract No. CS-1016 sheet drawings, incorporated into this Agreement by this reference:

<u>Sheet No.</u>	<u>Plan No.</u>	<u>Description</u>
1	-	Title Sheet & Notes
2	-	50 <sup>th</sup> Street - Pavement
3	-	50 <sup>th</sup> Street - Channelization

B-1.03 Specifications – Installation and payment for all the work shall conform to the Standard Specifications for Public Works Construction (2018 Edition), State of California Department of Transportation “Caltrans” Standard Plans and Standard Specifications (2018 Edition), California Manual on Uniform Traffic Control Devices (2014 Edition), and the City of Vernon Standard Plans.

The Standard Specifications for Public Works Construction (2018 Edition) shall be referred to hereafter as the “Standard Specifications”. The Caltrans Standard Plans (2018 Edition) shall be referred to hereafter as the “Standard Plans”. The California Manual on Traffic Control Devices (2014 Edition) shall be referred hereafter as the “CA MUTCD”.

B-1.04 Delays and Extensions of Time – The provisions of Section 6-6 entitled "Delays and Extensions of Time" of the Standard Specifications shall apply except as modified and supplemented below.

The second paragraph of subsection 6-6.1 is hereby deleted and the following paragraph shall be inserted in its place:

No extension of time will be granted for a delay caused by the inability of the Contractor to obtain materials, equipment and labor, except as authorized by the City Engineer. The length of contract time stipulated includes any time which may be required to obtain materials, equipment and labor, and the Contractor in submitting a bid shall be deemed to have ascertained the availability of materials, equipment and labor and considered same in his proposed construction schedule.

B-1.06 Quality of Work – The provisions of Section 4-1.1 entitled "Materials and Workmanship" of the Standard Specifications (2018) shall apply. In addition, any work deemed unacceptable by the City Engineer, whether a cause is determined or not shall be repaired or replaced by the Contractor at his expense.

B-1.07 Liquidated Damages – In accordance with Section 6-9 of the Standard Specifications (2018), for each consecutive calendar day required to complete the work in excess of the time specified herein for its completion, as adjusted in accordance with Section 6-6 of the Standard Specifications (2018), the Contractor shall pay to the City, or have withheld from monies due it, the sum of \$1,000

B-1.08 Unit Prices - All costs not covered by specific unit prices but required for a complete job in place, shall be included in the items most related to the work.

B-2.01 Scheduling of Work – The Contractor shall submit his work schedule to the City Engineer at the pre-construction meeting. The construction schedule shall show the sequence of work, critical path and estimated time for completion of each segment of work. This schedule must be reviewed and accepted by the City Engineer before the Contractor will be permitted to begin work. **In addition, the Contractor shall submit a detailed schedule forecasting two weeks of work describing each day's work. This schedule shall be updated and submitted to the City every other Monday during the construction period.** The Contractor shall give 48 hours' notice to the City Engineer prior to the start of the work.

B-2.02 Construction Hours- **Work shall occur between the hours of 7am to 4pm unless otherwise restricted by the type of work shown below:**

- **Asphalt work shall occur on Saturday and Sunday between the hours of 7am to 5pm.**
- **All re-striping work shall occur at night between the hours of 9pm to 4am Layout "Cat Track" shall be approved by the City before the final striping improvements are installed.**
- **Concrete improvement work which may include sidewalk, and accessible ramp improvements shall occur Monday-Friday between the hours of 8am to 4pm**

B-3.01 Traffic Requirements - General – Before any partial or total closure of any street, the Contractor shall be required to obtain the approval of the City Engineer.

The Contractor shall comply with Section 7-10 of the Standard Specifications (2018) and provide safe and continuous passage for pedestrian and vehicular traffic at all times. The contractor shall provide and maintain all necessary flagmen, barricades, delineators, signs, flashers and any other safety equipment as set forth in the latest publication of the State of California, Division of Highways, Traffic Manual or as required by the City Engineer to insure safe passage of traffic.

In addition to the requirements of the "CA MUTCD" handbook, the City Engineer may require flatter traffic tapers, additional traffic control devices, barricading, and other signing in order to ensure driver awareness and safety in the construction area. Further, the Contractor shall provide Type II or Type III barricades and delineators at locations as determined by the City Engineer.

The Contractor shall maintain continuous access to all businesses within the project limits. Any closed access or drive approach shall be immediately restored when the construction operation that necessitated such closure is completed. The following is a partial list of factors required to comply with this access requirement:

- a. Where a business or residence has more than one two-way drive, continuous access to at least one two-way drive shall be maintained at all times.
- b. A business or residence that has a drive approach that is at least 40 feet wide shall be poured in halves in order to maintain continuous access unless otherwise approved by the City Engineer.
- c. In addition to the above, the Contractor shall be required to construct temporary ramps at excavated areas and utilize other construction methods such as temporarily backfilling areas and surfacing with temporary A.C. paving, in order to comply with the requirements of continuous access unless otherwise directed by the City Engineer.

B-3.02 Traffic Requirements – Specific for this Project – In addition to the general specific requirements of Section B -3.01 of these Specifications, the following provisions shall apply unless otherwise directed by the City Engineer.

- a. **Construction hours shall be per Section B-2.02. During other work hours, the Contractor shall maintain all existing traffic lanes during the hours of 7a.m. - 8a.m. and 4p.m - 6p.m. each day. During the hours of 9a.m. – 4p.m., the Contractor may close the area adjacent to the proposed construction only if the street has more than one through lane of traffic in each direction and one through lane in each direction can be maintained unless otherwise specified in the contract provisions.**
- b. **The Contractor shall submit traffic channelization and detour plans to the City Engineer for approval at least (10) ten working days prior to commencement of work.**
- c. **The posting of "NO PARKING" signs within the construction limits is permitted with the approval of the City Engineer. "NO PARKING" signs shall contain a "TOW AWAY" warning.**

**These signs shall be furnished and maintained by the Contractor and shall be of the type approved by the City Engineer. Each sign posted shall have the date and time indicating the duration of the "NO PARKING" prohibition printed clearly in a manner acceptable to the City Engineer, and not handwritten. New signs shall be posted when changes occur in the parking prohibitions indicated on the previously**

posted signs.

**Signs must be posted at least 72 hours in advance of construction or they are invalid. Signs shall not be attached to trees or taped to street light or traffic signal poles. Contractor shall only post "NO PARKING SIGNS" on one side of the street at a time unless otherwise approved by the City Engineer. The signs shall be effective for no more than five working days and shall be removed within 24 hours after the work is complete. If signs are not removed in a timely manner, the City Engineer may suspend all work until signage requirement is corrected. All signs, lights and other warning devices used shall be in accordance with State of California Business and Transportation City Department of Public Works Manual of Warning Signs, Lights and Devices for Use in Performance of Work upon Highways.**

**Due to the necessity of private property access, the contractor may be required to maintain a fifteen (15) foot, in width, travel lane. Detour of traffic shall be maintained within the construction zone for the duration of the construction. The Contractor shall provide access to local businesses at all times unless otherwise approved by the City Engineer. This may include providing steel plates at some driveway approaches. The Contractor shall furnish and maintain Type II and Type III barricades with flashers at the removal areas. Message boards shall be used for pre-construction warnings, lane closure/detour areas and placed 10 calendar days in advance of the closure/detour. Flashing arrow boards shall be used on Santa Fe Avenue. The traffic control shall be in accordance with the California Manual of Temporary Traffic Controls (CA MUTCD, latest edition) handbook.**

- d. Traffic Control Work shall include all labor, materials, tools, equipment, transportation and incidentals necessary to maintain and control all vehicular and pedestrian traffic through the construction site. The cost of furnishing and maintaining traffic control during the construction including flagmen as necessary must be included in the various bid items, and no extra compensation will be paid to the Contractor.**

B-4.01 Extra Work – In the event the City and the Contractor are unable to negotiate an agreed price for extra work, which is acceptable to both parties, payment shall be made based on time and materials as follows:

- a. Work by the Contractor: The following percentages shall be added to the Contractor's cost and shall constitute the markup for all overhead and profits:

1.	Labor	20%
2.	Materials	15%
3.	Equipment Rental	15%
4.	Other Items and Expenditures	15%

- b. Work by the Subcontractor - When all or any part of the extra work is performed by a subcontractor, the above markups shall apply to the aggregate sum of the extra work, regardless

of the number of tiers of subcontractors used. In addition, a markup of 10-percent on the first \$5,000 of extra work and 5-percent on work in excess of \$5,000 may be added by the Contractor.

**B-4.02 Compliance with Laws, Regulations, and Safe Practices** – The Contractor shall perform all work in a safe, competent manner and in accordance with all federal, state, and local statutes, regulations, ordinances, rules, and governmental orders. The Contractor will be solely and completely responsible for the conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. Inspection of the Contractor's performance by the City, its agents, or employees is not intended to include review of the adequacy of the Contractor's safety measures in or near the job site.

**B-4.03 Notification of Affected Residents/Businesses** – The Contractor shall be responsible for distribution of the general information letter of the project to all *affected* residents and businesses.

A project general information letter and sufficient copies thereof will be prepared by City staff for Contractor distribution to all residents, business establishments, and institutions fronting on or directly affected by the project.

The Contractor shall be responsible for distribution of said letter in handout form to all the appropriate residences and buildings in the subject area. Distribution shall be accomplished in a manner acceptable to the City Engineer and shall be five (5) working days prior to the beginning of construction operations in the immediate vicinity.

In addition to the above, the Contractor shall be fully responsible for such other notifications as may be required related to necessary closures of streets, alleys, driveways, etc., or to unavoidable access or parking restrictions. These notifications shall apply where the closures and access or parking restrictions required in the performance of any work under this contract preclude any resident, tenant, or property owner from utilizing the premises or conducting business thereon in a reasonable and customary manner.

Additional notification to the *affected* businesses and residents shall be prepared by the City and distributed by the Contractor for roadway and driveway closures five (5) working days in advance of any construction work. No removal or excavation work is allowed until the additional notification has been distributed to the *affected* residents and businesses. If a Contractor is unable to adhere to his schedule as indicated on his written notification, then all the affected residents and places of business shall be re-notified of the revised schedule, in writing, as indicated above.

Contractor costs for all of the above notifications shall be considered as included in the appropriate items of the Bid Proposal.

**B-4.04 Notification of Utilities** – The provisions of Section 5 entitled "Utilities" of the Standard Specifications shall apply. The Contractor shall contact the Underground Service Alert of Southern California (U.S.A.) at least two working days in advance of the construction work.

**B-5.01 Noise Restrictions** – The Contractor may not operate certain power equipment, within a

residential area or within a radius of 500 feet from a residential area, except during the following times:

- 1. From 7:00 am to 4:00 pm, Monday through Friday**
- 2. From 7:00 am to 5:00 pm on Saturday and Sunday**

In addition, the noise level from the Contractor's operations shall not exceed 85 dBA when measured within a one hundred (100) foot radius at any time.

B-6.01 Construction Order of Work – Work shall be scheduled so as to lessen the impact upon businesses.

Requirements – General:

1. All construction shall conform to Sections 6-1 and 6-2 of the latest edition of the Standard Specifications for Public Works Construction and shall proceed in a smooth, efficient, timely and continuous manner. As such, once construction is started in a work area, the Contractor will be required to work continuously in that work area until construction has been completed and the work area is open and accessible to both vehicular and pedestrian traffic in a manner approved by the City Engineer before the next stage of work will be allowed to begin.
2. Once construction is started in a work area, the Contractor shall not withdraw manpower or equipment from that work area in order to start construction in another work area if doing so, in the opinion of the City Engineer, delays the completion of the work presently under construction.
3. The Contractor shall maintain continuous access to all residents and businesses within the project limits, including drive approaches, unless the Contractor has obtained the approval of the City Engineer to close either such access or drive approach.
4. No stockpiling of material and construction equipment on public streets or sidewalks will be permitted on this project unless approved by the City Engineer. Material and equipment placed on public streets, sidewalks and on the construction areas shall be used the same day.

B-7.01 Character of Workers – If any subcontractor or person employed by the Contractor shall appear to the City's Engineer to be incompetent, intemperate, troublesome, or acts in a disorderly or otherwise objectionable manner, he/she shall be immediately discharged from the project on the request of the City's Engineer, and such person shall not be reemployed on the work. If said individual has an ownership interest in the contracting entity, the City Engineer will serve written notice upon the Contractor and the Surety providing the faithful performance bond, in accordance with Section 6-4, "Default by Contractor," of the Standard Specifications, demanding complete and satisfactory compliance with the Contract.

B-8.01 Examination of the Site – The Contractor is required to examine the site and judge for themselves the location, physical conditions, substructures, and surroundings of the proposed work.

B-8.02 Mobilization – The cost of all preparatory work and operations for the multiple movements of personnel, equipment, supplies, and incidentals to the project site must be included in the various bid items, and no extra compensation will be paid to the Contractor.

B-8.03 Dust Control – Throughout all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall abate dust nuisance by cleaning, sweeping and sprinkling water, or other means as necessary when requested by the City. Failure of the Contractor to comply with the City Engineer's cleanup orders may result in an order to suspend work until the condition is corrected. No additional compensation or extension of contract completion time will be allowed as a result of such suspension. The cost of furnishing and operating dust control during the construction project shall be included in the various bid items, and **no** extra compensation will be paid to the Contractor.

B-8.04 Temporary Water Meter – If necessary, the Contractor shall obtain a temporary water meter from the City of Vernon Water Department by placing a deposit of \$1,000. Contractor shall pay for all water used. Contractor shall not relocate the service. The Contractor shall call the City of Vernon Water Department to relocate the service and will be charged \$50.00 for each relocation.

B-8.05 Cleaning of Site During Construction – During construction, all existing improvements, including pavement, sidewalk, curb and gutter, adjacent to the work area shall be swept free from soils, gravel, dirt or debris on a daily basis. The Contractor is responsible for maintaining all sidewalk, curb and gutter areas within the construction zone free from loose materials at all times.

B-8.06 Sanitary Facilities – The Contractor shall furnish and maintain sufficient sanitary facilities by the worksites for the entire duration of construction activities. The cost of furnishing and maintaining sufficient sanitary facilities shall be included in the various bid items, and **no** extra compensation will be paid to the Contractor.

B-8.07 Final Cleaning of Site and Restoration – The Contractor shall be responsible for cleaning and restoration of all damaged existing improvements such as sidewalk, driveway, curb and gutter, and private property at no cost to the City.

The Contractor shall remove all loose aggregates by sweeping all the sidewalks and gutters. The cost of furnishing and operating such sweeping after the construction of the project must be included in the various bid items, and no extra compensation will be paid to the Contractor.

B-9.01 Best Management Practices (BMP's) – The Contractor shall submit a copy of their Best Management Practices (BMPs) to the City Engineer for review ten (10) days prior to the beginning of any work.

The Contractor is hereby notified that specific construction practices in the Standard Specifications, Section 7-8.6.2, “Best Management Practices (BMPs)” are considered to be Best Management Practices. The Contractor shall implement and maintain such BMP's as are relevant to the work, and as are specifically required by the Plans or Special Provisions. The Contractor shall not commence activity until the BMP submittal has been reviewed and approved.

B-10.01 Protection of the Public – The Contractor shall take such steps and precautions as his/her operations warrant to protect the public from danger, loss of life, loss of property or interruption of public services. Unforeseen conditions may arise which will require that immediate provisions be made to protect the public from danger or loss, or damage to life and property, due directly or indirectly to prosecution of work under this contract. Whenever, in the opinion of the City Engineer, a condition exists in which the Contractor has not taken sufficient precaution of public safety, protection of utilities, and/or protection of adjacent structures or property, the City Engineer will order the Contractor to provide a remedy for the condition. If the Contractor fails to act on the situation within a reasonable time period as determined by the City Engineer, or in the event of an emergency situation, the City Engineer may provide suitable protection by causing such work to be done and material to be furnished as, in the opinion of the City Engineer, may seem reasonable and necessary.

The cost and expense of all repairs (including labor and materials) as are deemed necessary, shall be borne by the Contractor. All expenses incurred by the City for emergency repairs will be deducted from the final payment due to the Contractor.

B-11.01 Material Submittals – The Contractor shall provide all required submittals including, but not limited to the following:

Shop drawings, materials and mix designs to the City upon award of the contract for review and approval before the construction, and truncated domes.

The “Notice to Proceed” will not be issued to the Contractor until all the submittals have been reviewed and approved by the City.

B-12.01 Unclassified Excavation – This section shall conform to Subsection 300-2 of the Standard Specifications and these Special Provisions.

Unclassified excavation shall consist of saw cutting, excavation and disposal of existing concrete sidewalk, curb and gutter, and/or adjacent one foot wide strip asphalt pavement along proposed concrete improvements, aggregate base, soil etc., as shown on the Standard Plans. The cost for unclassified excavation shall be included in the unclassified excavation bid item unit price and no additional compensation to the Contractor shall be made therefor.

Cost for **unclassified fill** if any, **re-grading** and **re-compaction** shall be included in the unit price paid for the unclassified excavation for the said areas and **no** additional payment will be allowed therefor.

B-12.02 Saw-cutting – A concrete saw shall, where practicable, be used to neatly saw the edge of all existing concrete sidewalk, curb, gutter, and/or drive apron to be removed. All work shall conform to applicable provisions of the Standard Specifications. Payment for saw-cutting concrete and asphalt pavement, concrete spandrel, drive aprons, curb, gutter or sidewalk shall be included in the unit bid prices of the various related items as specified in the Bidder's Proposal and no additional compensation for this work shall be made therefor.

Saw-cutting will be required along score lines of all individual concrete areas to be removed unless otherwise directed by the City's Engineer. A minimum 8" saw-cutting depth will be required along the joint line for curb and gutter.

The residue resulting from the saw-cutting operations shall not be permitted to flow beyond the specific work location and shall be vacuumed concurrently with the operation. See Section I-2.04.1 of these Specifications for NPDES requirements.

B-13.01 Cold Planing – This section shall conform to Subsection 302-1 Cold Milling of Existing Pavement of the Standard Specifications. Cold planed (cold milled) asphalt will be disposed of in accordance Subsection 302-1.8 of the Standard Specification. **The cost to dispose of the cold planed asphalt concrete shall be included in the uniform cold plane bid item and no additional compensation for the work shall be made therefor.**

B-14.01 Benchmark Replacement – If benchmarks and/or centerline ties are displaced or damaged during construction, the Contractor shall replace them per City of Vernon Standards at **no** cost to the City. Contractor shall notify the City within 24 hours of displacing a benchmark and/or centerline ties.

B-15.01 Maintaining Existing Traffic Signal System – In accordance with Section 701-4 and 701-5.4 of the Standard Specifications, the existing traffic signals shall be in operation at all times.

B-16.01 Parkway Restoration – Parkway and lawn areas disturbed by construction and/or root removal operations shall be backfilled with material approved by the City Engineer, mechanically compacted to 90% of optimum density, and graded to join the adjacent improvements and parkway lawn areas. The parkway and lawn area shall be restored by sodding in accordance with Section 801-4.8 of the Standard Specifications, and the irrigation system to match the adjacent parkway area. The payment for this work shall be included in the most appropriately related bid item.

B-17.01 Concrete Improvement – General – The construction of concrete improvements shall consist of removal and disposal of concrete, asphalt concrete pavement, debris, native soil, and construction of concrete curb ramps and sidewalks according to the City of Vernon Plans. All concrete work shall be formed according to City of Vernon Standards. No wild pouring allowed. **All concrete classifications are according to Standard Specification for Public Works Construction Section 201-1.1.2.**

**The cost for construction of the depressed concrete gutter for curb ramps, soil backfill, re-compaction shall be included in the various bid items and no extra compensation will be paid to the Contractor.**

B-17.02 Concrete Sidewalk – The 3.5" thick concrete sidewalk and walkway shall be constructed according to the City of Vernon Standard Plan No. PV582. Saw-cut, remove, and dispose existing concrete, asphalt concrete, and/or soil to nearest score line or as painted by the City's Engineer. Sidewalk shall be measured and paid under the concrete sidewalk unit bid item including subgrade preparations, forming, finishing, and all incidentals. The cost for the removal and replacement of the concrete sidewalk shall be included in the sidewalk bid item unit price and **no** additional

compensation to the Contractor shall be made therefor.

B-17.03 Root Shaving/Pruning – Where the sidewalk has been raised by an existing tree, interfering roots shall be shaved per the Engineer's direction. The shaving of the roots will be paid under the appropriate bid item. The cost of shaving the tree roots and backfilling with clean soil shall be included in the Prune/Root Shave bid unit price and no additional compensation shall be made to the Contractor therefor.

The locations of the root shaving/pruning are shown on Attachment A and Attachment B of the Contract Specifications.

B-17.06 Concrete Curb and Gutter- Concrete curb & gutter shall be constructed according to the plans and City of Vernon Standard Plan No. PV582 including 6" thick Crushed Miscellaneous base (CMB). **The concrete curb face shall be 8" high.** New concrete curb & gutter shall be doweled with #4 rebar into existing concrete curb & gutter when length is less than 25'. Unless otherwise indicated on plans, remove a 2' wide by 17" deep section of pavement (asphalt, concrete, base) along the edge of existing gutter, re-compact base or sub-grade and repave with 5" thick asphalt concrete pavement to 4" below edge of gutter to allow for 4" asphalt concrete pavement overlay to be flush with edge of gutter. The cost for the removal & repaving of the 2' wide asphalt pavement depth along the removed concrete curb or gutter for forming shall be included in the various bid items and **no** extra compensation will be paid to the Contractor.

B-17.07 Concrete Joints and Keyways – Longitudinal joints shall coincide with traffic lanes unless otherwise approved by the City Engineer. Construction of keyways and tie bars shall be per the Standard Plans for Public Works Construction (SPPWC) Standard Plan No. 134-2 and placed at every cold joint in the concrete slab/pavement or as directed by the City Engineer.

B-18.01 Contractor Responsibility – **The Contractor shall be responsible for the final product and shall make any quality control, adjustments and corrections necessary to obtain the final product accepted by the City Engineer.** The Contractor shall perform process and quality control sampling and testing and exercise management control the work of his/her subcontractors, technicians and workers to ensure that the milling, transporting, spreading, compaction, and finishing processes conform to these Specifications. The proficiency of testing laboratories and sampling and testing personnel shall be reviewed and approved by the City Engineer prior to providing services to the project. The City Engineer shall have unrestricted access to the laboratory, sampling, testing sites, and all information resulting from mix design and quality control activities. All Quality Control testing results shall be submitted to the City Engineer on a daily basis.

B-19.01 Weather Limitations – Placement operations shall not be performed during wet conditions or if rain or cold conditions (less than 45°F) are imminent or predicted to exist at any time. "Imminent or predicted" is defined as being forecasted within a 48-hour period on the National Weather Service Web Site <http://www.wrh.noaa.gov> for the most representative and nearest location listed where placement is to begin and end.

B-20.01 Full Depth Asphalt Removal – Shall be in accordance with Section 300-1 of the Standard Specifications. Contractor shall remove entire asphalt section without disturbing or introducing any

subgrade materials to the asphalt millings.

B-21.01 Subgrade and Surface Preparation – Prior to placing new pavement the subgrade soils/base shall be properly prepared, moisture treated and compacted to a minimum of 95 percent relative compaction based upon ASTM D 1557 so as to create an evenly graded, unyielding surface. If the new pavement is to be placed on an existing milled pavement surface it shall be verified that the milled surface is firm and unyielding and there are no subgrade failure areas beneath the milled surface that might compromise the integrity of the new pavement. When new pavement is placed on a milled surface or adjacent to structures such as curbs, concrete gutters, swales, planters, etc... these contact surfaces shall be swept of all loose material to create a dry clean surface. A tack coat of SS-1h emulsion, emulsified recycling agent or equivalent (0.05 gallon per square yard minimum) shall be applied to all surface areas prior to placing the new pavement. New pavement is not recommended as a direct overlay on existing asphalt pavement without first milling the underlying pavement to aid in bonding and to prevent slippage.

B-22.01 New Asphalt Concrete Paving – Material – Asphalt concrete base paving material for this project shall be **Class C2 PG 70-10** with **2% Latex Additive** and per the specifications below. The asphalt concrete material shall include the following:

- (1) **Fractured faces** of crushed rock shall conform to Standard Specifications 200-1.2.
- (2) **Recycled Asphalt Concrete** shall **not** be allowed in new asphalt concrete mix.
- (3) Minimum **air void** shall be **4%** per Standard Specifications 203-6.4.3.

The Contractor shall inform the City of the name and location of the **asphalt plant** that will furnish asphalt concrete to the job sites. The City will schedule plant inspection on paving days for quality control. The City will reject asphalt concrete load shipments from any other plants.

The Contractor shall establish designated **asphalt truck routes and staging areas** and shall communicate these routes and areas to truck drivers prior to the arrival at the job site. The City shall approve this plan five (5) days prior to paving.

The Contractor shall place diesel fuel on top of all manholes, valves and monument covers immediately before the final asphalt pavement overlay. Feather joint edges shall be made along straight lines by hand raking out all heavy aggregates prior to rolling to produce a smooth uniform surface. Compacted edge along gutter shall be flush.

**No** traffic shall be allowed on paved surfaces for a **minimum of two hours** after paving unless approved by the City. Contractor shall remove all tracked asphalt materials from concrete surfaces. No asphalt trucks shall utilize existing driveways for turn around.

Paving operations at the end of each day or night shall leave **no joints parallel to the direction of traffic**. Joints perpendicular to the direction of traffic shall be ramped with temporary asphalt concrete. The ramping shall be removed prior to paving.

Existing potholed asphalt concrete pavement and base thicknesses are shown on plans.

B-22.02 Latex Rubber Additive – This work shall consist of adding a 2% latex rubber additive to the asphalt concrete mix for the final 2" thick surface overlay shall be **Class C2-PG 70-10** in accordance with the following provisions and the Standard Specifications for Public Works Construction, Section 203-10 "Latex Modified Asphalt Concrete":

- A. Latex rubber shall be water based emulsified suspension of Styrene/Butadiene Rubber in liquid form.
- B. Latex rubber, amounting to 2% by weight of the asphalt cement, shall be added at the pug mill with the asphalt cement during the mixing cycle.
- C. The Contractor shall submit the mix design to the City Engineer for approval prior to use.
- D. Latex rubber may be added to the mixture in any method that will assure uniform distribution, accurate measurement of quantity of latex introduced. The latex shall be introduced to the mix at the same time as the introduction of asphalt.
- E. The wet mixing cycle shall be 50 seconds.

Payment for Latex Rubber additive shall be included in the unit price for Asphalt Concrete Pavement with Latex and **no** extra compensation will be paid to the Contractor.

B-22.03 Tack Coat Application – A tack coat of SS-1h shall be applied at the rate of 0.10 gallons per square yard to all uniform thickness cold planed areas. **The surface shall be free of water, foreign material, or dust when the tack coat is applied. A similar tack coat shall be applied to the surface of any course, if the surface is such that a satisfactory bond cannot be obtained between it and a succeeding course.** The cost of furnishing and applying tack coat SS-1h must be included in the paving operation, and **no** extra compensation will be paid to the Contractor.

The Contractor shall make all necessary efforts to minimize the tracking of the fresh oil on the existing improvements such as sidewalks, driveways, curb and gutters, private property, etc. **Under no circumstance will the tack-coat truck spray the roadway more than 200 feet ahead of the paving machine. No trucks shall utilize existing driveways for turn around.** All maneuvering shall take place on the streets. Contractor will be responsible for such cleaning and restoration as needed.

B-22.04 Asphalt Concrete Pavement Reconstruction – Remove and dispose existing asphalt concrete pavement to a designated depth and re-compact top 6" of sub-grade to 95% relative compaction before constructing a new 6" thick **Crushed Miscellaneous Base (CMB)** and 6" thick asphalt concrete pavement base structure section with asphalt concrete **Class C2-PG 70-10** with added **2% latex rubber additive**.

B-22.05 Field Testing – The top six inches (6") of sub-grade and crushed miscellaneous base material shall be compacted to a relative compaction of 95%, except under sidewalks, ramps and driveways where the sub-grade shall be compacted to a relative compaction of 90%. All trenches and sub-grade below six inches (6") shall be compacted to a relative compaction of 90%.

The asphalt concrete pavement compaction after rolling shall also be 95%. The City shall test for the field density of the compacted asphalt concrete by using a properly calibrated nuclear asphalt-testing device.

The Contractor shall notify the City 48 hours in advance when to schedule field relative compaction tests. **Failed compaction test areas shall be immediately removed and replaced at Contractor's expense.**

B-23.01 Adjust Manhole Frame and Cover and Utility Valves – The Contractor, as part of the paving operations, shall **adjust to finish grade all the utility (gas, water etc.) manholes, valves and survey monuments as necessary at no cost to the City.** The City will furnish new extension sleeves when necessary and the Contractor shall install as directed by the City.

**The Contractor shall free all the valve covers 300 feet ahead of the paving machine.** Immediately after rolling, the valve covers must be raised or lowered to new grade to insure proper access. Existing valves must be exposed and accessible at all times. The valve covers that are unable to be freed and raised during paving operations shall be marked on the new pavement or tied to the existing sidewalk and the Contractor shall raise or adjust the valve covers to the new finished grade within a week with **no** cost to the City.

B-23.02 Replacement of Manhole Frame and Cover – The contractor must provide a cut sheet of the manhole frame and cover to the City for approval prior to the purchase of these materials. The manhole frame and cover name must match with the utility. Additionally, the manhole frame and cover must meet all the specifications of the SPPWC Standard Plan No. 630-4.

The cost for the materials and disposal of the manhole frame and cover must be included in the manhole frame and cover bid item.

B-25.01 Striping Improvements – Furnishing and installing traffic striping, pavement markers, and pavement markings (legends) shall conform to Section 214 of the Standard Specifications and/or the provision in Section 84 “Traffic Stripes and Pavement Markings”, and in Section 85, “Pavement Markers” of the Caltrans Specifications. The Contractor shall layout (cat track) all striping within one week after the placement of the final paved surface. Once approved by the City, the striping of all the streets shall be installed with Thin-mil thermoplastic traffic stripes and pavement markings. The Contractor shall furnish the necessary control points for all existing striping and legend marking prior to removing them. Traffic striping shall be placed upon the finished asphalt concrete or PCC pavement surface according to the plans. Crosswalk markings at adjacent approaches to the improvements shall be restriped as noted on traffic striping plans. The Contractor shall be responsible for the completeness and accuracy of the layout and re-striping to the satisfaction of the City. A blue retro reflective raised pavement marker per Caltrans Traffic Manual Section 6-03.4, Figure 6-44 shall be placed on new asphalt pavement at all fire hydrant locations. The contractor shall place temporary striping tabs before the street is opened up to traffic. The Contractor shall also install pavement markers according to the striping plans.

**Prior to the installation of the traffic signal loops, the contractor shall layout the proposed crosswalks.** The cost of preparing layout and furnishing control points must be included in the respective lump sum bid item, and **no** extra compensation will be paid to the Contractor.

B-26.01 Paint Materials – Furnishing and installing traffic striping, pavement markers, and pavement markings (legends) shall conform to Section 214 of the STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION “GREENBOOK” (2018 Edition and supplements) and/or the provision in Section 84 “Traffic Stripes and Pavement Markings”, and in Section 85, “Pavement Markers” of the Cal Trans State Specifications.

Thin-mil thermoplastic traffic stripes and pavement markings, and thermoplastic crosswalks and limit lines shall conform to the provisions in Sections 84-1, “General,” and 84-2, “Thermoplastic Traffic Stripes and Pavement Markings,” of the CSS and these special provisions.

Specifications for glass beads shall be “8010-004 (Type II).” Glass beads shall be premixed within the thermoplastic material prior to application and also applied to the thermoplastic striping material immediately following the application of the striping.

Thin-mil thermoplastic material shall conform to the requirements of Caltrans Specification No. PTH-02SPRAY, for Thermoplastic Traffic Striping Material, Sprayable, White and Yellow. The binder material shall be Alkyd. Copies of the Caltrans Specification No. PTH- 02SPRAY are available at the Caltrans Transportation Laboratory, Sacramento, California. Thermoplastic material shall conform to the requirements of Caltrans Specification No. PTH-02ALKYD.

Thin-mil thermoplastic material for traffic stripes shall be applied by spray method in single uniform layer at the minimum thickness of 30 mils and not to exceed 45 mils.

Thin-mil thermoplastic material shall be applied to the pavement at a temperature between 350° F. and 400° F., unless the manufacturer recommends a different temperature.

The Contractor shall adjust the thermoplastic application rate as necessary to achieve the thermoplastic application rate stated above prior to striping. Thermoplastic application rate tests (up to and including 5 thermoplastic application rate tests per day, including the thermoplastic application rate test at the start of each workday) may be conducted at random times and locations throughout each workday at the discretion of the Engineer.

Beads Materials:

1. Beads shall be colorless and free from milkiness.
2. No. 2 beads shall be used.
3. Beads shall be kept in a dry storage to prevent moisture absorption.
4. Beads shall be applied uniformly at the rate of five (5) pounds to seven (7) pounds of beads per gallon of paint.
5. Beads shall be uniformly heated to not less than eighty (80) degrees Fahrenheit when applied.

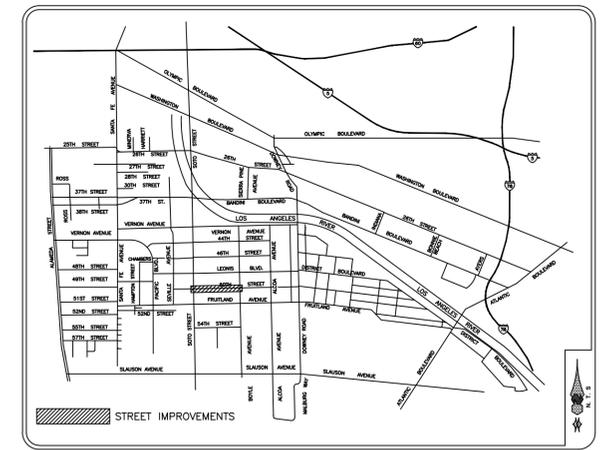
The cost of all paints, beads, other material and equipment required to complete the job must be included in the respective lump sum bid item, and **no** extra compensation will be paid to the contractor.

B-27.01 Testing – The paint application rate shall be determined by passing the striper over a metal plate while the paint application system is operating. The flow of glass beads shall be stopped while passing over the metal plate. The Engineer or representative shall measure thickness of the applied thermoplastic immediately after application of thermoplastic on the metal plate. Striping shall not continue if the proper thickness of thermoplastic is not being applied. Adjustments and corrective measures shall be applied to insure that the correct thickness of thermoplastic will be applied. Testing of the thermoplastic application rate, as described above, will be required following any adjustment to the thermoplastic application rate, thermoplastic applicator nozzles, or any other thermoplastic application equipment prior to commencement or re-commencement of striping. The initial testing and re-testing of thermoplastic application rates at any location shall be considered as a single thermoplastic application rate test.

B-28.01 Temporary Striping - The Contractor shall install temporary traffic striping tabs on the same day(s) of the cold planning and overlay before the lanes are opened to traffic. The cost of all the temporary striping and incidentals to the various project sites must be included in the various bid items, and **no** extra compensation will be paid to the contractor. All temporary striping shall be removed prior to the final striping.



# CITY OF VERNON PUBLIC UTILITIES DEPARTMENT 50TH ST. BETWEEN SOTO ST. AND BOYLE AVE. STREET IMPROVEMENTS



VICINITY MAP

### GENERAL CONSTRUCTION NOTES:

1. STATIONING IS ALONG THE CENTERLINE OF STREET.
2. ELEVATIONS ARE IN FEET ABOVE CITY OF VERNON DATUM PLANE B.M.M. NO.10-A, ELEV. 180.217.
3. WORK TO BE DONE IS SHOWN IN HEAVY SOLID LINES, AND PER CONTRACT NO. CS-1061.
4. THE CONSTRUCTION SHALL COMPLY WITH THE 2018 EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION - SOUTHERN CALIFORNIA CHAPTERS OF THE AMERICAN PUBLIC WORKS ASSOCIATION AND ASSOCIATED GENERAL CONTRACTORS OF AMERICA.
5. ANY CONTRACTOR PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE WITH THE SITES AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM HIS OPERATIONS, WHETHER OR NOT THESE FACILITIES ARE SHOWN ON THESE PLANS.
6. THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE DIG ALERT AT 811 2 DAYS PRIOR TO ANY DIGGING.
7. THE CONTRACTOR SHALL NOTIFY THE CITY OF VERNON DEPARTMENT OF PUBLIC WORKS AT LEAST 48 HOURS PRIOR TO THE BEGINNING OF WORK. PHONE NO. (323) 583-8811.
8. THE CONTRACTOR SHALL PROVIDE CONSTRUCTION SURVEYING AND STAKING SERVICES AS NEEDED AT NO EXTRA COST TO THE CITY.
9. CONTRACTOR SHALL COORDINATE ALL ACTIVITIES WITH UTILITY OWNERS AND RAILROAD COMPANIES.
10. THE CITY WILL PERFORM COMPACTION TESTS. ANY FAILED TESTS SHALL BE PAID FOR BY THE CONTRACTOR.
11. NO CONCRETE SHALL BE POURED UNTIL THE FORMS, COMPACTION AND ANY REINFORCING STEEL ARE PLACED, INSPECTED, AND APPROVED. ALL CONCRETE REMOVAL SHALL BE SAWCUT AT JOINS.
12. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING AND MAINTAINING ALL TRAFFIC CONTROLS AND SIGNS DURING THE ENTIRE PROJECT.
13. ALL A.C. OVERLAY MATERIAL SHALL BE 2% LATEX ASPHALT PAVEMENT CLASS C2-PG 70-10.
14. CONTRACTOR SHALL PLACE TEMPORARY STRIPING IMMEDIATELY AFTER REPAVING OF THE STREETS.
15. ALL ADJUSTMENTS TO MANHOLE FRAMES AND COVERS, VALVE AND MONUMENT COVERS SHALL BE PERFORMED AS PART OF THE PAVING OPERATION AT NO EXTRA COST. CITY WILL PROVIDE SLEEVES FOR ADJUSTING TO GRADE WHEN NECESSARY.
16. ALL EDGES OF COLD PLANE CUT AREAS SHALL BE RAMPED WITH TEMPORARY A.C. COLD MIX AT THE JOIN LINES FOR A BETTER VEHICLE CROSSING WITH NO EXTRA COST TO THE CITY.

### GENERAL CHANNELIZATION NOTES:

1. ALL SIGNS, STRIPING AND PAVEMENT MARKINGS SHALL CONFORM TO THE 2018 EDITION OF THE CALTRANS STD. PLANS/TRAFFIC MANUAL/CA MUTCD 2014, EXCEPT AS NOTED IN PROJECT PLANS AND SPECIFICATIONS.
2. TRANSITION CURVE FOR LEFT TURN POCKETS SHALL BE L= 60' UNLESS OTHERWISE NOTED.
3. LANELINE APPROACHES SHALL BE L= 50' UNLESS OTHERWISE NOTED.
4. INSTALL BLUE RETROREFLECTIVE RAISED PAVEMENT MARKERS AT FIRE HYDRANTS PER THE 2014 EDITION OF THE CA MUTCD, SECTION 3B.11.
5. LANE LINES AND CENTERLINES AT RAILROAD CROSSINGS SHALL TERMINATE 3 FEET FROM OUTSIDE TRACK.
6. CAT TRACKS SHALL BE PLACED WITHIN 48 HOURS AFTER RESURFACING/SLURRY SEAL.
7. FIRST ROW OF TRAFFIC LOOPS SHALL BE INSTALLED 1' BEHIND LIMIT LINE.
8. GRADE CROSSING PAVEMENT MARKING (RXR) SHALL BE PLACED DIRECTLY OPPOSITE THE GRADE CROSSING ADVANCE WARNING SIGN. CONTRACTOR SHALL NOTIFY CITY ENGINEER IF NO ADVANCE WARNING SIGN IS POSTED.
9. REMOVE CONFLICTING CROSSWALKS OR LANE LINES.
10. THERE MUST BE AT LEAST A 7' CLEARANCE FROM THE BOTTOM OF INSTALLED SIGNS TO THE GROUND. SIGNS MUST BE AT LEAST 2' FROM THE ROADWAY (1' WHERE SIDEWALK IS NARROW).

CONTRACT SHEET SCHEDULE		
SHEET NO.	PLAN NO.	DESCRIPTION
1	-	TITLE SHEET & NOTES
2	-	STREET IMPROVEMENTS - 50TH ST. FROM SOTO ST. TO BOYLE AVE.
3	-	CHANNELIZATION IMPROVEMENTS - 50TH ST. FROM SOTO ST. TO BOYLE AVE.

### STANDARD LEGEND

<p>AC = ASPHALT CONCRETE BC = BEGIN CURVE BCR = BEGIN CURB RETURN BW = BACK OF WALK CB = CATCH BASIN C-G = CURB-GUTTER CL = CENTERLINE CLF = CHAIN LINK FENCE C.M.B. = CRUSHED MISCELLANEOUS BASE CONC = CONCRETE COV = CITY OF VERNON STORM DRAIN D = DISTRICT DRAIN, IMPROVE. D.M.H. = STORM DRAIN MANHOLE DWY = DRIVEWAY APPROACH ECL = EAST OF CENTERLINE ECR = END CURVE RETURN EG = EDGE OF GUTTER EMH = ELECTRIC MANHOLE EPB = ELECTRIC PULL BOX EX = EXISTING EXIST = EXISTING FDC = FIRE DEPT. CONNECTION FG = FINISHED GROUND/GRADE FH = FIRE HYDRANT FL = FLOW LINE FS = FINISHED SURFACE GB = GRADE BREAK GVR = GAS VALVE RISER HP = HIGH POINT LAJ = LOS ANGELES JUNCTION RAILWAY COMPANY LAC = LOS ANGELES COUNTY LACFCD = LOS ANGELES COUNTY FLOOD CONTROL DISTRICT L.A.D.W.P. = LOS ANGELES DEPARTMENT OF WATER AND POWER</p>	<p>LF = LINEAR FEET MOC = MIDPOINT OF CURVE MH = MANHOLE NIC = NOT IN CONTRACT OVR = OIL VALVE RISER PIV = POST INDICATOR VALVE PL = PROPERTY LINE PP = POWER POLE PVMT = PAVEMENT (A.C./CONC.) R = RADIUS RCB = REINFORCED CONC. BOX R/W = RIGHT OF WAY RW = RECLAIMED WATER S.P.P.W.C. = STD. PLANS FOR PUBLIC WORKS CONSTRUCTION SG = STRAIGHT GRADE SMH = SEWER MANHOLE STD = STANDARD SW = SIDEWALK TC = TOP OF CURB TH = THICKNESS THR = TRAFFIC HOME RUN TL = TRAFFIC LOOP TMH = TELEPHONE MANHOLE TPB = TRAFFIC PULL BOX TR = TOP OF RAIL (TRACK) TS = TRAFFIC SIGNAL TSC = TRAFFIC SIGNAL CABINET TX = TOP OF "X" WB = WATER VALVE BOX WCL = WEST OF CENTERLINE WVR = WATER VALVE RISER WMH = WATER MANHOLE</p>
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### LEGEND



1- GRIND 4" OF EXISTING ASPHALT, PLACE BACK 4" THICK C2-PG 70-10. (BY PETRELLI)

2- SALVAGE MANHOLE COVER AND FRAME. SLURRY BACKFILL AND PAVE.

3- ADJUST TO GRADE MANHOLE FRAME AND COVER, UTILITY VALVE COVER OR CITY OF VERNON MONUMENT COVER AS NEEDED.

4- REMOVE UTILITY COVER, BACKFILL, AND PAVE. NOTE: PROTECT IN PLACE NEARBY ACTIVE WATER MAIN LINE VALVE SLEEVE AND COVER



5- GRIND 4" OF EXISTING ASPHALT, PLACE BACK 4" THICK C2-PG 70-10. (BY CONTRACTOR)

### STREET CONSTRUCTION NOTES

### CHANNELIZATION NOTES

- 6- PAINT 6" SOLID DOUBLE YELLOW LINE PER CALTRANS STANDARD PLAN A20A, DETAIL 22.
- 7- PAINT 'STOP' TEXT 8' BEHIND LIMIT LINE PER CALTRANS STANDARD PLAN A24D.
- 8- PAINT 12" WHITE LIMIT LINE PER CALTRANS STANDARD RSP A24G.
- 9- PAINT 6" BROKEN YELLOW CENTERLINE PER CALTRANS STANDARD PLAN A20A, DETAIL 2.

### CALTRANS STANDARDS

A20A, A20D	PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS
A24A	PAVEMENT MARKINGS ARROWS
A24D	PAVEMENT MARKINGS WORDS
A24G	PAVEMENT MARKINGS YIELD LINES, LIMIT LINES, AND WRONG WAY DETAILS
A88A	CURB RAMP DETAILS
ES-5B	ELECTRICAL SYSTEMS (DETECTORS)
ES-8A	ELECTRICAL SYSTEMS (NON-TRAFFIC PULL BOX)

### A.P.W.A. STANDARDS

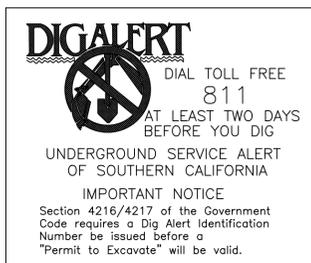
134-2	CONCRETE PAVEMENT JOINT DETAILS
122-2	CROSS AND LONGITUDINAL GUTTERS
630-4	MANHOLE FRAME & COVER

### STANDARD SYMBOLS

⊙	= SEWER MANHOLE
⊙	= STORM DRAIN MANHOLE
⊙	= WATER MANHOLE
⊙	= TELEPHONE MANHOLE
⊙	= ELECTRIC MANHOLE
⊙	= WATER OR GAS VALVE
⊙	= POWER POLE
⊙	= BENCH MARK
⊙	= FIRE HYDRANT
⊙	= TRAFFIC SIGNAL
⊙	= GRATE
⊙	= TREE
⊙	= EXIST. A.C. PAVEMENT POTHOLED THICKNESS

### NOTICE TO CONTRACTOR

THE CONTRACTOR SHALL ASCERTAIN THE TRUE VERTICAL AND HORIZONTAL LOCATION AND SIZE OF ALL UTILITIES, PIPES, AND/OR STRUCTURES AND SHALL BE RESPONSIBLE FOR DAMAGE TO ANY PUBLIC OR PRIVATE UTILITIES, SHOWN OR NOT SHOWN HEREON



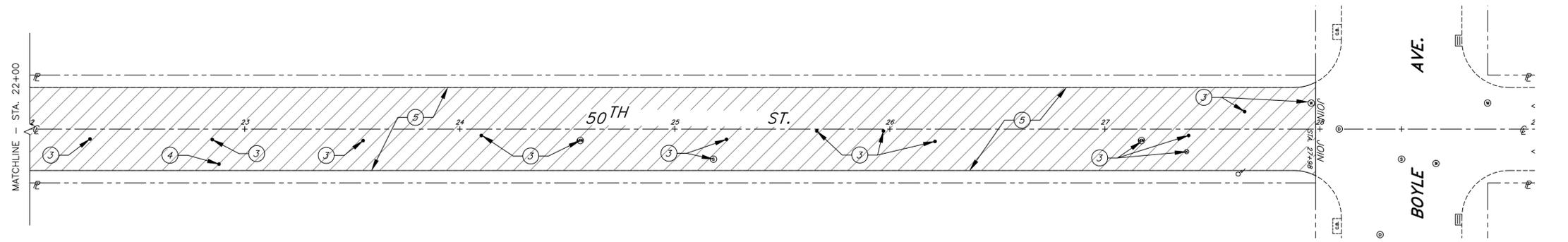
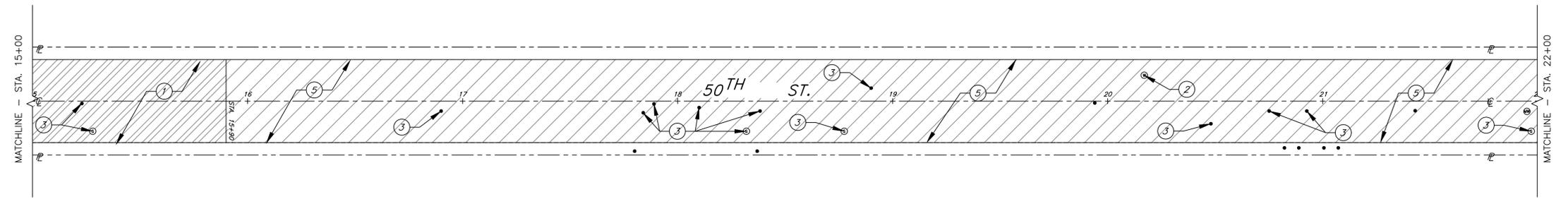
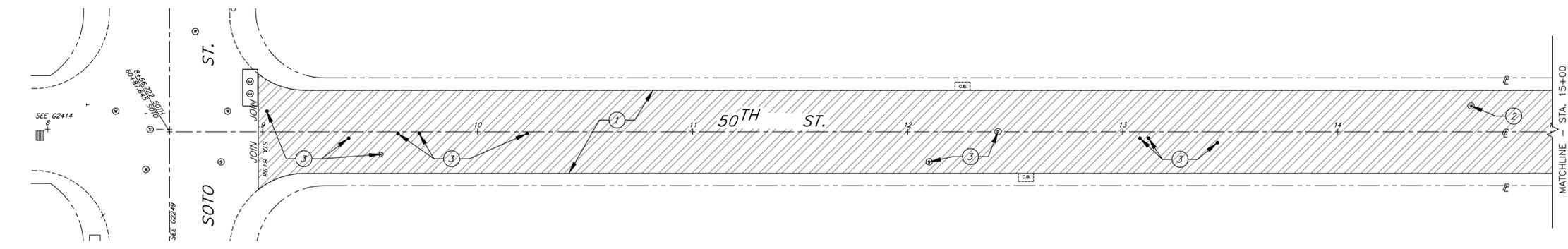
DESIGNED: MA	APPROVED:	CITY OF VERNON PUBLIC UTILITIES DEPARTMENT	TITLE SHEET
DRAWN: MA	CIVIL ENGINEER	50TH ST. BETWEEN SOTO ST. AND BOYLE AVE. STREET IMPROVEMENTS	SHEET 1 OF 3
CHECKED: MA	NO. 92728		CAPITAL IMPROVEMENT PROJECT
REVIEWED: MA	DATE:		

**LEGEND**



**STREET CONSTRUCTION NOTES**

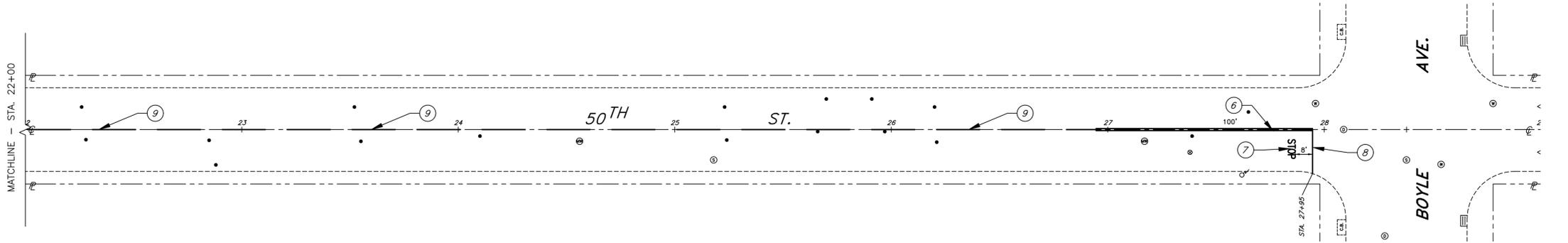
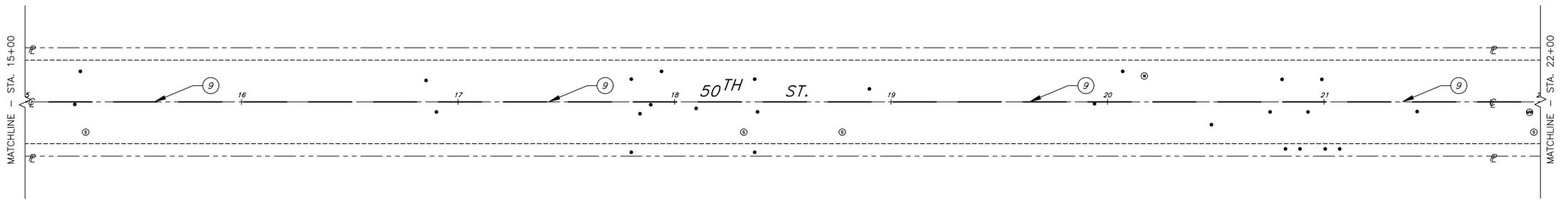
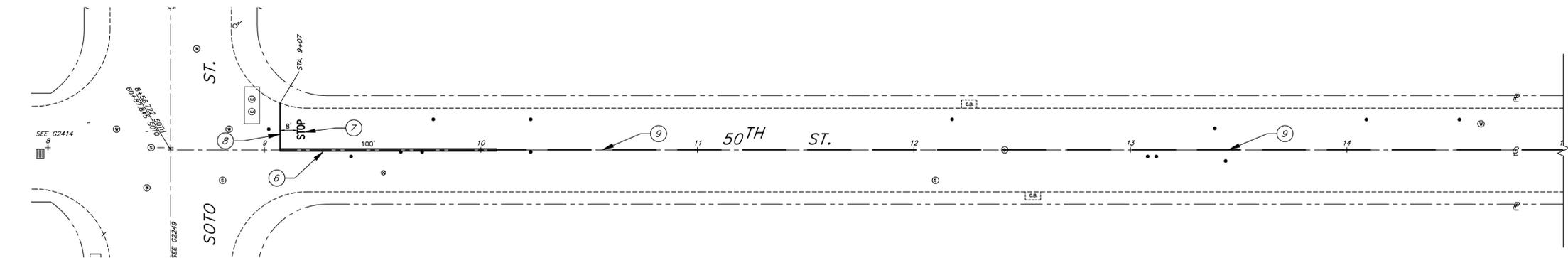
- ① GRIND 4" OF EXISTING ASPHALT, PLACE BACK 4" THICK C2-PG 70-10. (BY PETRELLI)
- ② SALVAGE MANHOLE COVER AND FRAME. SLURRY BACKFILL AND PAVE.
- ③ ADJUST TO GRADE MANHOLE FRAME AND COVER, UTILITY VALVE COVER OR CITY OF VERNON MONUMENT COVER AS NEEDED.
- ④ REMOVE UTILITY COVER, BACKFILL, AND PAVE. NOTE: PROTECT IN PLACE NEARBY ACTIVE WATER MAIN LINE VALVE SLEEVE AND COVER
- ⑤ GRIND 4" OF EXISTING ASPHALT, PLACE BACK 4" THICK C2-PG 70-10. (BY CONTRACTOR)



DESIGNED: MA	APPROVED:	CITY OF VERNON PUBLIC UTILITIES DEPARTMENT	CONTRACT No.	PAVEMENT
DRAWN: MA	CIVIL ENGINEER			
CHECKED: MA	NO. 92728	50TH ST. BETWEEN SOTO ST. AND BOYLE AVE.		SHEET 2 OF 3
REVIEWED: MA	DATE:			

**CHANNELIZATION NOTES**

- ⑥ — PAINT 6" SOLID DOUBLE YELLOW LINE PER CALTRANS STANDARD PLAN A20A, DETAIL 22.
- ⑦ — PAINT 'STOP' TEXT 8' BEHIND LIMIT LINE PER CALTRANS STANDARD PLAN A24D.
- ⑧ — PAINT 12" WHITE LIMIT LINE PER CALTRANS STANDARD RSP A24G.
- ⑨ — PAINT 6" BROKEN YELLOW CENTERLINE PER CALTRANS STANDARD PLAN A20A, DETAIL 2.



DESIGNED: MA	APPROVED:	CITY OF VERNON PUBLIC UTILITIES DEPARTMENT	CONTRACT No.	CHANNELIZATION
DRAWN: MA	CIVIL ENGINEER	50TH ST. BETWEEN SOTO ST. AND BOYLE AVE.		SHEET 3 OF 3
CHECKED: MA	NO. 92728	STREET IMPROVEMENTS		
REVIEWED: MA	DATE:			

EXHIBIT C  
EQUAL EMPLOYMENT OPPORTUNITY  
PRACTICES PROVISIONS

- A. Contractor certifies and represents that, during the performance of this Agreement, the contractor and each subcontractor shall adhere to equal opportunity employment practices to assure that applicants and employees are treated equally and are not discriminated against because of their race, religious creed, color, national origin, ancestry, handicap, sex, or age. Contractor further certifies that it will not maintain any segregated facilities.
- B. Contractor agrees that it shall, in all solicitations or advertisements for applicants for employment placed by or on behalf of Contractor, state that it is an "Equal Opportunity Employer" or that all qualified applicants will receive consideration for employment without regard to their race, religious creed, color, national origin, ancestry, handicap, sex or age.
- C. Contractor agrees that it shall, if requested to do so by the City, certify that it has not, in the performance of this Agreement, discriminated against applicants or employees because of their membership in a protected class.
- D. Contractor agrees to provide the City with access to, and, if requested to do so by City, through its awarding authority, provide copies of all of its records pertaining or relating to its employment practices, except to the extent such records or portions of such records are confidential or privileged under state or federal law.
- E. Nothing contained in this Agreement shall be construed in any manner as to require or permit any act which is prohibited by law.

# City Council Agenda Item Report

Submitted by: Diana Figueroa  
Submitting Department: City Administration  
Meeting Date: March 1, 2022

## **SUBJECT**

Ground Lease Re-Assignment and Sublease at 2970 E. 50<sup>th</sup> Street and Related Ground Lessor Estoppel and Consent

## **Recommendation:**

Adopt Resolution No. 2022-03 approving the ground lease re-assignment and sublease at 2970 E. 50<sup>th</sup> Street and authorizing the execution of related Ground Lessor Estoppel and Consent.

## **Background:**

Currently, NM GLCR, LP, an affiliate of New Mountain Net Lease Acquisition Corp. (NM GLCR) leases property located at 2970 East 50<sup>th</sup> Street in Vernon from the City pursuant to a Ground Lease (Lease) dated December 27, 2004. Since its commencement, the Lease has been modified, amended, substituted, assigned, or extended on four separate occasions in years 2005, 2007, 2012, and 2017.

NM GLCR now intends to sell its interests in certain industrial properties in the state of California, including the property located at 2970 East 50<sup>th</sup> Street to Rexford Industrial Acquisitions, LLC or its assignee (Rexford). With respect to the Vernon property, NM GLCR is landlord to Arctic Glacier USA, Inc. (Arctic Glacier USA), a manufacturer and distributor of packaged ice, ice equipment, and related services, pursuant to a sublease. NM GLCR intends to assign its ground lessee interest in the Vernon property to Rexford with the proposed Ground Lessor Estoppel and Consent (Exhibit A to the resolution). Arctic Glacier USA will continue to sublease its facility following the sale of NM GLCR's interest in the Vernon property and its assignment of interest to Rexford.

Most recently, the City Council adopted Resolution No. 2017-50 approving a ground lease re-assignment and sublease, and authorized the execution of related ground lessor estoppel, consent and ground lease amendment. Unlike the 2017 re-assignment, there is no proposed amendment to the Lease terms. All parties to the re-assignment intend that the ground lease remain substantively identical post-sale, with Rexford operating as the new ground lessee and landlord to Arctic Glacier USA. The current term of the Lease is scheduled to expire on January 9, 2061. At present, all rent and other charges due and payable under the Lease have been paid in full to the City.

Since the City is the lessor of the property located at 2970 East 50<sup>th</sup> Street, and pursuant to the terms of the Lease, the Council may allow re-assignment of the Ground Lease for said premises from NM GLCR to Rexford by adopting the proposed resolution.

## **Fiscal Impact:**

A one-time \$1,500 processing fee will be paid to the City for the ground lease re-assignment, as per Section 13.2(e) of the Ground Lease Agreement for the property at 2970 East 50<sup>th</sup>

Street.

**Attachments:**

1. Resolution No. 2022-03

RESOLUTION NO. 2022-03

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF VERNON  
APPROVING THE GROUND LEASE RE-ASSIGNMENT AND SUBLEASE  
AT 2970 E. 50<sup>TH</sup> STREET AND AUTHORIZING THE EXECUTION OF  
RELATED GROUND LESSOR ESTOPPEL AND CONSENT

SECTION 1. Recitals.

- A. The City of Vernon owns certain real property located at 2970 E. 50<sup>th</sup> Street in the City of Vernon, consisting of approximately 113,000 square feet of land and a building located thereon (the "Premises").
- B. On January 5, 2005, the City Council of the City of Vernon adopted Resolution No. 8632 approving a Ground Lease Agreement (Lease) with Union Ice-Pacific, L.P., through its General Partner, Union Ice GP Inc. (Union Ice), dated as of December 27, 2004, for rental and renovation of the Premises for use as an ice production, food processing and cold storage facility.
- C. On October 12, 2005, the City Council of the City of Vernon adopted Resolution No. 8866 approving an Amendment to the Lease with Union Ice, which modified the commencement date of the Lease to June 30, 2005.
- D. On February 20, 2007, the City Council of the City of Vernon adopted Resolution No. 9251 approving the execution of a Landlord's Estoppel Certificate, Agreement and Consent which (i) permitted assignment of the Lease to Arctic Ice Properties, LLC (Arctic Ice); and (ii) permitted sublease (as amended, modified or restated, "Sublease") of the Premises to Arctic Glacier Vernon Inc. or an affiliate thereof (Arctic Glacier Vernon).
- E. On or about June 12, 2012, the City was notified by Arctic Glacier Vernon that (i) it along with several of its affiliates had commenced Court-supervised restructuring proceedings in Canada and thereunder had agreed to sell their business and all of their assets to H.I.G. Zamboni, LLC (HIG), which is the corporate parent of Arctic Glacier U.S.A., Inc. (Arctic Glacier USA), effective as of June 7, 2012 (the "Bankruptcy Sale"); and (ii) it desired to assign its interest in the Sublease to HIG or an affiliate thereof, with the intention of continuing the operation of Arctic Glacier Vernon's business uninterrupted following closing of the Bankruptcy Sale.
- F. As of June 28, 2012, HIG changed its name to "Arctic Glacier LLC," but this fact was not made known to the City at the time.
- G. On July 17, 2012, the City Council of the City of Vernon adopted Resolution No. 2012-125 approving and authorizing the execution of a consent to the assignment of the Sublease from Arctic Glacier Vernon to HIG, which, unbeknownst to the City, had legally changed its name to "Arctic Glacier LLC," or an affiliate thereof.

H. On July 27, 2012, the Bankruptcy Sale was completed (the “2012 Sublease Transaction”).

I. Following the 2012 Sublease Transaction, the current lessee under the Lease was Arctic Ice, and the current sublessee under the Sublease and occupant of the Premises is Arctic Glacier USA.

J. On October 3, 2017, the City Council of the City of Vernon adopted Resolution No. 2017-50 approving the ground lease re-assignment and sublease at 2970 E. 50<sup>th</sup> Street and authorizing the execution of related ground lessor estoppel, consent and ground lease amendment to and for the benefit of NM GLCR, L.P., an affiliate of New Mountain Net Lease Acquisition Corp. (NM GLCR).

K. On or about January 14, 2022, the City was notified that NM GLCR now intends to sell its interests in certain industrial properties in the state of California, including the subject Premises, to Rexford Industrial Acquisitions, LLC, or its assignee (Rexford). NM GLCR intends to assign its ground lessee interest in the Premises to Rexford with the proposed Ground Lessor Estoppel and Consent. Arctic Glacier USA will continue to sublease its facility following the sale of NM GLCR’s interest in the Vernon property and its assignment of interest to Rexford.

L. By memorandum dated March 1, 2022, the City Administrator has recommended the approval of re-assignment of the Lease and Sublease and the authorization to execute the related ground lessor estoppel and consent to and for the benefit of Rexford.

M. The City Administrator further recommends approval of a sublease of the Premises by Rexford to Arctic Glacier USA.

N. Rexford intends to continue to perform the obligations under the Lease from and after the date of such re-assignment.

O. The City Council of the City of Vernon desires to approve the Lease re-assignment, the authorization to execute related ground lessor estoppel and consent to and in favor of Rexford, and the sublease from Rexford to Arctic Glacier USA.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF VERNON AS FOLLOWS:

SECTION 2. The City Council of the City of Vernon hereby finds and determines that the above recitals are true and correct.

SECTION 3. The City Council of the City of Vernon hereby approves the re-assignment of the Lease at 2970 E. 50<sup>th</sup> Street to Rexford and approves and authorizes

the execution of the related Ground Lessor Estoppel and Consent, in substantially the same form as the copy which is attached hereto as Exhibit A.

SECTION 4. The City Council of the City of Vernon hereby approves of a sublease of the Premises from Rexford to Arctic Glacier USA.

SECTION 5. The City Council of the City of Vernon hereby authorizes the Mayor or Mayor Pro-Tem to execute said Ground Lessor Estoppel and Consent for, and on behalf of, the City of Vernon and the City Clerk, or Deputy City Clerk, is hereby authorized to attest thereto.

SECTION 6. The City Council of the City of Vernon hereby instructs the City Administrator, or his designee, to take whatever actions are deemed necessary or desirable for the purpose of implementing and carrying out the purposes of this Resolution and the transactions herein approved or authorized, including but not limited to, making any non-substantive changes to the Ground Lessor Estoppel and Consent attached hereto.

SECTION 7. The City Council of the City of Vernon hereby directs the City Clerk, or the City Clerk's designee, to send a fully executed Ground Lessor Estoppel and Consent to NM GLCR and Rexford.

SECTION 8. The City Clerk shall certify the passage and adoption of this resolution and enter it into the book of original resolutions.

APPROVED AND ADOPTED this 1<sup>st</sup> day of March, 2022.

\_\_\_\_\_  
MELISSA YBARRA, Mayor

ATTEST:

\_\_\_\_\_  
LISA POPE, City Clerk  
(seal)

APPROVED AS TO FORM:

\_\_\_\_\_  
ZAYNAH N. MOUSSA,  
Interim City Attorney

**GROUND LESSOR ESTOPPEL AND CONSENT**

THIS **GROUND LESSOR ESTOPPEL AND CONSENT** (this “Estoppel”) made as of this 1<sup>st</sup> day of March 2022, by and between **THE CITY OF VERNON** (individually and collectively, together with their successors and/or assigns, “Lessor”) and **REXFORD INDUSTRIAL ACQUISITIONS, LLC**, a Delaware limited liability company, and its successors and assigns (“Lessee”).

WHEREAS, Lessor has heretofore leased certain lands described on **Exhibit A** attached hereto (the “Premises”) to NM GLCR, L.P., as successor-in-interest to Arctic Ice Properties, LLC (“NM GLCR”), pursuant to a Ground Lease dated December 27, 2004, as amended by that Amendment to Lease dated August 24, 2005, as further amended by that certain Ground Lease reassignment and sublease dated February 20, 2007, as further amended by that certain Ground Lease reassignment and sublease dated July 17, 2012, and as further amended by that certain Ground Lessor Estoppel, Consent and Ground Lease Amendment dated October 3, 2017 (as same may have been amended, modified, substituted, assigned or extended, the “Lease”);

WHEREAS, the current lessee under the Lease is NM GLCR, which subleases the Premises to the current tenant, Arctic Glacier U.S.A., Inc. (“Sublessee”), provided that, on or following the date of this Estoppel, Lessee will (i) acquire NM GLCR’s interest in the Lease, as ground tenant, and (ii) enter into that certain Lease Agreement, dated as of March 1, 2022, with Sublessee, as tenant, in substitution of the existing sublease between NM GLCR and Sublessee and pursuant to which, among other things, Sublessee will sublease the Land from Lessee (the “Sublease”); and

WHEREAS, Lessee requires the confirmation of certain matters in the Lease, as more particularly set forth herein;

NOW THEREFORE, in consideration of one thousand five hundred dollars (\$1,500.00) as the City’s review fee pursuant to Section 13.2 of the Ground Lease, and other good and valuable consideration the receipt and sufficiency of which are hereby acknowledged, Lessor hereby certifies to and agrees with Lessee as follows:

1. Lessor hereby acknowledges that Lessee’s notice address is as follows, for all purposes of the Lease:

<b>Address for Lessee Notice:</b> (or such other address as Lessee may provide from time-to-time)	c/o Rexford Industrial 11620 Wilshire Blvd., Ste 1000 Los Angeles, CA 90025 Attention: Kelly Diep, P.M.
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2. Lessor hereby certifies, as of the date hereof, to Lessee and as follows:

(a) Lessor is the owner of the fee simple estate in the Premises and is the Lessor under the Lease.

(b) Lessee is the owner of the leasehold estate in the Premises and is the Lessee under the Lease.

(c) The Lease is in full force and effect in accordance with its terms and has not been further assigned, supplemented, modified or otherwise amended and each of the obligations on Lessor’s part to be performed to date under the Lease have been performed.

**GROUND LESSOR ESTOPPEL AND CONSENT**

(d) To the best of Lessor's knowledge, each of the obligations on Lessee's part to be performed to date under the Lease have been performed.

(e) To the best of Lessor's knowledge, no offsets, counterclaims, deductions, credits or defenses to the payment of rent exist under the Lease.

(f) With respect to the Lease, no options to renew or extend exist, and no security deposits, escrows or prepaid rent or liens have been paid, except as set forth therein. The Base Rent, additional rent, and other additional charges related to the Premises, including all charges for real property taxes, operating expenses and other such expenses, and all other sums payable by Lessee to the Lessor under the Lease, including utility charges during the original and any renewal term of the Lease, are the responsibility of Lessee under the Lease.

(g) Other than the Lease and the Sublease, there do not exist any other effective agreements (including Subordination, Non-Disturbance and Attornment Agreements) concerning the Premises, whether oral or written between Lessor and Lessee (or their respective predecessors) under the Lease.

(h) As of the date hereof, no Base Rent or additional rent is delinquent from Lessee under the Lease. The Base Rent currently payable by Lessee under the Lease is \$11,913.56 per month. Base Rent due under the Lease has been paid through February 2022. The Base Rent will next reset effective as of January 2026.

(i) The current term of the lease shall expire on January 9, 2061, whereupon Lessee will have remaining four (4) renewal options of ten (10) years each.

(j) Aside from the Sublease, neither Lessor nor Lessee has assigned the Lease, nor has Lessor sublet the Premises.

(k) Lessor has not assigned, conveyed, transferred, sold, encumbered or mortgaged its interest in the Lease or the Premises and there are currently no mortgages, deeds of trust or other security interests encumbering Lessor's fee interest in the Premises and Lessor has not granted to any third party an option or preferential right to purchase all or any part of the Premises.

(l) Lessor has not received written notice of any pending eminent domain proceedings or other governmental actions or any judicial actions of any kind against the Lessor's interest in the Premises.

(m) Lessor has not received written notice that it is in violation of any governmental law or regulation applicable to its interest in the Premises and its operation thereon, including, without limitation, any environmental laws or the Americans with Disabilities Act, and has no reason to believe that there are grounds for any claim or such violation.

(n) There are no actions, voluntary or otherwise, pending or, to the best knowledge of Lessor, threatened against Lessor under the bankruptcy, reorganization, moratorium or similar laws of the United States, any state thereof or any other jurisdiction.

3. Lessor hereby consents and agrees to the following:

(a) assignment of the Lease from NM GLCR to Lessee; and

**GROUND LESSOR ESTOPPEL AND CONSENT**

(b) sublease of the Premises from Lessee to Sublessee; provided, however, Lessor's consent to any of the foregoing is not intended, and shall not be construed (a) to modify or otherwise affect any provision of the Lease (except as may be set forth herein), or (b) as a waiver of any of Lessor's rights under the Lease.

4. This Estoppel and the representations, warranties and covenants contained herein are given with the understanding that this Estoppel constitutes a material inducement for Lessee entering into the transactions described herein and that Lessee shall rely on the same. This Estoppel and the representations, warranties and covenants contained herein shall inure to the benefit of Lessee and its successors and assigns (including, without limitation, each person who may thereafter acquire Lessee's interest under the Lease by purchase or otherwise) and shall be binding on Lessor, its heirs, legal representatives, successors and assigns and Lessor further agrees that this Agreement may be relied upon by Lessee and its successors and assigns.

5. This Estoppel may be executed in any number of counterparts, each of which shall be effective only upon delivery and thereafter shall be deemed an original, and all of which shall be taken to be one and the same instrument, for the same effect as if all parties hereto had signed the same signature page. Any signature page of this Estoppel may be detached from any counterpart of this Estoppel without impairing the legal effect of any signatures thereon and may be attached to another counterpart of this Estoppel identical in form hereto but having attached to it one or more additional signature pages.

[SIGNATURE PAGE FOLLOWS]

**GROUND LESSOR ESTOPPEL AND CONSENT**

IN WITNESS WHEREOF, the undersigned parties have executed this Ground Lessor Estoppel and Consent as of the date and year first written above.

**LESSOR:  
THE CITY OF VERNON**

By: \_\_\_\_\_  
Carlos Fandino, Jr.  
City Administrator

Attest:

By: \_\_\_\_\_  
Lisa Pope  
City Clerk

Approved as to form:

By: \_\_\_\_\_  
Zaynah N. Moussa  
Interim City Attorney

**ACCEPTED AND AGREED TO:  
LESSEE:**

**REXFORD INDUSTRIAL ACQUISITIONS, LLC,  
a Delaware limited liability company, for itself and its  
successors and assigns**

By: Rexford Industrial Realty, L.P.,  
a Maryland limited partnership,  
its Managing Member

By: Rexford Industrial Realty, Inc.,  
a Maryland corporation,  
its General Partner

By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_

GROUND LESSOR ESTOPPEL AND CONSENT

**EXHIBIT A**

PARCEL 1 AS SHOWN ON RESOLUTION NO. 8363 FOR LOT LINE ADJUSTMENT, AS EVIDENCED BY DOCUMENT RECORDED FEBRUARY 10, 2004 AS INSTRUMENT NO. 2004-0296188 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PARCEL 1

THAT PORTION OF LOT 31, OF THE 500 ACRE TRACT OF THE LOS ANGELES FRUIT LAND ASSOCIATION, IN THE CITY OF VERNON, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 3, PAGES 156 AND 157 OF MISCELLANEOUS RECORDS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF SAID LOT 31; THENCE SOUTH 321.50 FEET ALONG THE EAST LINE OF SAID LOT 31 TO THE NORTH LINE OF THAT 17.00 FOOT WIDE RIGHT OF WAY OF THE LOS ANGELES JUNCTION RAILWAY, AS DESCRIBED IN DEED TO CENTRAL MANUFACTURING DISTRICT INC., RECORDED 4-7-1927, IN BOOK 4752, PAGE 265 OF OFFICIAL RECORDS, IN SAID RECORDER'S OFFICE; THENCE WEST 387.70 FEET ALONG SAID NORTH LINE OF SAID RIGHT OF WAY TO THE INTERSECTION OF A LINE THAT IS 387.70 FEET WEST MEASURED PERPENDICULAR TO AND IS PARALLEL WITH THE EAST LINE OF SAID LOT 31; THENCE NORTH 321.50 FEET ALONG LAST SAID PARALLEL LINE TO THE NORTH LINE OF SAID LOT 31; THENCE EAST 387.70 FEET ALONG SAID NORTH LINE OF SAID LOT 31, ALSO BEING THE CENTERLINE OF EAST 50TH STREET, 40.00 FEET WIDE, AS DESCRIBED IN DEED TO THE CITY OF VERNON, RECORDED 9-5-1929, AS DOCUMENT NO. 1410, IN BOOK 9335, PAGE 149 OF OFFICIAL RECORDS, IN SAID RECORDER'S OFFICE, TO THE POINT OF BEGINNING.

EXCEPT THEREFROM THE NORTH 20.00 FEET OF SAID LOT 31, THE SOUTH LINE OF SAID NORTH 20.00 FEET, ALSO BEING THE SOUTH LINE OF EAST 50TH STREET 40.00 FEET WIDE, AS DESCRIBED IN DEED TO THE CITY OF VERNON, RECORDED 9-5-1929, AS DOCUMENT NO. 1410, IN BOOK 9335, PAGE 149 OF OFFICIAL RECORDS, IN SAID RECORDER'S OFFICE.

32352928.2

# City Council Agenda Item Report

Submitted by: Angela Melgar  
Submitting Department: Finance/Treasury  
Meeting Date: March 1, 2022

## **SUBJECT**

2022 Pension Obligation Bonds

### **Recommendation:**

Adopt Resolution No. 2022-24 authorizing the issuance of bonds to refund and prepay certain pension obligations of the City; approving the form and authorizing execution of a trust agreement and bond purchase agreement; authorizing judicial validation proceedings relating to the issuance of such bonds; and approving additional actions related thereto.

### **Background:**

As part of a multifaceted approach, Pension Obligation Bonds (POBs) allow the City to level annual payments for savings and, combined with a 115 Trust and a Pension Management Policy, will contribute to the long-term success of the City's pension financing program.

In June 2021, staff engaged the services of GovInvest to analyze the benefits and risks associated with issuing bonds to refinance pension and Other Post-Employment Benefits (OPEB) debt. On September 21, 2021, GovInvest presented its findings to Council, focusing on the potential savings, risks, and benefits of issuing POBs. On February 1, 2022, with Workshop I, GovInvest provided an updated presentation to Council, highlighting factors in CalPERS' rate of return for fiscal year 2020-21 of 21.3% which caused an automatic lowering of the discount rate from 7.0% to 6.8% due to CalPERS' Funding Risk Mitigation Policy, and discussed its impacts to the City's Unfunded Actuarial Liability (UAL). Supplementary Workshop II on February 15, 2022 provided an opportunity for questions and answers, and further discussion. The recent volatility in the market was communicated as well as interest rate fluctuations. Also on February 15, 2022, Council approved the issuance of Pension Obligation Bonds and appointed Stifel, Nicolaus & Company, Inc. (Stifel) to serve as underwriters on the proposed POBs. Stifel was selected through a competitive Request for Proposal process and will offer and sell the POBs to investors. Their fees, known as an underwriter's discount, will be paid through bond proceeds and are contingent on the sale of bonds. The Resolution authorizing the issuance of the POBs sets the maximum underwriter's discount at 0.4% of the principal amount of the POBs.

POBs can be viewed as "refinancing" the CalPERS liability at a lower interest rate. Instead of paying CalPERS 6.8% on its unfunded liabilities, the City can issue POBs, which are currently being sold to investors at a much lower interest rate. Essentially, the greater the difference between the interest rate of the POBs and the CalPERS discount rate, the greater the savings. Based on current market conditions, the average interest rate for the City's POBs is estimated to be 4.5%.

Council has already approved BLX Group LLC (BLX) to serve as Municipal Advisor and Stradling Yocca Carlson & Rauth (Stradling) to serve as Bond and Disclosure Counsel on the POBs and to serve as litigation counsel in connection with the judicial validation proceedings described below.

Adoption of the proposed resolution is necessary to further the bond issuance process and provides legal authority to issue POBs sometime in the future. Once the judicial validation process is complete, staff would still present the Preliminary Official Statement (the offering document that will be available to prospective investors) for City Council approval, currently expected for the July 5, 2022 Council meeting.

The accompanying Resolution accomplishes the following:

1. Authorizes the Issuance of POBs. Authorizes the issuance of POBs to refund all or a portion of the City's UAL and the issuance of additional bonds from time to time to refund any additional CalPERS obligations in an aggregate principal amount not-to-exceed \$145,000,000.
2. Commences Validation Proceedings. Authorizes and directs bringing a validation action pursuant to Section 860 of the California Code of Civil Procedure.
3. Approves the Form and Authorizes the Execution of Trust Agreement. Approves the form and authorizes the execution of the Trust Agreement by and between the City and the Bank of New York Mellon Trust Company. The Trust Agreement sets forth the terms and conditions of the POBs.
4. Approves the Form and Authorizes the Execution of the Bond Purchase Agreement. Approves the form and authorizes the execution of the Bond Purchase Agreement by and between the City and Stifel, as underwriter. The Bond Purchase Agreement authorizes the issuance and sale of the POBs by a negotiated sale to the Underwriter.

The Resolution authorizes the sale of up to \$145 million in POBs; however, it is important to note that this amount is based on the CalPERS actuarial valuation report as of June 30, 2020. As discussed at the February 1, 2022 Council meeting, CalPERS' rate of return for fiscal year 2021 was 21.3%, which caused an automatic lowering of the discount rate from 7.0% to 6.8% pursuant to CalPERS' Funding Risk Mitigation Policy. Combined, these factors will result in a significant credit to the City's pension liability profile, which will ultimately lead to a lower amount of POBs issued. Also important to note, the City does not need to "refund" the entire UAL. An analysis will be completed to pinpoint which plan amortization bases will have the most beneficial impact from financing.

Next Step in Bond Process:

The next step required for the issuance of POBs is to obtain judicial validation. This process requires review before a Superior Court judge prior to issuance, which could take 90 to 120 days. In California, POBs do not require voter approval due to an exception to the State Constitutional debt limitation for the financing or refinancing of existing obligations imposed by law, such as the City's obligations under its CalPERS contract. In order to obtain authorization to issue POBs, the City is required to obtain a formal judgment that the City's obligations to CalPERS are an obligation imposed by law under the California Constitution and, therefore, may be refunded under the Refunding Bond Law under the California Government Code. The judicial proceedings are largely an administrative matter, a process typically handled by bond counsel.

**Fiscal Impact:**

Exhibit A to the Resolution sets forth "Good Faith Estimates" as required by SB 450; such Good Faith Estimates have been determined by assuming the POBs will be issued in the \$145 million not-to-exceed par amount. City staff and the financing team will provide an update of estimates (including savings) to Council once the validation process is complete, concurrent with the approval of the Preliminary Official Statement and prior to the bond sale (currently

expected at the July 5, 2022 City Council meeting).

**Attachments:**

1. Resolution No. 2022-04
2. Trust Agreement
3. Bond Purchase Agreement

## RESOLUTION NO. 2022-04

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF VERNON AUTHORIZING THE ISSUANCE OF BONDS TO REFUND AND PREPAY CERTAIN PENSION OBLIGATIONS OF THE CITY; APPROVING THE FORM AND AUTHORIZING THE EXECUTION OF A TRUST AGREEMENT AND BOND PURCHASE AGREEMENT; AUTHORIZING JUDICIAL VALIDATION PROCEEDINGS RELATING TO THE ISSUANCE OF SUCH BONDS; AND APPROVING ADDITIONAL ACTIONS RELATED THERETO

### SECTION 1. Recitals.

A. The City of Vernon (the "City") has previously adopted a retirement plan pursuant to the Public Employees' Retirement Law, commencing with Section 20000 of the Government Code of the State of California, as amended (the "Retirement Law") and elected to become a contracting member of the California Public Employees' Retirement System ("PERS").

B. The Retirement Law and the contract (as amended, the "PERS Contract") effective November 1, 1948, between the Board of Administration of PERS and the City Council of the City (the "City Council") obligate the City to (i) make contributions to PERS to fund pension benefits for certain City employees, (ii) make payments towards the unfunded actuarial liability with respect to such pension benefits under the Retirement Law and the PERS Contract (the "Unfunded Liability"), and (iii) appropriate funds for the foregoing purposes.

C. The City desires to authorize the issuance of its City of Vernon Taxable Pension Obligation Bonds (the "Bonds") pursuant to the provisions of Articles 10 and 11 of Chapter 3 of Part 1 of Division 2 of Title 5 of the California Government Code, commencing with Section 53570 of said Code (the "Bond Law"), in a maximum principal amount not to exceed that required to refund the Unfunded Liability, to prepay all or a portion of the City's annual required retirement contribution that is due and payable to PERS within 18 months of the issuance of the Bonds (the "Current Obligation"), to pay capitalized interest on the Bonds and to pay the costs of issuance of such Bonds, including the underwriter's discount and any original issue discount on such Bonds.

D. The City expects that the need may arise in the future to issue additional refunding bonds (the "Additional Bonds") pursuant to the Bond Law to refinance all or a portion of the then outstanding Unfunded Liability and to fund the Current Obligation.

E. The Bonds will be issued under and secured by a Trust Agreement (such Trust Agreement, in substantially the form presented to this meeting, with such changes, insertions and omissions as are made pursuant to this Resolution, being referred to herein as the "Trust Agreement") by and between the City and The Bank of New York Mellon Trust Company, N.A., as trustee.

F. The City has determined the advisability of filing an action to determine the validity of the Bonds, the Additional Bonds and the Trust Agreement, and the actions proposed to be taken in connection therewith.

G. In compliance with SB 450, the City has obtained from its Municipal Advisor the required good faith estimates and such estimates are disclosed and set forth in Exhibit A hereto.

H. All acts, conditions and things required by the laws of the State of California to exist, to have happened and to have been performed precedent to and in connection with the consummation of the financing authorized hereby do exist, have happened and have been performed in regular and due time, form and manner as required by law, and the City is now duly authorized and empowered, pursuant to each and every requirement of law, to consummate such financing for the purpose, in the manner and upon the terms herein provided.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF VERNON AS FOLLOWS:

SECTION 2. The City Council of the City of Vernon hereby finds and determines that the above recitals are true and correct.

SECTION 3. The City Council of the City of Vernon hereby authorizes and approves the issuance of the Bonds on the terms and conditions set forth in, and subject to the limitations specified in, the Trust Agreement. The Bonds shall be dated, shall bear interest at the rates, shall mature on the dates, shall be issued in the form and shall have terms as provided in the Trust Agreement, as the same shall be completed in accordance with this Resolution. The title of the Bonds may be changed to reflect the year in which the Bonds are issued, and to reflect the appropriate series designation, as directed by the City Administrator of the City.

SECTION 4. The City Council of the City of Vernon hereby approves and authorizes the execution of the Trust Agreement, in substantially the form submitted to this meeting and made a part hereof as though set forth in full herein. The Mayor, Mayor Pro Tem, City Administrator or Finance Director and their authorized designees (the "Authorized Officers") are, and each of them is, hereby authorized and directed, for and in the name and on behalf of the City, to execute and deliver the Trust Agreement in substantially the form presented to this meeting, with such changes, insertions and omissions as the Authorized Officer executing the same may require or approve, such requirement or approval to be conclusively evidenced by the execution of the Trust Agreement by such Authorized Officer. The City Clerk of the City is hereby authorized and directed to attest the Trust Agreement for and in the name and on behalf of the City.

SECTION 5. The City Council of the City of Vernon hereby authorizes and approves the issuance of Additional Bonds pursuant to the Bond Law, as authorized by the Trust Agreement, from time to time, to refund all or a portion of the Unfunded Liability

and fund the Current Obligation, provided that the City Administrator, or his or her designee, first certifies to the Council in writing that such actions will result in anticipated cost savings to the City. The City Council authorizes any one of the Authorized Officers, or their designees, to execute and deliver one or more other trust agreements and/or one or more supplemental agreements supplementing or amending the Trust Agreement and providing for the issuance of Additional Bonds (each an "Additional Trust Agreement"); provided, however, that (i) each series of Additional Bonds shall be in a principal amount not to exceed the sum of the Unfunded Liability of the City to PERS under the PERS Contract and the Retirement Law remaining unpaid on the date of issuance of such Additional Bonds, the Current Obligation, and the costs of issuing the Additional Bonds, (ii) the issuance of each series of Additional Bonds results in net present value savings to the City as determined by an Authorized Officer at the time that each series of such Additional Bonds are issued, and (iii) the Additional Bonds shall not mature later than the last date through which PERS has determined for the amortization of the Unfunded Liability of the City in accordance with its current procedures.

Each Unfunded Liability refunded and Current Obligation funded by the Bonds and each series of Additional Bonds pursuant to the Trust Agreement and each Additional Trust Agreement constitutes an obligation imposed by law, pursuant to the Constitution and laws of the State of California and an obligation of the City not limited as to payment from any special source of funds. The Unfunded Liability refunded and Current Obligation funded by the Bonds pursuant to the Trust Agreement and each series of Additional Bonds pursuant to an Additional Trust Agreement shall not, however, constitute an obligation of the City for which the City is obligated or permitted to levy or pledge any form of taxation or for which the City has levied or pledged or will levy or pledge any form of taxation.

SECTION 6. The City Council of the City of hereby approves the form of the Bond Purchase Agreement (the "Bond Purchase Agreement") by and among the City and Stifel, Nicolaus & Company, Incorporated (the "Underwriter") presented to this meeting and on file with the Clerk and the sale of the Bonds to the Underwriter pursuant thereto upon the terms and conditions set forth therein, and subject to such approval and subject to the provisions hereof, the Authorized Officers, acting alone, are each hereby authorized and directed to evidence the City's acceptance of the offers made by the Bond Purchase Agreement by executing and delivering the Bond Purchase Agreement in substantially said form, with any additions thereto (including the insertion of the maturity dates, principal amounts, interest rates and redemption provisions of the Bonds) and changes therein as any of the Authorized Officers executing the same may approve and such matters as are authorized by this Resolution, such approval to be conclusively evidenced by the execution and delivery thereof by any one of the Authorized Officers.

SECTION 7. The City Council of the City of Vernon hereby authorizes the Authorized Officers, on behalf of the City, to establish and determine (i) the final principal amount of the Bonds, provided the aggregate initial principal amount of the Bonds shall not be greater than the lesser of (a) \$145,000,000 or (b) the sum of the City's Unfunded Liability and Current Obligation as calculated by PERS or other actuary selected by the

Authorized Officer, together with the costs of issuing the Bonds as approved by such Authorized Officer, (ii) the final interest rates on various maturities of the Bonds, provided that the issuance of the Bonds results in net present value savings to the City as determined by an Authorized Officer at the time that the Bonds are sold and that the maturity date of the Bonds shall not be later than the last date through which PERS has determined for the amortization of the Unfunded Liability of the City in accordance with its current procedures; and (iii) the Underwriter's discount for the purchase of the Bonds, not to exceed 0.40% of the principal amount of the Bonds.

SECTION 8. The City Council of the City of Vernon hereby authorizes the Authorized Officers to negotiate and execute an insurance policy and/or a debt service reserve fund insurance policy for the Bonds (and such other agreements that may be required by the insurer in connection therewith) if it is determined that the policies will result in interest rate savings for the City, and to pay the insurance premium of such policies from the proceeds of the issuance and sale of the Bonds.

SECTION 9. The City Council of the City of Vernon hereby appoints the Bank of New York Mellon Trust Company, N.A. to act as trustee under the Trust Agreement.

SECTION 10. In order to determine the validity of the Bonds, the Additional Bonds, the Trust Agreement and the Additional Trust Agreements, and the actions authorized hereby to be taken in connection therewith, the City Council hereby authorizes the City Attorney, in concert with Stradling Yocca Carlson & Rauth, Bond Counsel, to prepare and cause to be filed and prosecuted to completion all proceedings required for the judicial validation of the Bonds, the Additional Bonds, the Trust Agreement and the Additional Trust Agreements in the Superior Court of Los Angeles County, under and pursuant to the provisions of Sections 860 *et seq.* of the California Code of Civil Procedure. The City Council further authorizes the Authorized Officers and all other officers, employees and agents of the City to take any and all actions, including the execution and delivery of appropriate documentation, as may be required to conclude such judicial validation proceedings.

SECTION 11. The City Council of the City of Vernon hereby authorizes and directs the Authorized Officers, and each of them, to execute and deliver any and all documents and instruments and to do and cause to be done any and all acts and things necessary or proper for carrying out the transactions contemplated hereby, including, but not limited to, the preparation of an Official Statement (and a Preliminary Official Statement) for use in connection with the offering and sale of the Bonds, the execution and delivery of a continuing disclosure undertaking, and the execution and delivery of any documents required by PERS in order to complete the issuance of the Bonds or Additional Bonds, the refunding of the Unfunded Liability and the funding of the Current Obligation.

SECTION 12. The City Council of the City of Vernon hereby approves, confirms and ratifies all actions heretofore taken by the Authorized Officers and by any other officers, employees or agents of the City with respect to the issuance of the Bonds, or in connection with or related to any of the agreements or documents referenced herein.

SECTION 13. The City Clerk shall certify the passage and adoption of this resolution and enter it into the book of original resolutions.

APPROVED AND ADOPTED this 1<sup>st</sup> day of March, 2022.

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MELISSA YBARRA, Mayor

ATTEST:

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LISA POPE, City Clerk  
(seal)

APPROVED AS TO FORM:

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ZAYNAH N. MOUSSA,  
Interim City Attorney

EXHIBIT A

GOVERNMENT CODE SECTION 5852.1 DISCLOSURE

In compliance with Section 5852.1 of the California Government Code, the following information consists of estimates that have been provided by BLX Group LLC, the City's Municipal Advisor in connection with the Bonds (the "Municipal Advisor") and has been represented by such party to have been provided in good faith:

(A) *Principal Amount.* The Municipal Advisor has informed the City that, based on the City's financing plan and current market conditions, its good faith estimate of the aggregate principal amount of the Bonds to be sold is \$145,000,000 (the "Estimated Principal Amount").

(B) *True Interest Cost of the Bonds.* The Municipal Advisor has informed the City that, assuming that the Estimated Principal Amount of the Bonds is sold, and based on market interest rates prevailing at the time of preparation of such estimate, its good faith estimate of the initial true interest cost in aggregate of the Bonds, which means the rate necessary to discount the amounts payable on the respective principal and interest payment dates to the purchase price received for the Bonds, is 4.50%. This estimate is based on an initial Finance Charge of the Bonds as described below.

(C) *Finance Charge of the Bonds.* The Municipal Advisor has informed the City that, assuming that the Estimated Principal Amount of the Bonds is sold, and based on market interest rates prevailing at the time of preparation of such estimate, its good faith estimate of the finance charge for the Bonds, which means the sum of all fees and charges paid to third parties (or costs associated with the Bonds), is \$780,750.

(D) *Amount of Proceeds to be Received.* The Municipal Advisor has informed the City that, assuming that the Estimated Principal Amount of the Bonds is sold, and based on market interest rates prevailing at the time of preparation of such estimate, its good faith estimate of the amount of proceeds expected to be received by the City for sale of the Bonds, less the finance charge of the Bonds, as estimated above, and any reserves or capitalized interest paid or funded with proceeds of the Bonds, is \$144,219,250.

(E) *Total Payment Amount.* The Municipal Advisor has informed the City that, assuming that the Estimated Principal Amount of the Bonds is sold, and based on market interest rates prevailing at the time of preparation of such estimate, its good faith estimate of the total payment amount, which means the sum total of all payments the City will make to pay debt service on the Bonds, plus the finance charge for the Bonds, as described above, not paid with the proceeds of the Bonds, calculated to the final maturity of the Bonds, is \$225,651,618.

The foregoing constitute good faith estimates only. The principal amount of the Bonds, the true interest cost of the Bonds, the finance charges thereof, the amount of proceeds received therefrom and total payment amount with respect thereto may differ from such good faith estimates due to: (a) the actual date of the sale of the Bonds being different than the date assumed for purposes of such estimates; (b) the actual principal amount of Bonds sold

being different from the estimated amount used for purposes of such estimates; (c) the actual amortization of the Bonds being different than the amortization assumed for purposes of such estimates; (d) the actual market interest rates at the time of sale of the Bonds being different than those estimated for purposes of such estimates; (e) other market conditions; or (f) alterations in the City's financing plan, or a combination of such factors.

The actual date of sale of the Bonds and the actual principal amount of Bonds sold will be determined by the City based on a variety of factors. The actual interest rates borne by the Bonds will depend on market interest rates at the time of sale thereof. The actual amortization of the Bonds will also depend, in part, on market interest rates at the time of sale thereof. Market interest rates are affected by economic and other factors beyond the control of the City.

**TRUST AGREEMENT**

**by and between**

**CITY OF VERNON**

**and**

**THE BANK OF NEW YORK MELLON TRUST COMPANY, N.A.,  
as Trustee**

**Dated as of \_\_\_\_\_ 1, 2022**

**Relating to**

**\$ \_\_\_\_\_  
CITY OF VERNON  
2022 TAXABLE PENSION OBLIGATION BONDS**

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## TRUST AGREEMENT

This **TRUST AGREEMENT** is dated as of \_\_\_\_\_ 1, 2022, and is made by and between the **CITY OF VERNON**, a municipal corporation duly organized and validly existing under and pursuant to the Constitution and the laws of the State of California (the “**City**”), and **THE BANK OF NEW YORK MELLON TRUST COMPANY, N.A.** a national banking association organized and existing under the laws of the United States of America, as trustee (the “**Trustee**”).

### *RECITALS*

**WHEREAS**, the City is a member of the California Public Employees’ Retirement System (“**PERS**”) and, as such, is obligated by the Public Employees’ Retirement Law, constituting Part 3 of Division 5 of Title 2 of the California Government Code (the “**Retirement Law**”), and the contract between the Board of Administration of PERS and the City Council of the City, effective November 1, 1948 (as amended, the “**PERS Contract**”), to make contributions to PERS to (a) fund pension benefits for its employees who are members of PERS, (b) amortize the unfunded actuarial liability with respect to such pension benefits, and (c) appropriate funds for the purposes described in (a) and (b); and

**WHEREAS**, the City is authorized pursuant to Articles 10 and 11 (commencing with Section 53570) of Chapter 3 of Division 2 of Title 5 of the California Government Code (the “**Refunding Law**”) to issue bonds for the purpose of refunding certain evidences of indebtedness of the City, including the requirements imposed by the Retirement Law and PERS Contract described in the first whereas clause above; and

**WHEREAS**, the City has determined to issue its \$ \_\_\_\_\_ City of Vernon 2022 Taxable Pension Obligation Bonds (the “**Bonds**”), pursuant to and secured by this Trust Agreement providing for the issuance of the Bonds, all in the manner provided herein, to refund the City’s unamortized, unfunded accrued actuarial liability with respect to pension benefits under the Retirement Law (the “**Unfunded Liability**”), to prepay all or a portion of the City’s annual required retirement contribution that is due and payable within 18 months of the issuance of the Bonds (the “**Current Obligation**”), and to pay the costs of issuance, including underwriter’s discount and any original issue discount;

**NOW THEREFORE**, the City and the Trustee agree as follows, each for the benefit of the other and the benefit of holders of the Bonds (as defined below) issued in accordance with this Trust Agreement.

### ARTICLE I

#### DEFINITIONS; INTERPRETATION

**Section 1.01 Certain Defined Terms.** The terms defined in this Article I shall, for all purposes of this Trust Agreement, have the meanings specified unless the context clearly requires otherwise.

“**Account**” means any account established pursuant to this Trust Agreement.

“**Additional Bonds**” means bonds issued in accordance with Section 2.06 hereof.

**“Annual Debt Service”** means, for any Bond Year, the sum of the aggregate amount of principal required to be paid on the Bonds during such Bond Year either at maturity or pursuant to a mandatory sinking fund payment and the interest due on the Bonds on each Interest Payment Date during such Bond Year.

**“Authorized City Representative”** means the Mayor, Mayor Pro Tem, City Administrator, Finance Director, or any officer authorized to act on their respective behalves.

**“Authorized Denominations”** means \$5,000 and any integral multiple thereof.

**“Beneficial Owner”** means, whenever used with respect to a Bond, the person in whose name such Bond is recorded as the beneficial owner of such Bond by a Participant on the records of such Participant or such person’s subrogee.

**“Bond”** or **“Bonds”** means the bonds issued under this Trust Agreement and designated as “City of Vernon 2022 Taxable Pension Obligation Bonds.”

**“Bond Counsel”** means (a) Stradling Yocca Carlson & Rauth, a Professional Corporation, or (b) a firm of attorneys nationally recognized as experts in the area of municipal finance who are familiar with the transactions contemplated under this Trust Agreement and acceptable to the City.

**“Bond Interest Account”** means the Account of that name established within the Revenue Fund pursuant to Section 6.02(a) hereof.

**“Bond Principal Account”** means the Account of that name established within the Revenue Fund pursuant to Section 6.02(a) hereof.

**“Bond Year”** means the twelve-month period commencing on each August 2 and ending on the next succeeding August 1, except that the first Bond Year shall commence on the Closing Date and end on August 1, 20\_\_.

**“Book-Entry Bonds”** means the Bonds held by DTC (or its nominee) as the registered owner thereof pursuant to the terms and provisions of Section 3.03 hereof.

**“Business Day”** means a day (a) other than a day on which banks located in the City of New York, New York or the cities in which the respective Principal Office of the Trustee or any Paying Agent are located, are required or authorized by law or executive order to close, and (b) on which the New York Stock Exchange is open.

**“Closing Date”** means \_\_\_\_\_, 2022.

**“Consultant”** means the accountant, attorney, consultant, municipal finance consultant or investment banker, or firm thereof, retained by the City to perform acts and carry out the duties provided for such Consultant in this Trust Agreement. Such accountant, attorney, consultant, municipal finance consultant or investment banker, or firm thereof, shall be nationally recognized within its profession for work of the character required.

**“Continuing Disclosure Certificate”** means that certain Continuing Disclosure Certificate executed and delivered by the City and acknowledged and accepted by the dissemination agent listed

therein, dated \_\_\_\_\_, 2022, as originally executed and as it may be amended from time to time in accordance with the terms thereof.

“**Costs of Issuance**” means all costs and expenses incurred by the City in connection with the issuance of the Bonds, the refunding of the Unfunded Liability and the funding of the Current Obligation, including, but not limited to, out-of-pocket expenses of the City, costs and expenses of printing and copying documents and the Bonds and the fees, costs and expenses of Rating Agencies, credit providers or enhancers, the Trustee, counsel to the Trustee, Bond Counsel, the verification agent, accountants, municipal finance consultant, disclosure counsel and other consultants and the premium for any municipal bond insurance and surety bond insurance.

“**Current Obligation**” has the meaning assigned that term in the Recitals of this Trust Agreement.

“**Defeasance Securities**” means any of the following: (a) non-callable direct obligations of the United States of America (“Treasuries”), (b) evidence of ownership of proportionate interests in future interest and principal payments on Treasuries held by a bank or trust company as custodian, under which the owner of the investment is the real party in interest and has the right to proceed directly and individually against the obligor and the underlying Treasuries are not available to any person claiming through the custodian or to whom the custodian may be obligated, and (c) pre-refunded municipal obligations rated “AAA” and “Aaa” by S&P and Moody’s, respectively (or any combination thereof), which shall be authorized to be used to effect defeasance of the Bonds.

“**DTC**” means The Depository Trust Company, a limited-purpose trust company organized under the laws of the State of New York, and its successors and assigns.

“**Event of Default**” means any occurrence or event specified in Section 11.01 hereof.

“**Fiduciary**” or “**Fiduciaries**” means the Trustee, any Paying Agent, or any or all of them, as may be appropriate.

“**Fiscal Year**” means the period beginning on July 1 of each given year and ending on June 30 of the immediately subsequent year, or such other period as the City designates as its fiscal year.

“**Fund**” means any fund established pursuant to this Trust Agreement.

“**Holder**,” or “**Bondholder**,” “**owner**” or “**registered owner**” means the registered owner of any Bonds, including DTC or its nominee as the sole registered owner of Book-Entry Bonds.

“**Information Services**” means any one or more of the national information services that Trustee determines are in the business of disseminating notices of redemption of obligations such as the Bonds.

“**Interest Payment Date**” means February 1 and August 1 of each year commencing \_\_\_\_\_ 1, 20\_\_.

“**Mail**” means by first-class United States mail, postage prepaid.

**“Moody’s”** means Moody’s Investors Service, Inc., a corporation organized and existing under the laws of the State of Delaware, and its successors and assigns, except if such corporation shall be dissolved or liquidated or shall no longer perform the functions of a securities rating agency, then “Moody’s” shall be deemed to refer to any other nationally recognized rating agency selected by the City.

**“Opinion of Bond Counsel”** means a written opinion of Bond Counsel.

**“Outstanding,”** with respect to the Bonds, means all Bonds which have been authenticated and delivered under this Trust Agreement, except:

(a) Bonds canceled or purchased by the Trustee for cancellation or delivered to or acquired by the Trustee for cancellation and, in all cases, with the intent to extinguish the debt represented thereby.

(b) Bonds deemed to be paid in accordance with Section 10.02 hereof.

(c) Bonds in lieu of which other Bonds have been authenticated under Sections 3.02 and 3.04 hereof.

(d) Bonds that have become due (at maturity, on redemption, or otherwise) and for the payment of which sufficient moneys, including interest accreted or accrued to the due date, are held by the Trustee or a Paying Agent.

(e) For purposes of any consent or other action to be taken by the Holders of a specified percentage of Bonds Outstanding under this Trust Agreement, Bonds held by or for the account of the City or by any person controlling, controlled by or under common control with the City, unless such Bonds are pledged to secure a debt to an unrelated party, in which case such Bonds shall, for purposes of consents and other Bondholder action, be deemed to be Outstanding and owned by the party to which such Bonds are pledged. Nothing herein shall be deemed to prevent the City from purchasing Bonds from any party out of any funds available to the City.

**“Participant”** means the participants of DTC which include securities brokers and dealers, banks, trust companies, clearing corporations and certain other organizations.

**“Paying Agent”** means any paying agent for the Bonds, or successor thereto, appointed by the City pursuant to Sections 7.01 or 7.02 hereof, and any successor appointed pursuant to Section 7.04 hereof.

**“Permitted Investments”** means the following:

(1) Direct obligations of the United States of America and securities fully and unconditionally guaranteed as to the timely payment of principal and interest by the United States of America (“U.S. Government Securities”).

(2) Direct obligations\* of the following federal agencies which are fully guaranteed by the full faith and credit of the United States of America:

- a. Export-Import Bank of the United States – Direct obligations and fully guaranteed certificates of beneficial interest
- b. Federal Housing Administration – debentures
- c. General Services Administration – participation certificates
- d. Government National Mortgage Association (“GNMAs”) – guaranteed mortgage-backed securities and guaranteed participation certificates
- e. Small Business Administration – guaranteed participation certificates and guaranteed pool certificates
- f. U.S. Department of Housing & Urban Development – local authority bonds
- g. U.S. Maritime Administration – guaranteed Title XI financings
- h. Washington Metropolitan Area Transit Authority – guaranteed transit bonds

(3) Direct obligations\* of the following federal agencies which are not fully guaranteed by the faith and credit of the United States of America:

- a. Federal National Mortgage Association (“FNMA”) – senior debt obligations rated Aaa by Moody’s Investors Service (“Moody’s”) and AAA by Standard & Poor’s Ratings Services (“S&P”)
- b. Federal Home Loan Mortgage Corporation (“FHLMCs”) – participation certificates and senior debt obligations rated Aaa by Moody’s and AAA by S&P
- c. Federal Home Loan Banks – consolidated debt obligations
- d. Student Loan Marketing Association – debt obligations
- e. Resolution Funding Corporation – debt obligations

(4) Direct, general obligations of any state of the United States of America or any subdivision or agency thereof whose uninsured and unguaranteed general obligation debt is rated, at the time of purchase, A2 or better by Moody’s and A or better by S&P, or any obligation fully and unconditionally guaranteed by any state, subdivision or agency whose uninsured and unguaranteed general obligation debt is rated, at the time of purchase, A2 or better by Moody’s and A or better by S&P.

(5) Commercial paper (having original maturities of not more than 270 days) rated, at the time of purchase, P-1 by Moody’s and A-1 or better by S&P.

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\* The following are explicitly excluded from the securities enumerated in 2 and 3:

- (i) All derivative obligations, including without limitation inverse floaters, residuals, interest-only, principal-only and range notes;
- (ii) Obligations that have a possibility of returning a zero or negative yield if held to maturity;
- (iii) Obligations that do not have a fixed par value or those whose terms do not promise a fixed dollar amount at maturity or call date; and
- (iv) Collateralized Mortgage-Backed Obligations (“CMOs”).

(6) Certificates of deposit, savings accounts, deposit accounts or money market deposits in amounts that are continuously and fully insured by the Federal Deposit Insurance Corporation (“FDIC”), including the Bank Insurance Fund and the Savings Association Insurance Fund, and including funds for which the Trustee or its affiliates provide investment advisory or other management services.

(7) Certificates of deposit (including those placed by a third party pursuant to a separate agreement between the City and the Trustee,) deposit accounts, federal funds, trust funds, trust accounts, overnight banking deposits, interest bearing deposits, interest bearing money market accounts, or bankers’ acceptances (in each case having maturities of not more than 365 days following the date of purchase) of any domestic commercial bank or United States branch office of a foreign bank, provided that (i) such bank’s short-term certificates of deposit are rated P-1 by Moody’s and A-1 or better by S&P (not considering holding company ratings) or (ii) are insured by the Federal Deposit Insurance Corporation.

(8) Investments in money-market mutual funds rated AAAM or AAAM-G by S&P, including funds for which the Trustee and its affiliates provide investment advisory or other management services.

(9) Repurchase agreements that meet the following criteria:

- a. A master repurchase agreement or specific written repurchase agreement, substantially similar in form and substance to the Public Securities Association or Bond Market Association master repurchase agreement, governs the transaction.
- b. Acceptable providers shall consist of (i) registered broker/dealers subject to Securities Investors’ Protection Corporation (“SIPC”) jurisdiction or commercial banks insured by the FDIC, if such broker/dealer or bank has an uninsured, unsecured and unguaranteed rating of A3/P-1 or better by Moody’s and A-/A-1 or better by S&P, or (ii) domestic structured investment companies rated Aaa by Moody’s and AAA by S&P.
- c. The repurchase agreement shall require termination thereof if the counterparty’s ratings are suspended, withdrawn or fall below A3 or P-1 from Moody’s, or A- or A-1 from S&P. Within ten (10) days, the counterparty shall repay the principal amount plus any accrued and unpaid interest on the investments.
- d. The repurchase agreement shall limit acceptable securities to U.S. Government Securities and to the obligations of GNMA, FNMA or FHLMC described in 2(d), 3(a) and 3(b) above. The fair market value of the securities in relation to the amount of the repurchase obligation, including principal and accrued interest, is equal to a collateral level of at least 104% for U.S. Government Securities and 105% for GNMA, FNMA or FHLMC. The repurchase agreement shall require (i) the Trustee or the Agent to value the collateral securities no less frequently than weekly, (ii) the delivery of

additional securities if the fair market value of the securities is below the required level on any valuation date, and (iii) liquidation of the repurchase securities if any deficiency in the required percentage is not restored within two (2) business days of such valuation.

- e. The repurchase securities shall be delivered free and clear of any lien to the Trustee or to an independent third party acting solely as agent (“Agent”) for the Trustee, and such Agent is (i) a Federal Reserve Bank, or (ii) a bank which is a member of the FDIC and which has combined capital, surplus and undivided profits or, if appropriate, a net worth, of not less than \$50 million, and the Trustee shall have received written confirmation from such third party that such third party holds such securities, free and clear of any lien, as agent for the Trustee.
- f. A perfected first security interest in the repurchase securities shall be created for the benefit of the Trustee, and the issuer and the Trustee shall receive an opinion of counsel as to the perfection of the security interest in such repurchase securities and any proceeds thereof.
- g. The repurchase agreement shall have a term of one year or less, or shall be due on demand.
- h. The repurchase agreement shall establish the following as events of default, the occurrence of any of which shall require the immediate liquidation of the repurchase securities:
  - (i) insolvency of the broker/dealer or commercial bank serving as the counterparty under the repurchase agreement;
  - (ii) failure by the counterparty to remedy any deficiency in the required collateral level or to satisfy the margin maintenance call under item 9(d) above; or
  - (iii) failure by the counterparty to repurchase the repurchase securities on the specified date for repurchase.

(10) Investment agreements, collateralized at 102%, (also referred to as guaranteed investment contracts) that meet the following criteria:

- a. A master agreement or specific investment agreement governs the transaction.
- b. Acceptable providers of uncollateralized investment agreements shall consist of (i) domestic FDIC-insured commercial banks, or U.S. branches of foreign banks, rated at least Aa2 by Moody’s and AA by S&P; (ii) domestic insurance companies rated Aaa by Moody’s and AAA by S&P; and (iii) domestic structured investment companies rated Aaa by Moody’s and AAA by S&P.

- c. Acceptable providers of collateralized investment agreements shall consist of (i) registered broker/dealers subject to SIPC jurisdiction, if such broker/dealer has an unsecured, unsecured and unguaranteed rating of A1 or better by Moody's and A+ or better by S&P; (ii) domestic FDIC-insured commercial banks, or U.S. branches of foreign banks, rated at least A1 by Moody's and A+ by S&P; (iii) domestic insurance companies rated at least A1 by Moody's and A+ by S&P; and (iv) domestic structured investment companies rated Aaa by Moody's and AAA by S&P. Required collateral levels shall be as set forth in 10(f) below.
- d. The investment agreement shall provide that if the provider's ratings fall below Aa3 by Moody's or AA- by S&P, the provider shall within ten (10) days either (i) repay the principal amount plus any accrued and interest on the investment; or (ii) deliver Permitted Collateral as provided below.
- e. The investment agreement must provide for termination thereof if the provider's ratings are suspended, withdrawn or fall below A3 from Moody's or A- from S&P. Within ten (10) days, the provider shall repay the principal amount plus any accrued interest on the agreement, without penalty to the City.
- f. The investment agreement shall provide for the delivery of collateral described in (i) or (ii) below ("Permitted Collateral") which shall be maintained at the following collateralization levels at each valuation date:
  - (i) U.S. Government Securities at 104% of principal plus accrued interest; or
  - (ii) Obligations of GNMA, FNMA or FHLMC (described in 2(d), 3(a) and 3(b) above) at 105% of principal and accrued interest.
- g. The investment agreement shall require the Trustee to determine the market value of the Permitted Collateral not less than weekly and notify the investment agreement provider on the valuation day of any deficiency. Permitted Collateral may be released by the Trustee to the provider only to the extent that there are excess amounts over the required levels. Market value, with respect to collateral, may be determined by any of the following methods:
  - (i) the last quoted "bid" price as shown in Bloomberg, Interactive Data Systems, Inc., The Wall Street Journal or Reuters;
  - (ii) valuation as performed by a nationally recognized pricing service, whereby the valuation method is based on a composite average of various bid prices; or
  - (iii) the lower of two bid prices by nationally recognized dealers. Such dealers or their parent holding companies shall be rated

investment grade and shall be market makers in the securities being valued.

- h. Securities held as Permitted Collateral shall be free and clear of all liens and claims of third parties, held in a separate custodial account and registered in the name of the Trustee or the Agent.
- i. The provider shall grant the Trustee a perfected first security interest in any collateral delivered under an investment agreement. For investment agreements collateralized initially and in connection with the delivery of Permitted Collateral under 10(f) above, the Trustee shall receive an opinion of counsel as to the perfection of the security interest in the collateral.
- j. The investment agreement shall provide that moneys invested under the agreement must be payable and puttable at par to the Trustee without condition, breakage fee or other penalty, upon not more than two (2) business days' notice, or immediately on demand for any reason for which the funds invested may be withdrawn from the applicable fund or account established under the authorizing document, as well as the following:
  - (i) In the event of a deficiency in the debt service account;
  - (ii) Upon acceleration after an event of default;
  - (iii) Upon refunding of the Bonds in whole or in part;
  - (iv) Reduction of any debt service reserve requirement for the Bonds; or
  - (v) If a determination is later made by a nationally recognized bond counsel that investments must be yield-restricted.

Notwithstanding the foregoing, the agreement may provide for a breakage fee or other penalty that is payable in arrears and not as a condition of a draw by the Trustee if the City's obligation to pay such fee or penalty is subordinate to its obligation to pay debt service on the Bonds and to make deposits to any debt service reserve fund established for the Bonds.

- (k) The investment agreement shall establish the following as events of default, the occurrence of any of which shall require the immediate liquidation of the investment securities:
  - (i) Failure of the provider or the guarantor (if any) to make a payment when due or to deliver Permitted Collateral of the character, at the times or in the amounts described above;
  - (ii) Insolvency of the provider or the guarantor (if any) under the investment agreement;

- (iii) Failure by the provider to remedy any deficiency with respect to required Permitted Collateral;
- (iv) Failure by the provider to make a payment or observe any covenant under the agreement;
- (v) The guaranty (if any) is terminated, repudiated or challenged; or
- (vi) Any representation of warranty furnished to the Trustee or the issuer in connection with the agreement is false or misleading.

(l) The investment agreement must incorporate the following general criteria:

- (i) “Cure periods” for payment default shall not exceed two (2) business days;
- (ii) The agreement shall provide that the provider shall remain liable for any deficiency after application of the proceeds of the sale of any collateral, including costs and expenses incurred by the Trustee;
- (iii) Neither the agreement nor guaranty agreement, if applicable, may be assigned (except to a provider that would otherwise be acceptable under these guidelines);
- (iv) If the investment agreement is for a debt service reserve fund, reinvestments of funds shall be required to bear interest at a rate at least equal to the original contract rate.
- (v) The provider shall be required to immediately notify the Trustee of any event of default or any suspension, withdrawal or downgrade of the provider’s ratings; and
- (vi) The agreement shall be unconditional and shall expressly disclaim any right of set-off or counterclaim.

(11) Forward delivery agreements in which the securities delivered mature on or before each interest payment date (for debt service or debt service reserve funds) or draw down date (construction funds) that meet the following criteria:

- (a) A specific written investment agreement governs the transaction.
- (b) Acceptable providers shall be limited to (i) any registered broker/dealer subject to the Securities Investors’ Protection Corporation jurisdiction, if such broker/dealer or bank has an unsecured, unsecured and unguaranteed obligation rated A3/P-1 or better by Moody’s and A-/A-1 or better by S&P; (ii) any commercial bank insured by the FDIC, if such bank has an unsecured, unsecured and unguaranteed obligation rated A3/P-1 or better by Moody’s and

A-/A-1 or better by S&P; and (iii) domestic structured investment companies rated Aaa by Moody's and AAA by S&P.

- (c) The forward delivery agreement shall provide for termination or assignment (to a qualified provider hereunder) of the agreement if the provider's ratings are suspended, withdrawn or fall below A3 or P-1 from Moody's or A- or A-1 from S&P. Within ten (10) days, the provider shall fulfill any obligations it may have with respect to shortfalls in market value. There shall be no breakage fee payable to the provider in such event.
- (d) Permitted securities shall include the investments listed in 1, 2 and 3 above.
- (e) The forward delivery agreement shall include the following provisions:
  - (i) The permitted securities must mature at least one (1) business day before a debt service payment date or scheduled draw. The maturity amount of the permitted securities must equal or exceed the amount required to be in the applicable fund on the applicable valuation date.
  - (ii) The agreement shall include market standard termination provisions, including the right to terminate for the provider's failure to deliver qualifying securities or otherwise to perform under the agreement. There shall be no breakage fee or penalty payable to the provider in such event.
  - (iii) Any breakage fees shall be payable only on debt service payment dates and shall be subordinated to the payment of debt service and debt service reserve fund replenishments.
  - (iv) The provider must submit at closing a bankruptcy opinion to the effect that upon any bankruptcy, insolvency or receivership of the provider, the securities will not be considered to be a part of the provider's estate.
  - (v) The agreement may not be assigned (except to a provider that would otherwise be acceptable under these guidelines).

(12) Forward delivery agreements in which the securities delivered mature after the funds may be required but provide for the right of the City or the Trustee to put the securities back to the provider under a put, guaranty or other hedging arrangement.

(13) Any other investment which the City is permitted by law to make, including without limitation investment in the Local Agency Investment Fund of the State of California (LAIF), provided that any investment of the type authorized pursuant to paragraphs (d), (f), (h) and (i) of section 53601 of the California Government Code are additionally restricted as provided in the appropriate paragraph or paragraphs above applicable to such type of investment and provided further that investments authorized pursuant to paragraphs (k) and (m) of section 53601 are not permitted.

Maturity of investments shall be governed by the following:

- a. Investments of monies (other than reserve funds) shall be in securities and obligations maturing not later than the dates on which such monies will be needed to make payments.
- b. Investments shall be considered as maturing on the first date on which they are redeemable without penalty at the option of the holder or the date on which the Trustee may require their repurchase pursuant to repurchase agreements.
- c. Investments of monies in reserve funds not payable upon demand shall be restricted to maturities of five years or less.

To the extent that any of the requirements concerning Permitted Investments embodies a legal conclusion, the Trustee shall be entitled to conclusively rely upon a certificate from the appropriate party or an opinion from counsel to such party, that such requirement has been met.

“**PERS**” means the California Public Employees’ Retirement System.

“**PERS Contract**” has the meaning assigned that term in the Recitals to this Trust Agreement.

“**Principal Office of the Trustee**” means the office of the Trustee at the address set forth in Section 14.06 of this Trust Agreement, provided for transfer, exchange, registration, surrender and payment of Bonds means care of the corporate trust operations office of The Bank of New York Mellon Trust Company, N.A. in Los Angeles, California or such other office designated by the Trustee.

“**Rating Agencies**” means Moody’s and S&P.

“**Rating Category**” means (a) with respect to any long-term rating category, all ratings designated by a particular letter or combination of letters, without regard to any numerical modifier, plus or minus sign or other modifier and (b) with respect to any short-term or commercial paper rating category, all ratings designated by a particular letter or combination of letters and taking into account any numerical modifier, but not any plus or minus sign or other modifier.

“**Record Date**” means the fifteenth day of each calendar month preceding any Interest Payment Date, regardless of whether such day is a Business Day.

“**Redemption Fund**” means the Fund of that name established pursuant to Section 6.03 hereof.

“**Refunding Law**” has the meaning assigned that term in the Recitals to this Trust Agreement.

“**Registrar**” means, for purposes of this Trust Agreement, the Trustee or its successor or assignee.

**“Representation Letter”** means the Letter of Representations from the City and the Trustee to DTC with respect to the Bonds.

**“Requisition”** or **“Written Requisition”** means a Requisition or Written Requisition, substantially in the form of Exhibit B hereto.

**“Responsible Officer”** means an officer of the Trustee assigned by the Trustee to administer this Trust Agreement.

**“Retirement Law”** has the meaning assigned that term in the Recitals to this Trust Agreement.

**“Revenue Fund”** means the Fund of that name established pursuant to Section 6.02 hereof.

**“S&P”** means S&P Global Ratings, LLC, a Standard & Poor’s Financial Services LLC business, a limited liability company organized and existing under the laws of the State of Delaware and its successors and assigns, except if such company shall be dissolved or liquidated or shall no longer perform the functions of a securities rating agency, then “S&P” shall be deemed to refer to any other nationally recognized rating agency selected by the City.

**“Securities Depositories”** means any of The Depository Trust Company or, in accordance with then-current guidelines of the Securities and Exchange Commission, such other securities depositories, or if no such depositories, as the City may indicate in a certificate of the City delivered to the Trustee.

**“State”** means the State of California.

**“Total Bond Obligation”** means, as of any date of calculation, the aggregate principal amount of the Bonds then Outstanding.

**“Trust Agreement”** means this Trust Agreement dated as of \_\_\_\_\_ 1, 2022 between the City and the Trustee, as it may be amended, supplemented or otherwise modified from time to time.

**“Trustee”** means the entity named as such in the heading of this Trust Agreement until a successor replaces it, and thereafter means such successor.

**“Unfunded Liability”** has the meaning assigned that term in the Recitals to this Trust Agreement.

**Section 1.02 Other Definitional Provisions.** Except as otherwise indicated, references to Articles and Sections are to the Articles and Sections of this Trust Agreement. Any of the terms defined in Section 1.01 may, unless the context otherwise requires, be used in the singular or the plural, depending on the reference.

**ARTICLE II**

**THE BONDS**

**Section 2.01 Issuance of Bonds; Form; Dating.** Bonds may be issued by the City under the terms of this Trust Agreement only to refund the City’s Unfunded Liability under the PERS Contract and the Retirement Law, to fund the City’s Current Obligation, and to pay the Costs of Issuance in connection with the issuance of the Bonds. The Bonds shall be designated “City of Vernon 2022 Taxable Pension Obligation Bonds” and shall be issued in Authorized Denominations. The Bonds shall be issued hereunder in the aggregate principal amount of \$\_\_\_\_\_. Interest on the Bonds shall be payable on each February 1 and August 1, commencing \_\_\_\_\_ 1, 20\_\_.

**Section 2.02 Description of the Bonds.** Each Bond shall be issued in fully registered form and shall be numbered as determined by the Trustee. The Bonds shall be dated the Closing Date. The Bonds shall be issued in Authorized Denominations; provided, however, that the Bonds shall initially be Book-Entry Bonds.

The Bonds shall mature on the dates, in the principal amounts, and interest thereon shall be computed at the rates, as shown below:

<i><b>Maturity Date</b></i> <i><b>(August 1)</b></i>	<i><b>Principal Amount</b></i>	<i><b>Interest Rate</b></i>
	\$	%

**Section 2.03 Interest on the Bonds.** Interest on each Bond of each maturity shall be payable at the respective per annum rates set forth in Section 2.02 hereof and shall be payable on each Interest Payment Date until maturity or earlier redemption, computed using a year of 360 days comprised of twelve 30-day months. Interest on each Bond shall accrue from the Interest Payment Date for the Bonds next preceding the date of authentication and delivery thereof, unless (i) such date of authentication is an Interest Payment Date in which event interest shall be payable from such date of authentication; (ii) it is authenticated after a Record Date and before the close of business on the immediately following Interest Payment Date, in which event interest thereon shall be payable from such Interest Payment Date; or (iii) it is authenticated prior to the close of business on the first Record Date, in which event interest thereon shall be payable from the Closing Date; provided, however, that if at the time of authentication of any Bond interest thereon is in default, interest

thereon shall be payable from the Interest Payment Date to which interest has previously been paid or made available for payment or, if no interest has been paid or made available for payment, from the Closing Date.

**Section 2.04 Medium of Payment.** Principal, premium, if any, and interest on the Bonds shall be payable in currency of the United States of America which at the time of payment is legal tender for the payment of public and private debts. Payments of interest on any of the Bonds will be made on each Interest Payment Date by check of the Trustee sent by Mail, or by wire transfer to any Holder of \$1,000,000 or more of Bonds, to the account specified by such Holder in a written request delivered to the Trustee on or prior to the Record Date for such Interest Payment Date, to the Holder thereof on the Record Date; provided, however, that payments of defaulted interest shall be payable to the person in whose name such Bond is registered at the close of business on a special record date fixed therefor by the Trustee which shall not be more than 15 days and not less than ten days prior to the date of the proposed payment of defaulted interest. Payment of the principal of the Bonds upon redemption or maturity will be made upon presentation and surrender of each such Bond, at the Principal Office of the Trustee.

**Section 2.05 Form.** The Bonds shall be substantially in the form set forth in Exhibit A attached hereto and by this reference incorporated herein. The Bonds may be printed, lithographed, photocopied or typewritten and shall be in such Authorized Denominations as may be determined by the City.

**Section 2.06 Additional Bonds.** From time to time, the City may enter into (i) one or more other trust agreements or indentures and/or (ii) one or more agreements supplementing and/or amending this Trust Agreement, for the purpose of providing for the issuance of Additional Bonds to refund the Bonds, to refund all or any portion of any Unfunded Liability of the City under the PERS Contract or to fund all or any portion of the Current Obligation of the City arising subsequent to the issuance of the Bonds or any other obligations due by the City with respect to PERS. Such Additional Bonds may be issued on a parity with the Bonds.

### ARTICLE III

#### EXECUTION, AUTHENTICATION AND EXCHANGE OF BONDS; BOOK ENTRY BONDS

##### **Section 3.01 Execution and Authentication; Registration.**

(a) The Bonds will be signed for the City with the manual or facsimile signature of the Mayor of the City Council of the City. The City may deliver to the Trustee or its agent duly executed Bonds for authentication from time to time by the Trustee or its agent as such Bonds may be required. Bonds executed and so delivered and authenticated will be valid. In case any officer of the City whose signature or whose facsimile signature shall appear on any Bonds shall cease to be such officer before the authentication of such Bonds, such signature or the facsimile signature thereof shall nevertheless be valid and sufficient for all purposes the same as if he or she had remained in office until authentication. Also, if a person signing a Bond is the proper officer on the actual date of execution, the Bond will be valid even if that person is not the proper officer on the nominal date of action and even though, at the date of this Trust Agreement, such person was not such officer.

(b) A Bond will not be valid until the Trustee or its agent executes the certificate of authentication on such Bond by manual or facsimile signature. Such signature will be conclusive evidence that such Bond has been authenticated under this Trust Agreement. The Trustee may appoint an authenticating agent acceptable to the City to authenticate Bonds. An authenticating agent may authenticate Bonds whenever the Trustee may do so. Each reference in this Trust Agreement to authentication by the Trustee includes authentication by such agent.

(c) Bonds may be presented at the Principal Office of the Trustee, unless a different office has been designated for such purpose, for registration, transfer and exchange. The Registrar will keep a register of such Bonds and of their transfer and exchange.

**Section 3.02 Transfer or Exchange of Bonds.** Subject to Section 3.03:

(a) All Bonds shall be issued in fully registered form. Upon surrender for transfer of any Bond at the Principal Office of the Trustee, the Trustee shall deliver in the name of the transferee or transferees a new fully authenticated and registered Bond or Bonds of Authorized Denominations of the same maturity for the aggregate principal amount which the Bondholder is entitled to receive.

(b) All Bonds presented for transfer, redemption or payment shall be accompanied by a written instrument or instruments of transfer or authorization for exchange, in form and with guaranty of signature satisfactory to the City, duly executed by the Bondholder or by his or her duly authorized attorney. The Trustee also may require payment from the Bondholder of a sum sufficient to cover any tax, or other governmental fee or charge that may be imposed in relation thereto. Such taxes, fees and charges shall be paid before any such new Bond shall be delivered.

(c) Bonds delivered upon any transfer as provided herein, or as provided in Section 3.04, shall be valid obligations of the City, evidencing the same debt as the Bond surrendered, shall be secured by this Trust Agreement and shall be entitled to all of the security and benefits hereof to the same extent as the Bond surrendered.

(d) The City, the Trustee and the Paying Agent shall treat the Bondholder, as shown on the registration books kept by the Trustee, as the person exclusively entitled to payment of principal, premium, if any, and interest with respect to such Bond and to the exercise of all other rights and powers of the Bondholder, except that all interest payments will be made to the party who, as of the Record Date, is the Bondholder.

(e) The Trustee shall not be required to register the transfer or exchange of any Bond during the period in which the Trustee is selecting Bonds for redemption and any bond that has been selected for redemption.

(f) Prior to any transfer of the Bonds outside the book-entry system (including, but not limited to, the initial transfer outside the book-entry system) the transferor shall provide or cause to be provided to the Trustee all information necessary to allow the Trustee to comply with any applicable tax reporting obligations, including without limitation any cost basis reporting obligations under Internal Revenue Code Section 6045, as amended. The Trustee shall conclusively rely on the information provided to it and shall have no responsibility to verify or ensure the accuracy of such information.

### **Section 3.03 Book-Entry Bonds.**

(a) Except as provided in paragraph (c) of this Section 3.03, the registered owner of all of the Bonds shall be DTC and the Bonds shall be registered in the name of Cede & Co., as nominee for DTC. Except as provided in paragraph (d) of this Section 3.03, payment of principal, interest and premium, if any, for any Bonds registered in the name of Cede & Co. shall be made as provided in the Representation Letter.

(b) The Bonds shall be initially issued in the form of a separate single authenticated fully registered Bond for each separate stated maturity of the Bonds. The Trustee, the Registrar and the City may treat DTC (or its nominee) as the sole and exclusive owner of the Bonds registered in its name for the purposes of payment of the principal or redemption price of, or interest on, the Bonds, selecting the Bonds or portions thereof to be redeemed, giving any notice permitted or required to be given to Bondholders under this Trust Agreement, registering the transfer of Bonds, obtaining any consent or other action to be taken by Bondholders and for all other purposes whatsoever, and neither the Trustee, the Registrar nor the City shall be affected by any notice to the contrary. Neither the Trustee, the Registrar nor the City shall have any responsibility or obligation to any Participant, any person claiming a beneficial ownership interest in the Bonds under or through DTC or any Participant or any other person which is not shown on the registration books as being a Bondholder, with respect to (i) the accuracy of any records maintained by DTC or any Participant, (ii) the payment by DTC or any Participant of any amount in respect of the principal or redemption price of or interest on the Bonds, (iii) any notice which is permitted or required to be given to Bondholders under this Trust Agreement, (iv) the selection by DTC or any Participant of any person to receive payment in the event of a partial redemption of the Bonds, or (v) any consent given or other action taken by DTC as a Bondholder. The Trustee shall pay, from funds held under the terms of this Trust Agreement or otherwise provided by the City, all principal or redemption price of and interest on the Bonds only to DTC as provided in the Representation Letter and all such payments shall be valid and effective to satisfy and discharge fully the City's obligations with respect to the principal or redemption price of and interest on the Bonds to the extent of the sum or sums so paid. No person other than DTC shall receive authenticated Bonds evidencing the obligation of the City, to make payments of principal or redemption price and interest pursuant to this Trust Agreement. Upon delivery by DTC to the Trustee of written notice to the effect that DTC has determined to substitute a new nominee in place of Cede & Co., and subject to the provisions herein with respect to Record Dates, the name "Cede & Co." in this Trust Agreement shall refer to such new nominee of DTC.

(c) In the event the City determines that it is in the best interest of the Beneficial Owners that they be able to obtain Bond certificates and notifies DTC, the Trustee and the Registrar of such determination, then DTC will notify the Participants of the availability through DTC of Bond certificates. In such event, the Trustee shall authenticate and the Registrar shall transfer and exchange Bonds certificates as requested by DTC and any other Bondholders in appropriate amounts. DTC may determine to discontinue providing its services with respect to the Bonds at any time by giving notice to the City and the Trustee and discharging its responsibilities with respect thereto under applicable law. Under such circumstances (if there is no successor securities depository), the City and the Trustee shall be obligated to deliver Bond certificates as described in this Trust Agreement. In the event Bond certificates are issued, the provisions of this Trust Agreement shall apply to, among other things, the transfer and exchange of such certificates and the method of payment of principal of and interest on such certificates. Whenever DTC requests the City and the Trustee to do so, the Trustee and the City will cooperate with DTC in taking appropriate action after

reasonable notice (i) to make available one or more separate certificates evidencing the Bonds to any Participant having Bonds credited to its DTC account or (ii) to arrange for another securities depository to maintain custody of certificates evidencing the Bonds.

(d) Notwithstanding any other provision of this Trust Agreement to the contrary, so long as any Bond is registered in the name of Cede & Co., as nominee of DTC, all payments with respect to the principal or redemption price of and interest on such Bonds and all notices with respect to such Bonds shall be made and given, respectively, to DTC as provided in the Representation Letter.

(e) In connection with any notice or other communication to be provided to Bondholders pursuant to this Trust Agreement by the City or the Trustee with respect to any consent or other action to be taken by Bondholders, the City or the Trustee, as the case may be, shall establish a record date for such consent or other action and give DTC notice of such record date not less than 15 calendar days in advance of such record date to the extent possible. Notice to DTC shall be given only when DTC is the sole Bondholder.

(f) If the City purchases, or causes the Trustee to purchase, any of the Bonds, such purchase of Bonds shall be deemed to have occurred upon the purchase of beneficial ownership interests in the Bonds from a Participant. Upon receipt by DTC of notice from the City and a Participant that a purchase of beneficial ownership interests in the Bonds has been made by the City from such Participant, DTC shall surrender to the Trustee the Bonds referenced in such notice and, if the principal amount referenced in said notice is less than the principal amount of the Bonds so surrendered, the Trustee shall authenticate and deliver to DTC, in exchange for the Bonds so surrendered, a new Bond or Bonds, as the case may be, in Authorized Denominations and in a principal amount equal to the difference between (i) the principal amount of the Bonds so surrendered and (ii) the principal amount referenced in said notice.

(g) Notwithstanding any provision herein to the contrary, the City and the Trustee may agree to allow DTC, or its nominee, Cede & Co., to make a notation on any Bond redeemed in part to reflect, for informational purposes only, the principal amount and date of any such redemption.

(h) In the event that DTC notifies the City that it is discontinuing the book-entry system for the Bonds, the City may either appoint another entity to hold the Bonds in book-entry form or deliver Bond certificates to the beneficial owners or Participants, as directed by DTC.

#### **Section 3.04 Mutilated, Lost, Stolen or Destroyed Bonds.**

(a) In the event any Bond is mutilated or defaced but identifiable by number and description, the City shall execute and the Trustee shall authenticate and deliver a new Bond of like date, maturity and denomination as such Bond, upon surrender thereof to the Trustee; provided that there shall first be furnished to the City and the Trustee proof satisfactory to the Trustee that the Bond is mutilated or defaced. The Bondholder shall accompany the above with a deposit of money required by the City for the cost of preparing the substitute Bond and all other expenses connected with the issuance of such substitute. The City shall then cause proper record to be made of the cancellation of the original, and thereafter the substitute shall have the validity of the original.

(b) In the event any Bond is lost, stolen or destroyed, the City may execute and the Trustee may authenticate and deliver a new Bond of like date, maturity and denomination as that Bond lost, stolen or destroyed; provided that there shall first be furnished to the Trustee evidence of such loss, theft or destruction satisfactory to the Trustee, together with indemnity satisfactory to it.

(c) The City and the Trustee shall charge the Holder of such Bond all transfer taxes, if any, and their reasonable fees and expenses in this connection. All substitute Bonds issued and authenticated pursuant to this Section shall be issued as a substitute and numbered, if numbering is provided for by the Trustee, as determined by the Trustee. In the event any such Bond has matured or has been called for redemption, instead of issuing a substitute Bond, the Trustee may pay the same without surrender thereof upon receipt of indemnity satisfactory to the Trustee.

**Section 3.05 Destruction of Bonds.** Whenever any Outstanding Bonds shall be delivered to the Trustee for cancellation pursuant to this Trust Agreement, upon payment of the principal amount and interest represented thereby or for replacement pursuant to Section 3.04 or transfer pursuant to Section 3.02, such Bond shall be canceled and destroyed by the Trustee and counterparts of a certificate of destruction evidencing such destruction shall, upon the City's request, be furnished by the Trustee to the City.

**Section 3.06 Temporary Bonds.**

(a) Pending preparation of definitive Bonds, the City may execute and the Trustee shall authenticate and deliver, in lieu of definitive Bonds and subject to the same limitation and conditions, interim receipts, certificates or temporary bonds which shall be exchanged for the Bonds.

(b) If temporary Bonds shall be issued, the City shall cause the definitive Bonds to be prepared and to be executed and delivered to the Trustee, and the Trustee, upon presentation to it of any temporary Bond, shall cancel the same and deliver in exchange therefor at the place designated by the Bondholder, without charge to the Bondholder thereof, definitive Bonds of an equal aggregate principal amount, of the same series, maturity and bearing interest at the same rate or rates as the temporary Bonds surrendered. Until so exchanged, the temporary Bonds shall in all respects be entitled to the same benefit and security of this Trust Agreement as the definitive Bonds to be issued and authenticated hereunder.

**ARTICLE IV**

**REDEMPTION OF BONDS**

**Section 4.01 Notices to Trustee; Notices to Bondholders; Notices to DTC.**

(a) Notice of redemption shall be given by the Trustee, not less than 30 nor more than 60 days prior to the redemption date: (i) in the case of Bonds not registered in the name of a Securities Depository or its nominee, to the respective Holders of the Bonds designated for redemption at their addresses appearing on the registration books of the Trustee; (ii) in the case of Bonds registered in the name of a Securities Depository or its nominee, to such Securities Depository for such Bonds; and (iii) to the Information Services. Notice of redemption to the Holders pursuant to (i) above shall be given by mail at their addresses appearing on the registration books of the Trustee, or any other method agreed upon by such Holder and the Trustee. Notice of redemption to

the Securities Depositories pursuant to (ii) above and the Information Services pursuant to (iii) above shall be given by electronically secure means, or any other method agreed upon by such entities and the Trustee.

(b) Each notice of redemption shall state the Bonds or designated portions thereof to be redeemed, the date of redemption, the place of redemption, the redemption price, the CUSIP number (if any) of the Bonds to be redeemed, the distinctive numbers of the Bonds of such maturity to be redeemed and, in the case of Bonds to be redeemed in part only, the respective portions of the principal amount thereof to be redeemed, the original issue date, interest rate and stated maturity date of each Bond to be redeemed in whole or part. Each such notice shall also state that on said date there will become due and payable on each of the Bonds to be redeemed the redemption price, and redemption premium, if any, thereof, and that from and after such redemption date interest thereon shall cease to accrue.

(c) Failure to give the notices described in this Section 4.01 or any defect therein shall not in any manner affect the redemption of any Bonds. Any notice sent as provided herein will be conclusively presumed to have been given whether or not actually received by the addressee.

(d) The City shall have the right to rescind any notice of optional redemption previously sent pursuant to this Section 4.01. Any such notice of rescission shall be sent in the same manner as the notice of redemption. Neither the City nor the Trustee shall incur any liability, to Bond Owners, DTC, or otherwise, as a result of a rescission of a notice of redemption.

**Section 4.02 Optional Redemption of Bonds.** The Bonds maturing on or after August 1, 20\_\_ may be redeemed at the option of the City from any source of funds on any date on or after August 1, 20\_\_ in whole or in part from such maturities as are selected by the City within a maturity at a redemption price equal to the principal amount to be redeemed, together with accrued interest to the date of redemption, without premium.

**Section 4.03 Mandatory Sinking Fund Redemption of Bonds.** The Bonds maturing August 1, 20\_\_ (the “**Term Bonds**”) are subject to mandatory sinking fund redemption at a redemption price equal to the principal amount thereof, plus accrued interest to the redemption date, without premium. The Term Bonds shall be so redeemed on the following dates and in the following amounts:

<i>Redemption Date</i> <i>(August 1)</i>	<i>Principal</i> <i>Amount</i>
	\$

\*

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\* Final maturity.

On or before each July 15 next preceding any mandatory sinking fund redemption date, the Trustee shall proceed to select for redemption pro-rata from all Term Bonds subject to mandatory sinking fund redemption at that time, an aggregate principal amount of such Term Bonds equal to the amount for such year as set forth in the table above and shall call such Term Bonds or portions thereof for redemption and give notice of such redemption in accordance with the terms of Section 4.01. At the option of the City, to be exercised by delivery of a written certificate to the Trustee on or before June 1 next preceding any mandatory sinking fund redemption date, it may (a) deliver to the Trustee for cancellation Term Bonds or portions thereof (in the amount of an Authorized Denomination) of the stated maturity subject to such redemption or (b) specify a principal amount of such Term Bonds or portions thereof (in the amount of an Authorized Denomination) which prior to said date have been purchased or redeemed (otherwise than under the provisions of this Section 4.03) and canceled by the Trustee at the request of the City and not theretofore applied as a credit against any mandatory sinking fund redemption requirement. Each such Term Bonds or portion thereof so delivered or previously redeemed shall be credited by the Trustee at 100% of the principal amount of the Term Bonds so delivered to the Trustee by the City against the obligation of the City on such mandatory sinking fund redemption date.

**Section 4.04 Make-Whole Redemption of Bonds.** [The Bonds are subject to redemption prior to August 1, 20\_\_ , at the option of the City, in whole or in part (and if in part in any order of maturity selected by the City and within a maturity bearing interest at the same rate on a pro-rata basis as described below), on any date at a redemption price equal to the greater of:

(a) 100% of the principal amount of the Bonds to be redeemed; or

(b) the sum of the present value of the remaining scheduled payments of principal and interest to the maturity date of such Bonds to be redeemed, not including any portion of those payments of interest accrued and unpaid as of the date on which such Bonds are to be redeemed, discounted to the date on which such Bonds are to be redeemed on a semi-annual basis, assuming a 360-day year consisting of twelve 30-day months, at the Comparable Treasury Yield (defined below) plus \_\_ basis points,

plus, in each case, accrued interest on such Bonds to be redeemed to the redemption date.

For purposes of the foregoing, the following terms have the following meanings:

“Calculation Agent” means a commercial bank or an investment banking institution of national standing that is a primary dealer of United States government securities in the United States and designated by the City (which may be one of the institutions that served as an underwriter for the Bonds).

“Comparable Treasury Issue” means the United States Treasury security selected by the Calculation Agent as having a maturity comparable to the remaining term to maturity of the Bonds being redeemed that would be utilized, at the time of selection and in accordance with customary financial practice, in pricing new issues of corporate debt securities of comparable maturity to the remaining term to maturity of the Bonds being redeemed.

“Comparable Treasury Price” means, with respect to any date on which a Bond or portion thereof is being redeemed, either (a) the average of five Reference Treasury Dealer quotations for the date fixed for redemption, after excluding the highest and lowest such quotations, and (b) if the

Calculation Agent is unable to obtain five such quotations, the average of the quotations that are obtained. The quotations will be the average, as determined by the Calculation Agent, of the bid and asked prices for the Comparable Treasury Issue (expressed in each case as a percentage of principal amount) quoted in writing to the Calculation Agent, at 5:00 p.m. New York City time on a date selected by the Calculation Agent which is not less than three business days and not more than 20 business days preceding the date fixed for redemption.

“Comparable Treasury Yield” means the yield that represents the weekly average yield to maturity for the preceding week appearing in the most recently published statistical release designated “H.15(519) Selected Interest Rates” under the heading “Treasury Constant Maturities,” or any successor publication selected by the Calculation Agent that is published weekly by the Board of Governors of the Federal Reserve System and that establishes yields on actively traded United States Treasury securities adjusted to constant maturity, for the maturity corresponding to the remaining term to maturity of the Bonds being redeemed. The Comparable Treasury Yield will be determined no sooner than the third business day nor earlier than the twentieth calendar day preceding the applicable date fixed for redemption. If the H.15(519) statistical release sets forth a weekly average yield for United States Treasury securities that have a constant maturity that is the same as the remaining term to maturity of the Bonds being redeemed, then the Comparable Treasury Yield will be equal to such weekly average yield. In all other cases, the Comparable Treasury Yield will be calculated by interpolation on a straight-line basis between the weekly average yields on the United States Treasury securities that have a constant maturity (i) closest to and greater than the remaining term to maturity of the Bonds being redeemed; and (ii) closest to and less than the remaining term to maturity of the Bonds being redeemed. Any weekly average yields calculated by interpolation will be rounded to the nearest 1/100th of 1%, with any figure of 1/200th of 1% or above being rounded upward. If, and only if, weekly average yields for United States Treasury securities for the preceding week are not available in the H.15(519) statistical release or any successor publication, then the Comparable Treasury Yield will be the rate of interest per annum equal to the semiannual equivalent yield to maturity of the Comparable Treasury Issue (expressed as a percentage of its principal amount) equal to the Comparable Treasury Price (each as defined herein) as of the date fixed for redemption.

“Reference Treasury Dealer” means a primary dealer of United States Government securities in the United States (which may be one of the institutions that served as an underwriter for the Bonds) appointed by the District and reasonably acceptable to the Calculation Agent.]

#### **Section 4.05 Payment of Bonds Called for Redemption; Effect of Redemption Call.**

(a) Upon surrender to the Trustee or the Trustee’s agent, Bonds called for redemption shall be paid at the redemption price stated in the notice, plus interest accrued to the redemption date.

(b) On the date so designated for redemption, notice having been given in the manner and under the conditions provided herein relating to such Bonds as are to be redeemed and moneys for payment of the redemption price being held in trust to pay the redemption price, the Bonds so called for redemption shall become and be due and payable on the redemption date, interest on such Bonds shall cease to accrue, such Bonds shall cease to be entitled to any lien, benefit or security under this Trust Agreement and the owners of such Bonds shall have no rights in respect thereof except to receive payment of the redemption price and accrued interest to the redemption date.

(c) Bonds which have been duly called for redemption under the provisions of this Article IV and for the payment of the redemption price of which moneys shall be deposited in the Redemption Fund or otherwise held in trust for the Holders of the Bonds to be redeemed, all as provided in this Trust Agreement, shall not be deemed to be Outstanding under the provisions of this Trust Agreement.

**Section 4.06 Selection of Bonds for Redemption; Bonds Redeemed in Part.** If less than all of the Bonds are called for redemption, the City will designate the maturities from which the Bonds are to be redeemed. For so long as the Bonds are registered in book entry form and DTC or a successor securities depository is the sole registered owner of such Bonds, if fewer than all of such Bonds of the same maturity and bearing the same interest rate are to be redeemed, the particular Bonds to be redeemed shall be selected on a pro rata pass-through distribution of principal basis in accordance with the operational arrangements of DTC then in effect, and if the DTC operational arrangements do not allow for redemption on a pro rata pass-through distribution of principal basis, all Bonds to be so redeemed will be selected for redemption in accordance with DTC procedures by lot; provided further that any such redemption must be performed such that all Bonds remaining outstanding will be in authorized denominations.

In connection with any repayment of principal of the Bonds pursuant to the pass-through distribution of principal as described above, the Paying Agent will direct DTC to make a pass-through distribution of principal to the owners of the Bonds. A form of Pro Rata Pass-Through Distribution of Principal Notice will be provided to the Trustee that includes a table of factors reflecting the relevant scheduled redemption payments and DTC's applicable procedures, which are subject to change.

For purposes of calculating pro rata pass-through distributions of principal, "pro rata" means, for any amount of principal or interest to be paid, the application of a fraction to such amounts where (a) the numerator is equal to the amount due to the owners of the Bonds on a payment date, and (b) the denominator is equal to the total original par amount of the Bonds.

It is the City's intent that redemption allocations made by DTC with respect to the Bonds be made on a pro rata pass-through distribution of principal basis as described above. However, the City cannot provide any assurance that DTC, DTC's direct and indirect participants, or any other intermediary will allocate the redemption of such Bonds on such basis.

If the Bonds are not registered in book-entry form and if fewer than all of the Bonds of the same maturity and bearing the same interest rate are to be redeemed, the Bonds of such maturity and bearing such interest rate to be redeemed will be selected on a pro rata basis, and the particular Bonds of such maturity and bearing such interest rate to be redeemed will be selected by lot, provided that any such redemption must be performed such that all Bonds remaining outstanding will be in authorized denominations.

Upon surrender of a Bond to be redeemed in part, the Trustee will authenticate for the registered owner a new Bond or Bonds of the same maturity and tenor equal in principal amount to the unredeemed portion of the Bond surrendered.

## ARTICLE V

**APPLICATION OF PROCEEDS;  
SOURCE OF PAYMENT OF BONDS**

**Section 5.01 Application of Proceeds.** The net proceeds of the sale of the Bonds received by the Trustee, \$\_\_\_\_\_ (\$\_\_\_\_\_ principal amount, less \$\_\_\_\_\_ underwriter's discount), shall be deposited by the Trustee as follows:

(i) the sum of \$\_\_\_\_\_ shall be deposited into the Costs of Issuance Fund;

(ii) the sum of \$\_\_\_\_\_ shall be transferred to PERS and used to refund a portion of the Unfunded Liability relating to the City's Miscellaneous Plan;

(iii) the sum of \$\_\_\_\_\_ shall be transferred to PERS and used to refund a portion of the Unfunded Liability relating to the City's Safety Fire Plan;

(iv) the sum of \$\_\_\_\_\_ shall be transferred to PERS and used to refund a portion of the Unfunded Liability relating to the City's PEPRA Safety Fire Plan;

(v) the sum of \$\_\_\_\_\_ shall be transferred to PERS and used to refund a portion of the Unfunded Liability relating to the City's Safety Police Plan; and

(vi) the sum of \$\_\_\_\_\_ shall be transferred to PERS and used to refund a portion of the Unfunded Liability relating to the City's PEPRA Safety Police Plan.

The City shall provide written payment instructions to the Trustee for the transfers above to PERS, upon which the Trustee may conclusively rely.

The Trustee may establish and maintain for so long as is necessary one or more temporary funds and accounts under this Trust Agreement, including but not limited to a temporary fund for holding the proceeds of the Bonds.

**Section 5.02 Sources of Payment of Bonds; Semi-Annual Payments by the City.**

(a) The City shall provide for payment of principal or redemption price of and interest on the Bonds from any source of legally available funds of the City. If any Bonds are Outstanding, the City shall, no later than three Business Days preceding each Interest Payment Date beginning \_\_\_\_ 1, 20\_\_, deliver funds to the Trustee for deposit to the Revenue Fund in an aggregate amount equal to the portion of the Annual Debt Service coming due on such Interest Payment Date (less amounts on deposit in the Revenue Fund).

(b) The Bonds shall be obligations of the City payable from any lawfully available funds, shall not be limited as to payment to any special source of funds of the City, and shall be subject to appropriation in accordance with Section 8.01 hereof. The Bonds do not constitute an obligation of the City for which the City is obligated to levy or pledge any form of taxation or for which the City has levied or pledged any form of taxation.

## ARTICLE VI

### CREATION OF CERTAIN FUNDS AND ACCOUNTS

**Section 6.01 Creation of Costs of Issuance Fund.** There is hereby created a Fund to be held by the Trustee designated “City of Vernon 2022 Taxable Pension Obligation Bonds, Costs of Issuance Fund” (the “**Costs of Issuance Fund**”). Funds on deposit in the Costs of Issuance Fund shall be used to pay or to reimburse the City for the payment of Costs of Issuance. Amounts in the Costs of Issuance Fund shall be disbursed by the Trustee upon Written Requisition in the form of Exhibit B executed by an Authorized City Representative. Each such Written Requisition of the City shall be sufficient evidence to the Trustee of the facts stated therein and the Trustee shall have no duty to confirm the accuracy of such facts.

At such time as the City delivers to the Trustee written notice that all Costs of Issuance have been paid or otherwise notifies the Trustee in writing that no additional amounts from the Costs of Issuance Fund will be needed to pay Costs of Issuance, the Trustee shall transfer all amounts then remaining in the Costs of Issuance Fund to the Bond Interest Account of the City unless otherwise directed by the City. At such time as no amounts remain in the Costs of Issuance Fund, such Fund shall be closed.

**Section 6.02 Creation of Revenue Fund and Certain Accounts.** There is hereby created a Fund to be held by the Trustee designated “City of Vernon 2022 Taxable Pension Obligation Bonds, Revenue Fund” (the “**Revenue Fund**”). There are hereby created in the Revenue Fund two separate Accounts designated “**Bond Interest Account**” and “**Bond Principal Account**”.

(a) All amounts received by the Trustee from the City in respect of interest payments on the Bonds shall be deposited in the Bond Interest Account and shall be disbursed to the applicable Bondholders to pay interest on the Bonds. All amounts held at any time in the Bond Interest Account (including amounts deposited pursuant to Section 6.03) shall be held for the security and payment of interest on the Bonds pursuant to this Trust Agreement. If at any time funds on deposit in the Bond Interest Account are insufficient to provide for the payment of such interest, the City shall promptly deposit funds to such Account to cure such deficiency. On August 2 of each year beginning in 20\_\_, so long as no Event of Default has occurred and is continuing, the Trustee shall transfer all amounts on deposit in the Bond Interest Account to the Revenue Fund to be used for any lawful purpose.

(b) All amounts received by the Trustee from the City in respect of principal payments on the Bonds shall be deposited in the Bond Principal Account and all amounts in the Bond Principal Account will be disbursed to pay principal on the Bonds pursuant to this Trust Agreement. If at any time funds on deposit in the Bond Principal Account are insufficient to provide for the payment of such principal, the City shall promptly deposit funds to such Account to cure such deficiency.

(c) The moneys in such Funds and Accounts shall be held by the Trustee in trust and applied as herein provided and, pending such application, shall be subject to a lien and charge in favor of the holders of the Bonds issued and Outstanding under this Trust Agreement and for the further security of such holders until paid out or transferred as hereinafter provided.

**Section 6.03 Creation of Redemption Fund.** A Fund to be held by the Trustee is hereby created and designated the “City of Vernon 2022 Taxable Pension Obligation Bonds, Redemption Fund” (the “**Redemption Fund**”). All moneys deposited by the City with the Trustee for the purpose of redeeming Bonds shall be deposited in the Redemption Fund. All amounts deposited in the Redemption Fund shall be used and withdrawn by the Trustee solely for the purpose of redeeming Bonds in the manner, at the times and upon the terms and conditions specified in this Trust Agreement; provided that, at any time prior to giving such notice of redemption, the Trustee shall, upon receipt of written instructions from an Authorized City Representative, apply such amounts to the purchase of Bonds at public or private sale, as and when and at such prices (including brokerage and other charges) as directed by the City.

**Section 6.04 Moneys Held in Redemption Fund.** All moneys which shall have been withdrawn from the Revenue Fund and deposited in the Redemption Fund for the purpose of paying any of the Bonds hereby secured, either at the maturity thereof or upon call for redemption, shall be held in trust for the respective Holders of such Bonds.

**Section 6.05 Unclaimed Moneys.** Any moneys which shall be set aside or deposited in the Redemption Fund, the Bond Principal Account, the Bond Interest Account or any other Fund or Account for the benefit of Holders of Bonds and which shall remain unclaimed by the Holders of such Bonds for a period of one year after the date on which such Bonds shall have become due and payable (or such longer period as shall be required by State law) shall be paid to the City, and thereafter the Holders of such Bonds shall look only to the City for payment and the City shall be obligated to make such payment, but only to the extent of the amounts so received without any interest thereon, and the Trustee and any Paying Agent shall have no responsibility with respect to any of such moneys.

## ARTICLE VII

### CONCERNING PAYING AGENT

**Section 7.01 Paying Agent; Appointment and Acceptance of Duties.** The City hereby appoints the Trustee as the Paying Agent for the Bonds.

**Section 7.02 Paying Agent - General Responsibilities.**

(a) The City may at any time or from time to time appoint a different Paying Agent or Paying Agents for the Bonds, and each Paying Agent, if other than the Trustee, shall be a commercial bank with trust powers and shall designate to the City and the Trustee its principal office and signify its acceptance of the duties and obligations imposed upon it hereunder by a written instrument of acceptance delivered to the City under which each such Paying Agent will agree, particularly:

(i) to hold all sums held by it for the payment of the principal of, and premium or interest on, Bonds in trust for the benefit of the Bondholders until such sums shall be paid to such Bondholders or otherwise disposed of as herein provided;

(ii) to keep such books and records as shall be consistent with industry practice, to make such books and records available for inspection by the City and the Trustee at all reasonable times upon reasonable prior notice; and

(iii) upon the request of the Trustee, to forthwith deliver to the Trustee all sums so held by such Paying Agent.

(b) The Paying Agent shall perform the duties and obligations set forth in this Trust Agreement, and in particular shall hold all sums delivered to it by the Trustee for the payment of principal or premium of and interest on the Bonds for the benefit of the Bondholders until such sums shall be paid to such Bondholders or otherwise disposed of as herein provided.

(c) In performing its duties hereunder, the Paying Agent shall be entitled to all of the rights, protections and immunities accorded to the Trustee under the terms of this Trust Agreement.

**Section 7.03 Certain Permitted Acts.** Any Fiduciary may become the owner of any Bonds, with the same rights it would have if it were not a Fiduciary. To the extent permitted by law, any Fiduciary may act as depositary for, and permit any of its officers or directors to act as a member of, or in any other capacity with respect to, any committee formed to protect the rights of Bondholders or to effect or aid in any reorganization growing out of the enforcement of the Bonds or this Trust Agreement, whether or not any such committee shall represent the owners of a majority in Total Bond Obligation of the Bonds then Outstanding.

**Section 7.04 Resignation or Removal of Paying Agent and Appointment of Successor.**

(a) Any Paying Agent may at any time resign and be discharged of the duties and obligations created by this Trust Agreement in accordance with the provisions set forth in this Trust Agreement for the removal of the Trustee by giving at least 60 days' written notice to the City and the other Fiduciaries. Any Paying Agent may be removed at any time upon 30 days prior written notice by an instrument filed with such Paying Agent and the Trustee and signed by an Authorized City Representative. Any successor Paying Agent shall be appointed by the City with the approval of the Trustee and shall be a commercial bank with trust powers or trust company organized under the laws of any state of the United States, having capital stock and surplus aggregating at least \$100,000,000, and willing and able to accept the office on reasonable and customary terms and authorized by law to perform all the duties imposed upon it by this Trust Agreement.

(b) In the event of the resignation or removal of any Paying Agent, such Paying Agent shall assign and deliver any moneys and Bonds, including authenticated Bonds, held by it to its successor, or if there be no successor, to the Trustee. In the event that for any reason there shall be a vacancy in the office of any Paying Agent, the Trustee shall act as such Paying Agent.

**ARTICLE VIII**

**COVENANTS OF THE CITY**

**Section 8.01 Payment of Principal and Interest.** The City covenants and agrees that it will duly and punctually pay or cause to be paid the principal, premium, if any, and interest on every Bond at the place and on the dates and in the manner specified herein and in the Bonds, according to the true intent and meaning thereof, and that it will faithfully do and perform all covenants and agreements contained herein and in the Bonds and the City agrees that time is of the essence of this Trust Agreement. The obligations of the City under the Bonds, including the obligation to make all

payments of principal, premium, if any, and interest when due, are absolute and unconditional, without any right of set-off or counter claim.

The City shall in each Fiscal Year include in its budget a provision to provide funds in an amount sufficient to pay the principal, premium, if any, and interest on the Bonds coming due in such Fiscal Year, but only to the extent that such amounts exceed the amount of available funds then on deposit in the Revenue Fund, and shall make annual appropriations for all such amounts. If such principal, premium, if any, and interest on the Bonds coming due in any Fiscal Year exceeds the sum of amounts budgeted in respect thereof together with amounts then on deposit in the Revenue Fund, then the City shall amend or supplement the budget to provide for such excess amounts. The covenants contained in this Section shall be deemed to be and shall be duties imposed by law and it shall be the duty of each and every public official of the City to take such action and do such things as are required by law in the performance of the official duty of such officials to enable the City to carry out and perform the covenants and agreements in this Trust Agreement agreed to be carried out and performed by the City.

**Section 8.02 Performance of Covenants by City; Authority; Due Execution.** The City covenants that it will faithfully perform at all times any and all covenants, undertakings, stipulations and provisions contained in this Trust Agreement, in any and every Bond executed, authenticated and delivered hereunder and in all of its proceedings pertaining hereto. The City covenants that it is duly authorized under the Constitution and laws of the State to issue the Bonds.

**Section 8.03 Instruments of Further Assurance.** The City covenants that it will do, execute, acknowledge and deliver, or cause to be done, executed, acknowledged and delivered such further acts, instruments and transfers as the Trustee may reasonably request for the better assuring and confirming to the Trustee all the rights and obligations of the City under and pursuant to this Trust Agreement. The City shall, upon the reasonable request of the Trustee, from time to time execute and deliver such further instructions and take such further action as may be reasonable and as may be required to effectuate the purposes of this Trust Agreement or any provisions hereof; provided, however, that no such instruments or actions shall pledge the full faith and credit or the taxing powers of the State.

**Section 8.04 No Inconsistent Action.** The City covenants that no contract or contracts will be entered into or any action taken by the City which shall be inconsistent with the provisions of this Trust Agreement.

**Section 8.05 No Adverse Action.** The City covenants that it will not take any action which will have a material adverse effect upon the rights of the Holders of the Bonds.

**Section 8.06 Maintenance of Powers.** The City covenants that it will at all times use its best efforts to maintain the powers, functions, duties and obligations now reposed in it pursuant to applicable law and will not at any time voluntarily do, suffer or permit any act or thing the effect of which would be to hinder, delay or imperil either the payment of the indebtedness evidenced by any of the Bonds or the performance or observance of any of the covenants herein contained.

**Section 8.07 Covenants of City Binding on Successors.**

(a) All covenants, stipulations, obligations and agreements of the City contained in this Trust Agreement shall be deemed to be covenants, stipulations, obligations and agreements of

the City to the full extent authorized or permitted by law. If the powers or duties of the City shall hereafter be transferred by amendment of any provision of the Constitution or any other law of the State or in any other manner there shall be a successor to the City, and if such transfer shall relate to any matter or thing permitted or required to be done under this Trust Agreement by the City, then the entity that shall succeed to such powers or duties of the City shall act and be obligated in the place and stead of the City as provided in this Trust Agreement, and all such covenants, stipulations, obligations and agreements herein shall be binding upon such successor or successors thereof from time to time and upon any officer, board, body, district, authority or commission to whom or to which any power or duty affecting such covenants, stipulations, obligations and agreements shall be transferred by or in accordance with law.

(b) Except as otherwise provided in this Trust Agreement, all rights, powers and privileges conferred and duties and liabilities imposed upon the City by the provisions of this Trust Agreement shall be exercised or performed by the City or by such officers, board, body, district, authority or commission as may be required by law to exercise such powers or to perform such duties.

**Section 8.08 Trust Agreement to Constitute a Contract.** This Trust Agreement is executed by the City for the benefit of the Bondholders and constitutes a contract with the Bondholders.

**Section 8.09 City to Perform Pursuant to Continuing Disclosure Certificate.** The City hereby covenants and agrees that it will comply with and carry out all of the provisions of the Continuing Disclosure Certificate. Notwithstanding any other provision of this Trust Agreement, failure of the City to comply with the Continuing Disclosure Certificate shall not be considered an Event of Default under this Trust Agreement; provided, however, the obligations of the City to comply with the provisions of the Continuing Disclosure Certificate shall be enforceable by any Participating Underwriter or any Holder of Outstanding Bonds, or by the Trustee on behalf of the Holders of Outstanding Bonds; provided, further, that the Trustee shall not be required to take any enforcement action whatsoever except at the written direction of the Holders of not less than a majority in aggregate principal amount of the Bonds at the time Outstanding who shall have provided the Trustee with security and indemnity to its satisfaction, including without limitation, attorney's fees and expenses. The Participating Underwriters', Holders' and Trustee's rights to enforce the provisions of the Continuing Disclosure Certificate shall be limited solely to a right, by action in mandamus or for specific performance, to compel performance of the City's obligations under the Continuing Disclosure Certificate. Notwithstanding the foregoing, the City shall be entitled to amend or rescind the Continuing Disclosure Certificate to the extent permitted by law.

## ARTICLE IX

### INVESTMENTS

**Section 9.01 Investments Authorized.** Money held by the Trustee in any fund or account hereunder shall be invested by the Trustee in Permitted Investments pending application as provided herein solely at the prior written direction of an Authorized City Representative, shall be registered in the name of the Trustee where applicable, as Trustee, and shall be held by the Trustee. The City shall direct the Trustee prior to 12:00 p.m. Pacific time on the last Business Day before the date on which a Permitted Investment matures or is redeemed as to the reinvestment of the proceeds thereof. In the absence of such direction, moneys in any funds or accounts hereunder shall be held

uninvested. The Trustee may rely on the City's certification in such investment instructions that such investments are permitted by law and by any policy guidelines promulgated by the City. Money held in any fund or account hereunder may be commingled for purposes of investment only.

The Trustee may, with the prior written approval of an Authorized City Representative, purchase from or sell to itself or any affiliate, as principal or agent, investments authorized by this Section 9.01. Any investments and reinvestments shall be made after giving full consideration to the time at which funds are required to be available hereunder and to the highest yield practicably obtainable giving due regard to the safety of such funds and the date upon which such funds will be required for the uses and purposes required by this Trust Agreement. The Trustee or any of its affiliates may act as agent in the making or disposing of any investment and may act as sponsor or advisor with respect to any Permitted Investment. For investment purposes, the Trustee may commingle the funds and accounts established hereunder, but shall account for each separately.

The City acknowledges that to the extent regulations of the Comptroller of the Currency or other applicable regulatory entity grant the City the right to receive brokerage confirmations of security transactions as they occur, the City specifically waives receipt of such confirmations to the extent permitted by law. The Trustee will furnish the City with periodic cash transaction statements which shall include details for all investment transactions made by the Trustee hereunder.

**Section 9.02 Reports.** The Trustee shall furnish at least quarterly to the City a report (which may be in the form of the Trustee's regular account statements) of all investments made by the Trustee and of all amounts on deposit in each fund and account maintained hereunder.

**Section 9.03 Valuation and Disposition of Investments.** For the purpose of determining the amount in any fund or account hereunder, all Permitted Investments shall be valued at the market value thereof not later than July 1 of each year. With the prior written approval of an Authorized City Representative, the Trustee may sell at the best price obtainable, or present for redemption, any Permitted Investment so purchased by the Trustee whenever it shall be necessary in order to provide money to meet any required payment, transfer, withdrawal or disbursement from any fund or account hereunder, and the Trustee shall not be liable or responsible for any loss resulting from such investment or sale, except any loss resulting from its own negligence or willful misconduct.

**Section 9.04 Application of Investment Earnings.** Investments in any Fund or Account shall be deemed at all times to be a part of such Fund or Account, and any profit realized from such investment shall be credited to such Fund or Account and any loss resulting from such investment shall be charged to such Fund or Account. Interest earnings on investments in any Fund or Account shall be deposited in the Bond Interest Account of the Revenue Fund.

## ARTICLE X

### DEFEASANCE

**Section 10.01 Discharge of Bonds; Release of Trust Agreement.** Bonds or portions thereof (such portions to be in an Authorized Denomination) which have been paid in full or which are deemed to have been paid in full shall no longer be entitled to the benefits of this Trust Agreement except for the purposes of payment from moneys and Defeasance Securities. When all Bonds which have been issued under this Trust Agreement have been paid in full or are deemed to have been paid in full, and all other sums payable hereunder by the City, including all necessary and

proper fees, compensation and expenses of the Trustee and any Paying Agents, have been paid or are duly provided for, then the Trustee shall cancel, discharge and release this Trust Agreement, shall execute, acknowledge and deliver to the City such instruments of satisfaction and discharge or release as shall be requisite to evidence such release and such satisfaction and discharge and shall assign and deliver to the City any amounts at the time subject to this Trust Agreement which may then be in the Trustee's possession, except funds or securities in which such funds are invested and held by the Trustee or the Paying Agents for the payment of the principal, premium, if any, and interest on the Bonds.

#### **Section 10.02 Bonds Deemed Paid.**

(a) A Bond shall be deemed to be paid within the meaning of this Article X and for all purposes of this Trust Agreement when (i) payment with respect thereto of the principal, interest and premium, if any, either (1) shall have been made or caused to be made in accordance with the terms of the Bonds and this Trust Agreement or (2) shall have been provided for, as certified to the Trustee by a Consultant who is a certified public accountant, by irrevocably depositing with the Trustee in trust and irrevocably setting aside exclusively for such payment: (x) moneys sufficient to make such payment, and/or (y) Defeasance Securities maturing as to principal and interest in such amounts and at such times as will insure the availability of sufficient moneys to make such payment, and (ii) all necessary and proper fees, compensation and expenses of the Trustee and any Paying Agents pertaining to the Bonds with respect to which such deposit is made shall have been paid or provision made for the payment thereof. At such times as Bonds shall be deemed to be paid hereunder, such Bonds shall no longer be secured by or entitled to the benefits of this Trust Agreement, except for the purposes of payment from such moneys and Defeasance Securities.

(b) Notwithstanding the foregoing paragraph, no deposit under clause (i)(2) of the immediately preceding paragraph shall be deemed a payment of such Bonds until (i) proper notice of redemption of such Bonds shall have been given in accordance with Section 4.01, or in the event such Bonds are not to be redeemed within the next succeeding 60 days, until the City shall have given the Trustee irrevocable instructions to notify, as soon as practicable, the holders of the Bonds in accordance with Section 4.01, that the deposit required by clause (i)(2) above has been made with the Trustee and that such Bonds are deemed to have been paid in accordance with this Article X and stating the maturity or redemption date upon which moneys are to be available for the payment of the principal of, premium, if any, and unpaid interest on such Bonds; or (ii) the maturity of such Bonds.

### **ARTICLE XI**

#### **DEFAULTS AND REMEDIES**

**Section 11.01 Events of Default.** Each of the following events shall constitute and is referred to in this Trust Agreement as an “**Event of Default**”:

(a) a failure to pay the principal or premium, if any, on any of the Bonds when the same shall become due and payable at maturity or upon redemption;

(b) a failure to pay any installment of interest on any of the Bonds when such interest shall become due and payable;

(c) a failure by the City to observe and perform any covenant, condition, agreement or provision (other than as specified in clauses (a) and (b) of this Section 11.01) contained in the Bonds or in this Trust Agreement on the part of the City to be observed or performed, which failure shall continue for a period of 60 days after written notice, specifying such failure and requesting that it be remedied, shall have been given to the City by the Trustee; provided, however, that the Trustee shall be deemed to have agreed to an extension of such period if corrective action is initiated by the City within such period and is being diligently pursued; or

(d) if the City files a petition in voluntary bankruptcy, for the composition of its affairs or for its corporate reorganization under any state or federal bankruptcy or insolvency law, or makes an assignment for the benefit of creditors, or admits in writing to its insolvency or inability to pay debts as they mature, or consents in writing to the appointment of a trustee or receiver for itself.

Upon its actual knowledge of the occurrence of any Event of Default, the Trustee shall immediately give written notice thereof to the City.

### **Section 11.02 Remedies.**

(a) Upon the occurrence and continuance of any Event of Default, the Trustee in its discretion may, and shall upon the written direction of the holders of a majority of the Total Bond Obligation of the Bonds then Outstanding and, in each case, receipt of indemnity to its satisfaction, in its own name and as the Trustee of an express trust:

(1) by mandamus, or other suit, action or proceeding at law or in equity, enforce all rights of the Bondholders hereunder, as the case may be, and require the City to carry out any agreements with or for the benefit of the Bondholders and to perform its or their duties under the Refunding Law or any other law to which it is subject and this Trust Agreement; provided that any such remedy may be taken only to the extent permitted under the applicable provisions of this Trust Agreement;

(2) bring suit upon the defaulted Bonds;

(3) commence an action or suit in equity to require the City to account as if it were the trustee of an express trust for the Bondholders; or

(4) by action or suit in equity enjoin any acts or things which may be unlawful or in violation of the rights of the Bondholders hereunder.

(b) The Trustee shall be under no obligation to take any action with respect to any Event of Default unless the Trustee has actual knowledge of the occurrence of such Event of Default.

**Section 11.03 Restoration to Former Position.** In the event that any proceeding taken by the Trustee to enforce any right under this Trust Agreement shall have been discontinued or abandoned for any reason, or shall have been determined adversely to the Trustee, then the City, the Trustee and the Bondholders shall be restored to their former positions and rights hereunder, respectively, and all rights, remedies and powers of the Trustee shall continue as though no such proceeding had been taken.

**Section 11.04 Bondholders' Right to Direct Proceedings on their Behalf.** Anything in this Trust Agreement to the contrary notwithstanding, Holders of a majority in Total Bond Obligation shall have the right, at any time, by an instrument in writing executed and delivered to the Trustee, to direct the time, method and place of conducting all remedial proceedings on their behalf available to the Trustee under this Trust Agreement to be taken in connection with the enforcement of the terms of this Trust Agreement or exercising any trust or power conferred on the Trustee by this Trust Agreement; provided that such direction shall not be otherwise than in accordance with the provisions of the law and this Trust Agreement and that there shall have been provided to the Trustee security and indemnity satisfactory to the Trustee against the costs, expenses and liabilities to be incurred as a result thereof by the Trustee; provided further that the Trustee shall have the right to decline to follow any such direction which in the opinion of the Trustee would be unjustly prejudicial to Bondholders not parties to such direction.

**Section 11.05 Limitation on Bondholders' Rights to Institute Proceedings.** No owner of any Bond shall have the right to institute any suit, action or proceeding at law in equity, for the protection or enforcement of any right or remedy under this Trust Agreement, or applicable law with respect to such Bond, unless (a) such owner shall have given to the Trustee written notice of the occurrence of an Event of Default; (b) the owners of not less than a majority in Total Bond Obligation shall have made written request upon the Trustee to exercise the powers heretofore granted or to institute such suit, action or proceeding in its own name; (c) such owner or said owners shall have tendered to the Trustee reasonable indemnity against the costs, expenses and liabilities to be incurred in compliance with such request; (d) the Trustee shall have refused or failed to comply with such request for a period of 60 days after such written request shall have been received by and said tender of indemnity shall have been made to, the Trustee and (e) the Trustee shall not have received contrary directions from the owners of a majority in aggregate principal amount of the Total Bonds Obligation.

**Section 11.06 No Impairment of Right to Enforce Payment.** Notwithstanding any other provision in this Trust Agreement, the right of any Bondholder to receive payment of the principal of and interest on such Holder's Bond, on or after the respective due dates expressed therein, or to institute suit for the enforcement of any such payment on or after such respective date, shall not be impaired or affected without the consent of such Bondholder.

**Section 11.07 Proceedings by Trustee Without Possession of Bonds.** All rights of action under this Trust Agreement or under any of the Bonds secured hereby which are enforceable by the Trustee may be enforced by it without the possession of any of the Bonds, or the production thereof at the trial or other proceedings relative thereto, and any such suit, action or proceeding instituted by the Trustee shall be brought in its name for the equal and ratable benefit of the Bondholders, as the case may be, subject to the provisions of this Trust Agreement.

**Section 11.08 No Remedy Exclusive.** No remedy herein conferred upon or reserved to the Trustee or to Bondholders is intended to be exclusive of any other remedy or remedies, and each and every such remedy shall be cumulative, and shall be in addition to every other remedy given hereunder, or now or hereafter existing at law or in equity or by statute; provided, however, that any conditions set forth herein to the taking of any remedy to enforce the provisions of this Trust Agreement or the Bonds shall also be conditions to seeking any remedies under any of the foregoing pursuant to this Section 11.08.

**Section 11.09 No Waiver of Remedies.** No delay or omission of the Trustee or of any Bondholder to exercise any right or power accruing upon any default shall impair any such right or power or shall be construed to be a waiver of any such default, or an acquiescence therein and every power and remedy given by this Article XI to the Trustee and to the Bondholders, respectively, may be exercised from time to time and as often as may be deemed expedient.

**Section 11.10 Application of Moneys.**

(a) Any moneys received by the Trustee for the benefit of Bondholders, by any receiver or by any Bondholder pursuant to any right given or action taken under the provisions of this Article XI, after payment of the costs and expenses of the proceedings resulting in the collection of such moneys and of the fees, expenses, liabilities and advances incurred or made by the Trustee (including without limitation reasonable fees and reasonable expenses of its attorneys), shall be deposited in the Revenue Fund and all moneys so deposited in the Revenue Fund during the continuance of an Event of Default shall be applied (i) first, to the payment to the persons entitled thereto of all installments of interest then due on the Bonds, with interest on overdue installments, if lawful, at the rate per annum borne by the Bonds, as the case may be, in the order of maturity of the installments of such interest (if the amount available for such interest installments shall not be sufficient to pay in full any particular installment of interest, then to the payment ratably, according to the amounts due on such installment), and if the amount available for such interest shall not be sufficient to make payment thereof, then to the payment thereof ratably according to the respective aggregate amounts due and (ii) second, to the payment to the persons entitled thereto of the unpaid principal, as applicable, of any of the Bonds which shall have become due with interest on such Bonds at their respective rate from the respective dates upon which they became due (if the amount available for such unpaid principal and interest shall not be sufficient to pay in full Bonds due on any particular date, together with such interest, then to the payment ratably, according to the amount of principal and interest due on such date, in each case to the persons entitled thereto, without any discrimination or privilege among Holders of Bonds), and, if the amount available for such principal and interest shall not be sufficient to make full payment thereof, then to the payment thereof ratably according to the respective aggregate amounts due.

(b) Whenever moneys are to be applied pursuant to the provisions of this Section 11.10, such moneys shall be applied at such times, and from time to time, as the Trustee shall determine, having due regard to the amount of such moneys available for application and the likelihood of additional moneys becoming available for such application in the future. Whenever the Trustee shall apply such funds, it shall fix the date (which shall be an Interest Payment Date unless it shall deem another date more suitable) upon which such application is to be made and upon such date interest on the amounts to be paid on such date shall cease to accrue. The Trustee shall give notice of the deposit with it of any such moneys and of the fixing of any such date by Mail to all Bondholders and shall not be required to make payment to any Bondholder until such Bonds shall be presented to the Trustee for appropriate endorsement or for cancellation if fully paid.

**Section 11.11 Severability of Remedies.** It is the purpose and intention of this Article XI to provide rights and remedies to the Trustee and the Bondholders which may be lawfully granted under the provisions of applicable law, but should any right or remedy herein granted be held to be unlawful, the Trustee and the Bondholders shall be entitled, as above set forth, to every other right and remedy provided in this Trust Agreement and by applicable law.

**Section 11.12 Additional Events of Default and Remedies.** So long as any Bonds are Outstanding, the Events of Default and remedies as set forth in this Article XI may be supplemented with additional Events of Default and remedies as set forth from time to time in a supplemental agreement.

## ARTICLE XII

### TRUSTEE; REGISTRAR

**Section 12.01 Acceptance of Trusts.** The Trustee hereby accepts and agrees to execute the trusts specifically imposed upon it by this Trust Agreement, but only upon the additional terms set forth in this Article XII, to all of which the City agrees and the respective Bondholders agree by their acceptance of delivery of any of the Bonds.

#### **Section 12.02 Duties of Trustee.**

(a) If an Event of Default has occurred and is continuing, the Trustee shall exercise its rights and powers and use the same degree of care and skill in their exercise as a prudent person would exercise or use under the circumstances in the conduct of such person's own affairs.

(b) Except during the continuance of an Event of Default:

(i) the Trustee need perform only those duties that are specifically set forth in this Trust Agreement and no others; and

(ii) in the absence of negligence on its part, the Trustee may conclusively rely, as to the truth of the statements and the correctness of the opinions expressed, upon certificates or opinions furnished to the Trustee and conforming to the requirements of this Trust Agreement.

(c) The Trustee may not be relieved from liability for its own negligent action, its own negligent failure to act or its own willful misconduct, except that:

(i) this paragraph does not limit the effect of paragraph (b) of this Section 12.02;

(ii) the Trustee shall not be liable for any error of judgment made in good faith by a Responsible Officer unless the Trustee was negligent in ascertaining the pertinent facts;

(iii) the Trustee shall not be liable with respect to any action it takes or fails to take in good faith in accordance with a direction received by it from Bondholders or the City in the manner provided in this Trust Agreement; and

(iv) no provision of this Trust Agreement shall require the Trustee to expend or risk its own funds or otherwise incur any financial liability in the performance of any of its duties hereunder or in the exercise of any of its rights or powers.

(d) Every provision of this Trust Agreement that in any way relates to the Trustee is subject to all the paragraphs of this Section 12.02.

(e) The Trustee may refuse to perform any duty or exercise any right or power unless it receives indemnity reasonably satisfactory to it against any loss, liability or expense.

(f) The Trustee shall not be liable for interest on any cash held by it except as the Trustee may agree with the City.

### **Section 12.03 Rights of Trustee.**

(a) The recitals of facts contained herein and in the Bonds shall be taken as statements of the City, and the Trustee assumes no responsibility for the correctness of the same (other than the certificate of authentication of the Trustee on each Bond), and makes no representations as to the validity or sufficiency of this Trust Agreement or of the Bonds or of any Permitted Investment and shall not incur any responsibility in respect of any such matter, other than in connection with the duties or obligations expressly assigned to or imposed upon it herein or in the Bonds. The Trustee shall, however, be responsible for its representations contained in its certificate of authentication on the Bonds. The Trustee shall not be liable in connection with the performance of its duties hereunder, except for its own negligence, willful misconduct or breach of the express terms and conditions hereof. The Trustee and its directors, officers, employees or agents may in good faith buy, sell, own, hold and deal in any of the Bonds and may join in any action which any Holder of a Bond may be entitled to take, with like effect as if the Trustee was not the Trustee under this Trust Agreement.

(b) The Trustee may execute any of the trusts or powers hereof and perform the duties required of it hereunder by or through attorneys, agents or receivers, and shall be entitled to advice of counsel concerning all matters of trust and its duty hereunder, and the opinion of such counsel shall be authorization for any action taken or not taken in reliance on such opinion, but the Trustee shall be answerable for the negligence or misconduct of any such attorney, agent or receiver selected by it.

(c) No permissive power, right or remedy conferred upon the Trustee hereunder shall be construed to impose a duty to exercise such power, right or remedy.

(d) The Trustee shall not be bound to make any investigation into the facts or matters stated in any resolution, certificate, statement, instrument, opinion, report, notice, request, direction, consent, order, bond, debenture, coupon or other paper or document but the Trustee, in its discretion, may make such further inquiry or investigation into such facts or matters as it may see fit, and, if the Trustee shall determine to make such further inquiry or investigation, it shall be entitled to examine the books, records and premises of the City, personally or by agent or attorney.

(e) The Trustee shall not be responsible for the application or handling by the City of any moneys transferred to or pursuant to any requisition or request of the City in accordance with the terms and conditions hereof.

(f) Whether or not therein expressly so provided, every provision of this Trust Agreement relating to the conduct or affecting the liability of or affording protection to the Trustee shall be subject to the provisions of this Article XII.

(g) The Trustee shall be protected in acting upon any notice, resolution, request, consent, order, certificate, report, facsimile transmission, electronic mail, opinion, note or other paper

or document believed by it to be genuine and to have been signed or presented by the proper party or parties.

(h) The Trustee shall not be considered in breach of or in default in its obligations hereunder or progress in respect thereto in the event of delay in the performance of such obligations due to unforeseeable causes beyond its control and without its fault or negligence, including, but not limited to, Acts of God or of the public enemy or terrorists, acts of a government, acts of the other party, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, earthquakes, explosion, mob violence, riot, inability to procure or general sabotage or rationing of labor, equipment, facilities, sources of energy, material or supplies in the open market, litigation or arbitration involving a party or others relating to zoning or other governmental action or inaction pertaining to the project, malicious mischief, condemnation, and unusually severe weather or delays of suppliers or subcontractors due to such causes or any similar event and/or occurrences beyond the control of the Trustee.

(i) The Trustee shall have the right to accept and act upon instructions, including funds transfer instructions (“**Instructions**”) given pursuant to this Trust Agreement and delivered using Electronic Means (“**Electronic Means**” means the following communications methods: e-mail, facsimile transmission, secure electronic transmission containing applicable authorization codes, passwords and/or authentication keys issued by the Trustee, or another method or system specified by the Trustee as available for use in connection with its services hereunder); provided, however, that the City shall provide to the Trustee an incumbency certificate listing officers with the authority to provide such Instructions (“**Authorized Officers**”) and containing specimen signatures of such Authorized Officers, which incumbency certificate shall be amended by the City, whenever a person is to be added or deleted from the listing. If the City elects to give the Trustee Instructions using Electronic Means and the Trustee in its discretion elects to act upon such Instructions, the Trustee’s understanding of such Instructions shall be deemed controlling. The City understands and agrees that the Trustee cannot determine the identity of the actual sender of such Instructions and that the Trustee shall conclusively presume that directions that purport to have been sent by an Authorized Officer listed on the incumbency certificate provided to the Trustee have been sent by such Authorized Officer. The City shall be responsible for ensuring that only Authorized Officers transmit such Instructions to the Trustee and that the City and all Authorized Officers are solely responsible to safeguard the use and confidentiality of applicable user and authorization codes, passwords and/or authentication keys upon receipt by the City. The Trustee shall not be liable for any losses, costs or expenses arising directly or indirectly from the Trustee’s reliance upon and compliance with such Instructions notwithstanding such directions conflict or are inconsistent with a subsequent written instruction. The City agrees: (i) to assume all risks arising out of the use of Electronic Means to submit Instructions to the Trustee, including without limitation the risk of the Trustee acting on unauthorized Instructions, and the risk of interception and misuse by third parties; (ii) that it is fully informed of the protections and risks associated with the various methods of transmitting Instructions to the Trustee and that there may be more secure methods of transmitting Instructions than the method(s) selected by the City; (iii) that the security procedures (if any) to be followed in connection with its transmission of Instructions provide to it a commercially reasonable degree of protection in light of its particular needs and circumstances; and (iv) to notify the Trustee immediately upon learning of any compromise or unauthorized use of the security procedures.

(j) The Trustee shall not be responsible or liable for any failure or delay in the performance of its obligations under this Trust Agreement arising out of or caused, directly or

indirectly, by circumstances beyond its reasonable control, including, without limitation, acts of God; earthquakes; fire; flood; hurricanes or other storms; wars; terrorism; similar military disturbances; sabotage; epidemic; pandemic; quarantine restrictions, riots; interruptions; loss or malfunctions of utilities, computer (hardware or software) or communications services; accidents; labor disputes; acts of civil or military authority or governmental action; it being understood that the Trustee shall use commercially reasonable efforts which are consistent with accepted practices in the banking industry to resume performance as soon as reasonably practicable under the circumstances.

**Section 12.04 Individual Rights of Trustee.** The Trustee in its individual or any other capacity may become the owner or pledgee of Bonds and may otherwise deal with the City with the same rights it would have if it were not Trustee. Any Paying Agent or other agent may do the same with like rights.

**Section 12.05 Trustee's Disclaimer.** The Trustee makes no representations as to the validity or adequacy of this Trust Agreement or the Bonds, it shall not be accountable for the City's use of the proceeds from the Bonds paid to the City and it shall not be responsible for any statement in any official statement or other disclosure document or in the Bonds other than its certificate of authentication.

**Section 12.06 Notice of Defaults.** If an event occurs which with the giving of notice or lapse of time or both would be an Event of Default, and if the event is continuing and if it is actually known to the Trustee, the Trustee shall mail to each Bondholder notice of the event within 90 days after it occurs. Except in the case of a default in payment or purchase on any Bonds, the Trustee may withhold the notice to Bondholders if and so long as a committee of its Responsible Officers in good faith determines that withholding the notice is in the interests of the Bondholders.

**Section 12.07 Compensation of Trustee.** The City shall from time to time, but only in accordance with a written agreement in effect with the Trustee, pay to the Trustee reasonable compensation for its services and shall reimburse the Trustee for all its reasonable advances and expenditures, including but not limited to advances to and fees and expenses of independent appraisers, accountants, consultants, counsel, agents and attorneys-at-law or other experts employed by it in the exercise and performance of its powers and duties hereunder. The Trustee shall not otherwise have any claims or lien for payment of compensation for its services against any other moneys held by it in the funds or accounts established hereunder, except as provided in Section 11.10, but may take whatever legal actions are lawfully available to it directly against the City. To the extent permitted by applicable law, the City agrees to indemnify and save the Trustee, its officers, employees, directors and agents, harmless against any costs, expenses, claims or liabilities whatsoever, including, without limitation, fees and expenses of its attorneys, that it may incur in the exercise and performance of its powers and duties hereunder which are not due to its negligence or willful misconduct. The agreement contained in this Section shall survive the payment of the Bonds, the discharge of this Trust Agreement and the appointment of a successor trustee.

**Section 12.08 Eligibility of Trustee.** This Trust Agreement shall always have a Trustee that is a trust company, a bank or association having trust powers and is organized and doing business under the laws of the United States or any state or the District of Columbia, is subject to supervision or examination by United States, state or District of Columbia authority and has a combined capital and surplus of at least \$100,000,000 as set forth in its most recent published annual report of condition.

### **Section 12.09 Replacement of Trustee.**

(a) The Trustee may resign as trustee hereunder by notifying the City in writing prior to the proposed effective date of the resignation. The Holders of a majority in Total Bond Obligation of the Bonds may remove the Trustee by notifying the removed Trustee and may appoint a successor Trustee with the City's consent. The City may remove the Trustee, by notice in writing delivered to the Trustee 30 days prior to the proposed removal date; provided, however, that the City shall have no right to remove the Trustee during any time when an Event of Default has occurred and is continuing unless (i) the Trustee fails to comply with the foregoing Section, (ii) the Trustee is adjudged a bankrupt or an insolvent, (iii) the Trustee otherwise becomes incapable of acting or (iv) the City determines that the Trustee's services are no longer satisfactory to the City. No resignation or removal of the Trustee under this Section shall be effective until a new Trustee has taken office. If the Trustee resigns or is removed or for any reason is unable or unwilling to perform its duties under this Trust Agreement, the City shall promptly appoint a successor Trustee.

(b) A successor Trustee shall deliver a written acceptance of its appointment to the retiring Trustee and to the City. Immediately thereafter, the retiring Trustee shall transfer all property held by it as Trustee to the successor Trustee, the resignation or removal of the retiring Trustee shall then (but only then) become effective and the successor Trustee shall have all the rights, powers and duties of the Trustee under this Trust Agreement. If a Trustee is not performing its duties hereunder and a successor Trustee does not take office within 60 days after the retiring Trustee delivers notice of resignation or the City delivers notice of removal, the retiring Trustee, the City or the Holders of a majority in Total Bond Obligation of the Bonds may petition any court of competent jurisdiction for the appointment of a successor Trustee.

**Section 12.10 Successor Trustee or Agent by Merger.** If the Trustee, any Paying Agent or Registrar consolidates with, merges or converts into, or transfers all or substantially all its assets (or, in the case of a bank or trust company, its corporate trust business) to, another corporation, the resulting, surviving or transferee corporation without any further act shall be the successor Trustee, Paying Agent or Registrar.

**Section 12.11 Registrar.** The City shall appoint the Registrar for the Bonds and may from time to time remove a Registrar and name a replacement upon notice to the Trustee. The City hereby appoints the Trustee as Registrar. Each Registrar, if other than the Trustee, shall designate to the Trustee, the Paying Agent, and the City its principal office and signify its acceptance of the duties imposed upon it hereunder by a written instrument of acceptance delivered to the City and the Trustee under which such Registrar will agree, particularly, to keep such books and records as shall be consistent with prudent industry practice and to make such books and records available for inspection by the City, the Trustee, and the Paying Agent at all reasonable times.

**Section 12.12 Other Agents.** The City or the Trustee may from time to time appoint other agents to perform duties and obligations under this Trust Agreement which agents may include, but not be limited to, authenticating agents all as provided by resolution of the City.

**Section 12.13 Several Capacities.** Anything in this Trust Agreement to the contrary notwithstanding, the same entity may serve hereunder as the Trustee, Registrar and any other agent as appointed to perform duties or obligations under this Trust Agreement or an escrow agreement, or in any combination of such capacities, to the extent permitted by law.

### **Section 12.14 Accounting Records and Reports of Trustee.**

(a) The Trustee shall at all times keep, or cause to be kept, proper books of record and account in which complete and accurate entries shall be made of all transactions made by it relating to the proceeds of the Bonds and all Funds and Accounts established pursuant to this Trust Agreement and held by the Trustee. Such books of record and account shall be available for inspection by the City and any Bondholder, or his or her agent or representative duly authorized in writing, upon reasonable prior notice, at reasonable hours and under reasonable circumstances.

(b) The Trustee shall file and furnish to the City and to each Bondholder who shall have filed his or her name and address with the Trustee for such purpose (at such Bondholder's cost), on an annual basis (or, with respect to the City, such other interval that the City may request), a complete financial statement (which may be its regular account statements and which need not be audited) covering receipts, disbursements, allocation and application of moneys in any of the funds and accounts established pursuant to this Trust Agreement for the preceding year.

**Section 12.15 No Remedy Exclusive.** No remedy herein conferred upon or reserved to the City is intended to be exclusive of any other remedy or remedies, and each and every such remedy shall be cumulative, and shall be in addition to every other remedy given hereunder, or now or hereafter existing at law or in equity or by statute.

## **ARTICLE XIII**

### **MODIFICATION OF THIS TRUST AGREEMENT**

**Section 13.01 Limitations.** This Trust Agreement shall not be modified or amended in any respect subsequent to the first delivery of fully executed and authenticated Bonds except as provided in and in accordance with and subject to the provisions of this Article XIII.

### **Section 13.02 Supplemental Agreements Not Requiring Consent of Bondholders.**

(a) The City may, from time to time and at any time, without the consent of or notice to the Bondholders, execute and deliver supplemental agreements supplementing and/or amending this Trust Agreement as follows:

(i) to cure any defect, omission, inconsistency or ambiguity in this Trust Agreement;

(ii) to add to the covenants and agreements of the City in this Trust Agreement other covenants and agreements, or to surrender any right or power reserved or conferred upon the City, and which shall not adversely affect the interests of the Bondholders;

(iii) to confirm, as further assurance, any interest of the Trustee in and to the Funds and Accounts held by the Trustee or in and to any other moneys, securities or funds of the City provided pursuant to this Trust Agreement or to otherwise add security for the Bondholders;

(iv) to comply with the requirements of the Trust Indenture Act of 1939, as from time to time amended;

(v) to modify, alter, amend or supplement this Trust Agreement in any other respect which, in the judgment of the City, is not materially adverse to the Bondholders;

(vi) to qualify the Bonds for a rating or ratings by any Rating Agency; and

(vii) to authorize the issuance of Additional Bonds in accordance with this Trust Agreement.

(b) Before the City shall, pursuant to this Section 13.02, execute any supplemental agreement there shall have been delivered to the City an Opinion of Bond Counsel to the effect that such supplemental agreement (i) is authorized or permitted by this Trust Agreement and the Refunding Law, and (ii) will, upon the execution and delivery thereof, be valid and binding upon the City in accordance with its terms, subject to the typical exceptions.

### **Section 13.03 Supplemental Agreement Requiring Consent of Bondholders.**

(a) Except for any supplemental agreement entered into pursuant to Section 13.02, the Holders of not less than a majority in Total Bond Obligation shall have the right from time to time to consent to and approve the execution by the City of any supplemental agreement deemed necessary or desirable by the City for the purposes of modifying, altering, amending, supplementing or rescinding, in any particular, any of the terms or provisions contained in this Trust Agreement or in a supplemental agreement; provided, however, that, unless approved in writing by the Holders of all the Bonds then Outstanding, nothing contained herein shall permit or be construed as permitting (i) a change in the times, amounts or currency of payment of the principal of or interest on any Outstanding Bonds or (ii) a reduction in the principal amount or redemption price of any Outstanding Bonds or the rate of interest thereon; and provided that nothing contained herein, including the provisions of Section 13.03(b) below, shall, unless approved in writing by the Holders of all the Bonds then Outstanding, permit or be construed as permitting (1) a preference or priority of any Bond or Bonds over any other Bond or Bonds or (2) a reduction in the aggregate principal amount of Bonds the consent of the Holders of which is required for any such supplemental agreement. Nothing herein contained, however, shall be construed as making necessary the approval by Holders of the execution of any supplemental agreement as authorized in Section 13.02.

(b) If at any time the City shall desire to enter into any supplemental agreement for any of the purposes of this Section 13.03, the City shall cause notice of the proposed execution of the supplemental agreement to be given by Mail to all Holders. Such notice shall briefly set forth the nature of the proposed supplemental agreement and shall state that a copy thereof is on file at the office of the City for inspection by all Holders.

(c) Within two weeks after the date of the first mailing of such notice, the City may execute and deliver such supplemental agreement in substantially the form described in such notice, but only if there shall have first been delivered to the City (i) the required consents, in writing, of Holders and (ii) an Opinion of Bond Counsel stating that such supplemental agreement is authorized or permitted by this Trust Agreement and other applicable law, complies with their respective terms and, upon the execution and delivery thereof, will be valid and binding upon the City in accordance with its terms.

(d) If Holders of not less than the percentage of Bonds required by this Section 13.03 shall have consented to and approved the execution and delivery thereof as herein

provided, no Holders shall have any right to object to the adoption of such supplemental agreement, or to object to any of the terms and provisions contained therein or the operation thereof, or in any manner to question the propriety of the execution and delivery thereof, or to enjoin or restrain the City from executing the same or from taking any action pursuant to the provisions thereof.

**Section 13.04 Effect of Supplemental Agreements.** Upon execution and delivery of any supplemental agreement pursuant to the provisions of this Article XIII, this Trust Agreement and all supplemental agreements shall be, and shall be deemed to be, modified and amended in accordance therewith, and the respective rights, duties and obligations under this Trust Agreement and all supplemental agreements of the City, the Trustee, the Registrar, any Paying Agent and all Holders shall thereafter be determined, exercised and enforced under this Trust Agreement and all supplemental agreements, subject in all respects to such modifications and amendments.

**Section 13.05 Supplemental Agreements to be Part of this Trust Agreement.** Any supplemental agreement adopted in accordance with the provisions of this Article XIII shall thereafter form a part of this Trust Agreement or the supplemental agreement which they supplement or amend, and all of the terms and conditions contained in any such supplemental agreement as to any provision authorized to be contained therein shall be and shall be deemed to be part of the terms and conditions of this Trust Agreement which they supplement or amend for any and all purposes.

## ARTICLE XIV

### MISCELLANEOUS PROVISIONS

**Section 14.01 Parties in Interest.** Except as herein otherwise specifically provided, nothing in this Trust Agreement expressed or implied is intended or shall be construed to confer upon any person, firm or corporation other than the City, the Paying Agent, the Trustee, and the Bondholders any right, remedy or claim under or by reason of this Trust Agreement, this Trust Agreement being intended to be for the sole and exclusive benefit of the City, the Paying Agent, the Trustee and the Bondholders.

**Section 14.02 Severability.** In case any one or more of the provisions of this Trust Agreement, or of any Bonds issued hereunder shall, for any reason, be held to be illegal or invalid, such illegality or invalidity shall not affect any other provisions of this Trust Agreement or of Bonds, and this Trust Agreement and any Bonds issued hereunder shall be construed and enforced as if such illegal or invalid provisions had not been contained herein or therein.

**Section 14.03 No Personal Liability of City Officials; Limited Liability of City to Bondholders.**

(a) No covenant or agreement contained in the Bonds or in this Trust Agreement shall be deemed to be the covenant or agreement of any present or future official, officer, agent or employee of the City in their individual capacity, and neither the members of the City Council of the City nor any person executing the Bonds shall be liable personally on the Bonds or be subject to any personal liability or accountability by reason of the issuance thereof.

(b) Except for the payment when due of the payments and the observance and performance of the other agreements, conditions, covenants and terms required to be performed by it contained in this Trust Agreement, the City shall not have any obligation or liability to the

Bondholders with respect to this Trust Agreement or the preparation, execution, delivery, transfer, exchange or cancellation of the Bonds or the receipt, deposit or disbursement of the payments by the Trustee, or with respect to the performance by the Trustee of any obligation required to be performed by it contained in this Trust Agreement.

**Section 14.04 Execution of Instruments; Proof of Ownership.**

(a) Any request, direction, consent or other instrument in writing required or permitted by this Trust Agreement to be signed or executed by Bondholders or on their behalf by an attorney-in-fact may be in any number of concurrent instruments of similar tenor and may be signed or executed by such Bondholders in person or by an agent or attorney-in-fact appointed by an instrument in writing or as provided in the Bonds. Proof of the execution of any such instrument and of the ownership of Bonds shall be sufficient for any purpose of this Trust Agreement and shall be conclusive in favor of the Trustee with regard to any action taken by it under such instrument if made in the following manner:

(i) the fact and date of the execution by any person of any such instrument may be proved by the certificate of any officer in any jurisdiction who, by the laws thereof, has power to take acknowledgments within such jurisdiction, to the effect that the person signing such instrument acknowledged before him the execution thereof, or by an affidavit of a witness to such execution; and

(ii) the ownership of Bonds shall be proved by the registration books kept under the provisions of Section 3.01 hereof;

(b) Nothing contained in this Section 14.04 shall be construed as limiting the Trustee to such proof. The Trustee may accept any other evidence of matters herein stated which it may deem sufficient. Any request, consent of, or assignment by any Bondholder shall bind every future Bondholder of the same Bonds or any Bonds issued in lieu thereof in respect of anything done by the Trustee or the City in pursuance of such request or consent.

**Section 14.05 Governing Law; Venue.** This Trust Agreement is made in the State under the Constitution and laws of the State and is to be so construed. If any party to this Trust Agreement initiates any legal or equitable action to enforce the terms of this Trust Agreement, to declare the rights of the parties under this Trust Agreement or which relates to this Trust Agreement in any manner, each such party agrees that the place of making and for performance of this Trust Agreement shall be the City of Vernon, State of California, and the proper venue for any such action is the Superior Court of the State of California, in and for the County of Los Angeles.

**Section 14.06 Notices.**

(a) Any notice, request, direction, designation, consent, acknowledgment, certification, appointment, waiver or other communication required or permitted by this Trust Agreement or the Bonds must be in writing except as expressly provided otherwise in this Trust Agreement or the Bonds.

(b) The Trustee shall give written notice to the Rating Agencies if at any time (i) a successor Trustee is appointed under this Trust Agreement, (ii) there is any amendment to this Trust Agreement, (iii) Bonds are to be redeemed pursuant to Section 4.02, (iv) notice of any

defeasance of the Bonds has been provided, or (v) if the Bonds shall no longer be Book-Entry Bonds. Notice in the case of an event referred to in clause (ii) hereof shall include a copy of any such amendment.

(c) Except as otherwise required herein, all notices required or authorized to be given to the City, the Trustee and Paying Agent, and the Rating Agencies pursuant to this Trust Agreement shall be in writing and shall be sent by registered or certified mail, postage prepaid, to the following addresses:

1. if to the City, to:

City of Vernon  
4305 South Santa Fe Avenue  
Vernon, California 90058  
Attention: City Administrator

2. if to the Trustee and Paying Agent, to:

The Bank of New York Mellon Trust Company, N.A.  
333 S. Hope Street, Suite 2525  
Los Angeles, California 90071

3. if to Rating Agencies, to:

[TO COME]

or to such other addresses as may from time to time be furnished to the parties, effective upon the receipt of notice thereof given as set forth above.

**Section 14.07 Holidays.** If the date for making any payment or the last date for performance of any act or the exercising of any right, as provided in this Trust Agreement, shall not be a Business Day, such payment may, unless otherwise provided in this Trust Agreement be made or act performed or right exercised on the next succeeding Business Day with the same force and effect as if done on the nominal date provided in this Trust Agreement, and no interest shall accrue for the period from and after such nominal date.

**Section 14.08 Captions.** The captions and table of contents in this Trust Agreement are for convenience only and do not define or limit the scope or intent of any provisions or Sections of this Trust Agreement.

**Section 14.09 Counterparts.** This Trust Agreement may be signed in several counterparts, each of which will be an original, but all of them together constitute the same instrument.

*[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK.]*

**IN WITNESS WHEREOF**, the parties hereto have executed this Trust Agreement by their officers thereunto duly authorized as of the date first above written.

CITY OF VERNON

By: \_\_\_\_\_  
City Administrator

ATTEST:

\_\_\_\_\_  
City Clerk

THE BANK OF NEW YORK MELLON TRUST  
COMPANY, N.A., as Trustee

By: \_\_\_\_\_  
Authorized Officer

**EXHIBIT A**  
**FORM OF BOND**

*Unless this Bond is presented by an authorized representative of The Depository Trust Company, a New York corporation (“DTC”), to the City of Vernon or its agent for registration of transfer, exchange, or payment, and any Bond issued is registered in the name of Cede & Co. or in such other name as is requested by an authorized representative of DTC (and any payment is made to Cede & Co. or to such other entity as is requested by an authorized representative of DTC), ANY TRANSFER, PLEDGE, OR OTHER USE HEREOF FOR VALUE OR OTHERWISE BY OR TO ANY PERSON IS WRONGFUL inasmuch as the registered owner hereof, Cede & Co., has an interest herein.*

No. \_\_\_\_\_ \$ \_\_\_\_\_

**CITY OF VERNON**  
**2022 TAXABLE PENSION OBLIGATION BONDS**

*Neither the faith and credit nor the taxing power of the State of California or any public agency is pledged to the payment of the principal of, or interest on, this Bond.*

<i>Maturity</i>	<i>Interest Rate Per Annum</i>	<i>Dated Date</i>	<i>CUSIP NO.</i>
August 1, _____	_____ %	_____, 2022	_____

REGISTERED OWNER: CEDE & CO.

PRINCIPAL AMOUNT: \_\_\_\_\_ DOLLARS

**THE CITY OF VERNON**, a municipal corporation duly organized and validly existing under and pursuant to the Constitution and the laws of the State of California, for value received, hereby promises to pay to the registered owner named above or registered assigns, on the maturity date specified above, the principal sum specified above together with interest on such principal sum at the rates determined as herein provided on each Interest Payment Date (hereinafter defined) from the Interest Payment Date next preceding the date of authentication and delivery thereof, unless (i) such date of authentication is an Interest Payment Date in which event interest shall be payable from such date of authentication; (ii) it is authenticated after a Record Date and before the close of business on the immediately following Interest Payment Date, in which event interest thereon shall be payable from such Interest Payment Date; or (iii) it is authenticated prior to the close of business on the first Record Date, in which event interest thereon shall be payable from its Dated Date; provided, however, that if at the time of authentication of any Bond interest thereon is in default, interest thereon shall be payable from the Interest Payment Date to which interest has previously

been paid or made available for payment or, if no interest has been paid or made available for payment, from its Dated Date. The principal hereof and premium, if any, hereon are payable when due upon presentation hereof at the Principal Office of The Bank of New York Mellon Trust Company, N.A., as trustee (together with any successor as trustee under the Trust Agreement (hereinafter defined), the “**Trustee**”), in lawful money of the United States of America.

This Bond is one of a duly authorized issue of City of Vernon 2022 Taxable Pension Obligation Bonds (the “**Bonds**”) of the designation indicated on the face hereof. Said authorized issue of Bonds is limited in aggregate principal amount as provided in the Trust Agreement and consists or may consist of one or more series of varying denominations, dates, maturities, interest rates and other provisions, as provided in the Trust Agreement, all issued and to be issued pursuant to the provisions of Articles 10 and 11 (commencing with Section 53570 of Chapter 3 of Division 2 of Title 5 of the California Government Code (the “**Refunding Law**”). This Bond is issued pursuant to the Trust Agreement dated as of \_\_\_\_\_ 1, 2022 by and between the City of Vernon and the Trustee, providing for the issuance of the Bonds and setting forth the terms and authorizing the issuance of the Bonds (said Trust Agreement as amended, supplemented or otherwise modified from time to time being the “**Trust Agreement**”). Reference is hereby made to the Trust Agreement and to the Refunding Law for a description of the terms on which the Bonds are issued and to be issued, and the rights of the registered owners of the Bonds; and all the terms of the Trust Agreement and the Refunding Law are hereby incorporated herein and constitute a contract between the City and the registered owner from time to time of this Bond, and to all the provisions thereof the registered owner of this Bond, by its acceptance hereof, consents and agrees. All capitalized terms used herein and not otherwise defined shall have the meanings given such terms in the Trust Agreement.

The City is required under the Trust Agreement to make payments on the Bonds from any source of legally available funds. The City has covenanted to make the necessary annual appropriations for such purpose.

The obligation of the City to make payments on the Bonds does not constitute an obligation of the City for which the City is obligated to levy or pledge any form of taxation or for which the City has levied or pledged any form of taxation.

This Bond is one of the Bonds described in the Trust Agreement.

### **Interest on Bonds**

Interest shall be computed on the basis of a 360-day year consisting of twelve 30-day months. The Bonds or the principal portion thereof called for redemption will cease to bear interest after the specified redemption date, provided that notice has been given pursuant to the Trust Agreement and sufficient funds for redemption are on deposit at the place of payment on the redemption date.

### **Redemption of Bonds**

**Optional Redemption.** The Bonds maturing on or after August 1, 20\_\_ may be redeemed at the option of the City from any source of funds on any date on or after August 1, 20\_\_ in whole or in part from such maturities as are selected by the City within a maturity at a redemption price equal to the principal amount to be redeemed, together with accrued interest to the date of redemption, without premium.

**Mandatory Sinking Fund Redemption of Bonds.** The Bonds maturing August 1, 20\_\_ (the “Term Bonds”) are subject to mandatory sinking fund redemption at a redemption price equal to the principal amount thereof, plus accrued interest to the redemption date, without premium. The Term Bonds shall be so redeemed on the following dates and in the following amounts:

<i>Redemption Date (August 1)</i>	<i>Principal Amount</i>
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\*

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\* Final maturity.

**Make-Whole Redemption.** The Bonds shall be subject to make-whole redemption on any date as more fully set forth in the Trust Agreement.

#### **Certain Defined Terms**

“**Interest Payment Date**” means February 1 and August 1 of each year, commencing \_\_\_\_\_ 1, 20\_\_.

“**Record Date**” means the fifteenth day of each calendar month preceding any Interest Payment Date, regardless of whether such day is a Business Day.

#### **Other Provisions**

The rights and obligations of the City and of the holders and registered owners of the Bonds may be modified or amended at any time in the manner, to the extent, and upon the terms provided in the Trust Agreement, which provide, in certain circumstances, for modifications and amendments without the consent of or notice to the registered owners of the Bonds.

It is hereby certified and recited that any and all acts, conditions and things required to exist, to happen and to be performed, precedent to and in the incurring of the indebtedness evidenced by this Bond, and in the issuing of this Bond, do exist, have happened and have been performed in due time, form and manner, as required by the Constitution and statutes of the State of California, and that this Bond, is within every debt and other limit prescribed by the Constitution and the statutes of the State of California, and is not in excess of the amount of Bonds permitted to be issued under the Trust Agreement or the Refunding Law.

This Bond shall not be entitled to any benefit under the Trust Agreement, or become valid or obligatory for any purpose, until the certificate of authentication hereon endorsed shall have been manually signed by the Trustee.

**IN WITNESS WHEREOF, THE CITY OF VERNON**, a municipal corporation duly organized and validly existing under and pursuant to the Constitution and the laws of the State of California, has caused this Bond to be executed in its name and on its behalf by the Mayor of the City Council, and attested by the Clerk of the Council, and this Bond to be dated as of the Dated Date.

**CITY OF VERNON**

By: \_\_\_\_\_  
Mayor

ATTEST:

\_\_\_\_\_  
City Clerk

[FORM OF CERTIFICATE OF AUTHENTICATION AND REGISTRATION]

This is one of the Bonds described in the within-mentioned Trust Agreement and authenticated the date set forth below.

Dated: \_\_\_\_\_

THE BANK OF NEW YORK MELLON TRUST  
COMPANY, N.A., as Trustee

By: \_\_\_\_\_  
Authorized Signatory

[FORM OF LEGAL OPINION]

The following is a true copy of the opinion rendered by Stradling Yocca Carlson & Rauth, a Professional Corporation, Newport Beach, California, in connection with the issuance of, and dated as of the date of the original delivery of, the Bonds. A signed copy is on file in my office.

\_\_\_\_\_  
City Clerk of the City of Vernon

[FORM OF ASSIGNMENT]

For value received \_\_\_\_\_ hereby sells, assigns and transfers unto \_\_\_\_\_ (Tax I.D. No.: \_\_\_\_\_) the within Bond and hereby irrevocably constitute and appoints \_\_\_\_\_ attorney, to transfer the same on the books of the City at the office of the Trustee, with full power of substitution in the premises.

\_\_\_\_\_  
NOTE: The signature to this Assignment must correspond with the name on the face of the within Registered Bond in every particular, without alteration or enlargement or any change whatsoever.

Dated: \_\_\_\_\_

Signature Guaranteed by: \_\_\_\_\_

\_\_\_\_\_  
NOTE: Signature must be guaranteed by an eligible guarantor institution.

**EXHIBIT B**  
**FORM OF REQUISITION**

TO: [Trustee]

City of Vernon Use Only  
Request No. \_\_

DISBURSEMENT REQUEST: REGARDING \$ \_\_\_\_\_ CITY OF VERNON 2022 TAXABLE  
PENSION OBLIGATION BONDS

You are hereby requested to pay from the Costs of Issuance Fund established by the Trust Agreement with respect to the above-referenced bonds, to the person, corporation or other entity designated below as Payee, the sum set forth below such designation, in payment of all ( ) or a portion ( ) of the Costs of Issuance described below.

Name of Payee: \_\_\_\_\_  
Address: \_\_\_\_\_  
Amount: \$ \_\_\_\_\_  
Method of Payment: \_\_\_\_\_  
Service Provided: \_\_\_\_\_

The undersigned hereby certifies that:

- (i) s/he is an Authorized City Representative;
- (ii) this requisition for payment is in accordance with the terms and provisions of Section 6.01 of the Trust Agreement;
- (iii) each item to be paid with the requisitioned funds represents either incurred or due and payable Costs of Issuance;
- (iv) such Costs of Issuance have not been paid from other funds withdrawn from the Costs of Issuance Fund; and
- (v) to the best of the signatory's knowledge no Event of Default has occurred and is continuing under the Trust Agreement.

Dated: \_\_\_\_\_

CITY OF VERNON

By: \_\_\_\_\_  
Name:  
Title:

§ \_\_\_\_\_  
**CITY OF VERNON**  
**2022 TAXABLE PENSION OBLIGATION BONDS**

**BOND PURCHASE AGREEMENT**

\_\_\_\_\_, 2022

City of Vernon  
 4305 South Santa Fe Avenue  
 Vernon, California 90058

Ladies and Gentlemen:

The undersigned Stifel, Nicolaus & Company, Incorporated (the “**Underwriter**”) offers to enter into this Bond Purchase Agreement (this “**Purchase Agreement**”) with the City of Vernon, California (the “**City**”), which, upon the acceptance by the City, will be binding upon the City and the Underwriter. This offer is made subject to acceptance by the City by the execution of this Purchase Agreement and delivery of the same to the Underwriter prior to 11:59 P.M., California time, on the date hereof, and, if not so accepted, will be subject to withdrawal by the Underwriter upon notice delivered to the City at any time prior to the acceptance hereof by the City. Capitalized terms used herein and not otherwise defined shall have the meanings set forth in the Trust Agreement (defined herein).

**Section 1. Purchase and Sale.** Upon the terms and conditions and on the basis of the representations, warranties and agreements herein set forth, the Underwriter hereby agrees to purchase from the City, and the City hereby agrees to issue, sell and deliver to the Underwriter all (but not less than all) of the City of Vernon 2022 Taxable Pension Obligation Bonds (the “**Bonds**”) in the aggregate principal amount of \$ \_\_\_\_\_. The Bonds shall be dated as of their date of delivery. Interest on the Bonds shall be payable semiannually on February 1 and August 1 in each year, commencing \_\_\_\_\_ 1, 20\_\_ (each an “**Interest Payment Date**”) and will bear interest at the rates and on the dates as set forth in Exhibit A hereto. The purchase price for the Bonds shall be \$ \_\_\_\_\_ (which represents the principal amount of the Bonds in the amount of \$ \_\_\_\_\_, less an Underwriter’s discount of \$ \_\_\_\_\_).

The Underwriter agrees to make a bona fide public offering of the Bonds at the initial offering yields set forth in the Official Statement (defined herein); however, the Underwriter reserves the right to make concessions to dealers and to change such initial offering yields as the Underwriter shall deem necessary in connection with the marketing of the Bonds. The Underwriter agrees that, in connection with the public offering and initial delivery of the Bonds to the purchasers thereof from the Underwriter, the Underwriter will deliver or cause to be delivered to each purchaser a copy of the final Official Statement prepared in connection with the Bonds, for the time period required under Rule 15c2-12 promulgated under the Securities Exchange Act of 1934, as amended (“**Rule 15c2-12**”). Terms defined in the Preliminary Official Statement, and to be set forth in the final Official Statement are used herein as so defined.

The City acknowledges and agrees that: (i) the purchase and sale of the Bonds pursuant to this Purchase Agreement is an arm's-length commercial transaction between the City and the Underwriter; (ii) in connection therewith and with the discussions, undertakings and procedures leading up to the consummation of such transaction, the Underwriter is and has been acting solely as a principal and is not acting as a municipal advisor (as defined in section 15B of the Securities Exchange Act of 1934, as amended), financial advisor or fiduciary; (iii) the Underwriter has not assumed an advisory or fiduciary responsibility in favor of the City with respect to the offering contemplated hereby or the discussions, undertakings and procedures leading thereto (irrespective of whether the Underwriter has provided other services or is currently providing other services to the City on other matters); (iv) the only obligations the Underwriter has to the City with respect to the transaction contemplated hereby expressly are set forth in this Purchase Agreement; and (v) the City has consulted its own financial and/or municipal, legal, accounting, tax, financial and other advisors, as applicable, to the extent it has deemed appropriate.

**Section 2. The Bonds.** The Bonds are being issued pursuant to Articles 10 and 11 (commencing with section 53570) of Chapter 3 of Part 1 of Division 2 of Title 5 of the California Government Code (the "**Refunding Law**") and the Trust Agreement, dated as of \_\_\_\_\_ 1, 2022 (the "**Trust Agreement**"), between the City and The Bank of New York Mellon Trust Company, N.A. as trustee (together with any successor as trustee under the Trust Agreement, the "**Trustee**"). The Bonds shall be obligations of the City payable from any lawfully available funds, shall not be limited as to payment to any special source of funds of the City and the payment thereof shall not be subject to appropriation. The Bonds do not constitute an obligation of the City for which the City is obligated to levy or pledge any form of taxation or for which the City has levied or pledged any form of taxation. The Bonds otherwise shall be as described in the Preliminary Official Statement and the Official Statement, the Refunding Law and the Legal Documents. The Underwriter's agreement to purchase the Bonds from the City is made in reliance upon the City's representations, covenants and warranties and on the terms and conditions set forth in this Purchase Agreement.

The City is obligated by the Public Employees' Retirement Law, constituting Part 3 of Division 5 of Title 2 of the California Government Code (the "**Retirement Law**"), and the contract between the Board of Administration of the California Public Employees' Retirement System ("**PERS**"), established under Government Code sections 20000 through 21500 of (the "**Retirement Law**"), and the City Council of the City, effective November 1, 1948 (as amended, the "**PERS Contract**"), to make contributions to PERS to (a) fund pension benefits for its employees who are members of PERS, (b) amortize the unfunded actuarial liability with respect to such pension benefits, and (c) appropriate funds for the purposes described in (a) and (b). The City participates in two retirement plans (with tiers within such plans) under the PERS Contract.

The proceeds of the Bonds will be used to: (i) refund the City's unamortized unfunded accrued liability (the "**Unfunded Liability**") with respect to certain pension benefits under the Retirement Law, (ii) to prepay all or a portion of the City's annual required retirement contribution that is due and payable within 18 months of the issuance of the Bonds (the "**Current Obligation**") and (iii) pay certain costs associated with the issuance and delivery of the Bonds.

**Section 3. Public Offering.** The Underwriter agrees to make an initial public offering of all the Bonds at the public offering prices (or yields) set forth on Exhibit A attached hereto and incorporated herein by reference. Subsequent to the initial public offering, the Underwriter reserves the right to change the public offering prices (or yields) as it deems necessary in connection with the marketing of the Bonds, provided that the Underwriter shall not change the interest rates set forth on

Exhibit A. The Bonds may be offered and sold to certain dealers at prices lower than such initial public offering prices.

**Section 4. The Official Statement.** By its acceptance of this Purchase Agreement, the City ratifies, confirms and approves of the use and distribution by the Underwriter prior to the date hereof of the Preliminary Official Statement relating to the Bonds, dated \_\_\_\_\_, 2022 (including the cover page, all appendices and all information incorporated therein and any supplements or amendments thereto and as disseminated in its printed physical form or in electronic form in all respects materially consistent with such physical form, the “**Preliminary Official Statement**”) that the City has deemed “final” as of its date, for purposes of Rule 15c2-12 except for certain omissions permitted to be omitted therefrom by Rule 15c2-12. The City hereby agrees to deliver or cause to be delivered to the Underwriter, within seven (7) business days of the date hereof, copies of the final official statement, dated the date hereof, relating to the Bonds (including all information previously permitted to have been omitted by Rule 15c2-12, the cover page, all appendices, all information incorporated therein and any amendments or supplements as have been approved by the City and the Underwriter (the “**Official Statement**”)) in such quantity as the Underwriter shall reasonably request to comply with Rule 15c2-12(b)(4) and the rules of the Municipal Securities Rulemaking Board (the “**MSRB**”). To the extent required by applicable MSRB Rules, the City hereby confirms that it does not object to distribution of the Official Statement in electronic form.

**Section 5. Closing.** At 8:00 a.m., California time, on \_\_\_\_\_, 2022, or at such other time or date as the City and the Underwriter mutually agree upon, the City shall deliver or cause to be delivered to the Trustee, and the Trustee shall deliver or cause to be delivered through the facilities of The Depository Trust Company, New York, New York (“**DTC**”), the Bonds in definitive form, duly executed and authenticated. Concurrently with the delivery of the Bonds, the City shall deliver the documents hereinafter mentioned at the offices of Stradling Yocca Carlson & Rauth, a Professional Corporation, Newport Beach, California (“**Bond Counsel**”) or another place to be mutually agreed upon by the City and the Underwriter. The Underwriter will accept such delivery and pay the purchase price of the Bonds as set forth in Section 1 hereof by wire transfer in immediately available funds. This payment for and delivery of the Bonds, together with the delivery of the aforementioned documents referenced herein, is called the “**Closing**.”

The Bonds shall be registered in the name of Cede & Co., as nominee of DTC in denominations of \$5,000 and any integral multiple thereof as provided in the Trust Agreement, and shall be made available to the Underwriter at least one (1) business day before the Closing for purposes of inspection and packaging. The City acknowledges that the services of DTC will be used initially by the Underwriter to permit the issuance of the Bonds in book-entry form, and agrees to cooperate fully with the Underwriter in employing such services.

**Section 6. Representations, Warranties and Covenants of the City.** The City represents, warrants and covenants to the Underwriter as follows.

(a) The City is a municipal corporation of the State of California (the “**State**”), duly organized and validly existing pursuant to the Constitution and laws of the State.

(b) The City had full legal right, power and authority to adopt Resolution No. \_\_\_\_\_, adopted by a majority of the City Council on \_\_\_\_\_, 2022 (the “**Resolution**”), and the City has, and at the Closing Date will have, full legal right, power and authority (i) to execute and deliver the Trust Agreement, the Continuing Disclosure Certificate relating to the Bonds (the “**Continuing**

**Disclosure Certificate**”) and this Purchase Agreement (collectively, the “**Legal Documents**”), to perform its obligations under the Legal Documents, and has by official action duly authorized and approved the execution and delivery of, and the performance by the City of the obligations on its part contained in the Legal Documents, (ii) to issue, sell and deliver the Bonds to the Underwriter as provided herein, and (iii) to carry out, give effect to and consummate the transactions contemplated by the Legal Documents and the Resolution.

(c) The City Council has duly and validly adopted the Resolution at a meeting of the City Council duly noticed and at which a quorum was present, and the Resolution has not been modified or amended and is in full force and effect, and has duly approved the execution and delivery of the Bonds and the other Legal Documents, and the performance by the City of its obligations contained therein, and the taking of any and all action as may be necessary to carry out, give effect to and consummate the transactions contemplated by each of said documents.

(d) The Bonds and the other Legal Documents have been, on or before the Closing Date will be, duly executed and delivered by the City, and, on the Closing Date, the Bonds, when authenticated and delivered to the Underwriter in accordance with the Trust Agreement, and the other Legal Documents will constitute legally valid and binding obligations, enforceable against the City in accordance with their respective terms, except as such enforcement may be limited by bankruptcy, insolvency, reorganization, moratorium, or similar laws or equitable principles relating to or limiting creditors’ rights generally.

(e) The City is, and at the Closing Date will be, in compliance, in all respects, with the Legal Documents.

(f) To the best of its knowledge, the City is not in breach of or default under any applicable law or administrative regulation of the State or the United States of America or any applicable judgment or decree or any loan agreement, indenture, bond, note, resolution, agreement or other instrument to which the City is a party or is otherwise subject, and no event has occurred and is continuing which, with the passage of time or the giving of notice, or both, would constitute a default or an event of default under any such instrument, in each case which breach or default has or may have a material adverse effect on the ability of the City to perform its obligations under the Legal Documents.

(g) After due inquiry, except as may be required under blue sky or other securities laws of any state, there is no consent, approval, authorization or other action by any governmental or regulatory authority having jurisdiction over the City, other than the City Council, that has not been obtained is or will be required for the issuance and delivery of the Bonds or the consummation by the City of the other transactions contemplated by the Trust Agreement.

(h) The adoption of the Resolution and the execution and delivery by the City of the Legal Documents and the approval by the City of the Official Statement and compliance with the provisions on the City’s part contained in the Legal Documents, will not conflict with, or result in a violation or breach of, or constitute a default under, any law, administrative regulation, judgment, decree, loan agreement, indenture, trust agreement, bond, note, resolution, agreement or other instrument to which the City is a party or is otherwise subject to, which conflict, breach or default has or may have a material adverse effect on the ability of the City to carry out its obligations under the Legal Documents, nor will any such execution, delivery, adoption or compliance result in the creation or imposition of any material lien, charge or other security interest or encumbrance of any

nature whatsoever upon any of the properties or assets of City under the terms of any such law, administrative regulation, judgment, decree, loan agreement, indenture, trust agreement, bond, note, resolution, agreement or other instrument, except as provided by the Legal Documents.

(i) Prior to the date hereof, the City has provided to the Underwriter for its review the Preliminary Official Statement, that the City has deemed final for purposes of Rule 15c2-12, has approved the distribution of the Preliminary Official Statement and the Official Statement, and has duly authorized the execution and delivery of the Official Statement (including in electronic form). The Preliminary Official Statement, at the date thereof, and as of the date hereof, did not and does not contain any untrue statement of a material fact or omit to state any material fact necessary to make the statements therein (other than the information relating to DTC and its book-entry system, as to which no view is expressed), in light of the circumstances under which they were made, not misleading. As of the date hereof and on the Closing, the Official Statement did not and will not contain any untrue statement of a material fact or omit to state any material fact necessary to make the statements therein (other than the information relating to DTC and its book-entry system, as to which no view is expressed), in light of the circumstances under which they were made, not misleading.

(j) By official action of the City prior to or concurrently with the acceptance hereof, the City has duly approved the distribution of the Preliminary Official Statement and the distribution of the Official Statement (including in electronic form), and has duly authorized and approved the execution and delivery of, and the performance by the City of the obligations on its part contained, in the Legal Documents.

(k) The City will advise the Underwriter promptly of any proposal to amend or supplement the Official Statement and will not effect or consent to any such amendment or supplement without the consent of the Underwriter, which consent will not be unreasonably withheld. The City will advise the Underwriter promptly of the institution of any proceedings known to it by any governmental authority prohibiting or otherwise affecting the use of the Official Statement in connection with the offering, sale or distribution of the Bonds.

(l) The financial statements relating to the receipts, expenditures and cash balances of the City as of [June 30, 2021] as set forth in the Preliminary Official Statement and in the Official Statement fairly represent the financial position and results of operations of the City as of the dates and for the periods therein set forth in accordance with generally accepted accounting principles. Except as disclosed in the Preliminary Official Statement, the Official Statement or otherwise disclosed in writing to the Underwriter, there has not been any materially adverse change in the financial position and results of operations of the City or in its operations since [June 30, 2021] and, except as disclosed in the Preliminary Official Statement, the Official Statement or otherwise disclosed in writing to the Underwriter, there has been no occurrence, circumstance or combination thereof which is reasonably expected to result in any such materially adverse change.

(m) As of the time of acceptance hereof and as of the date of Closing, no action, suit, proceeding, inquiry or investigation, at law or in equity, before or by any court, government agency, public board or body, is pending or, to the knowledge of the City, threatened (i) in any way questioning the corporate existence of the City or the titles of the officers of the City to their respective offices; (ii) affecting, contesting or seeking to prohibit, restrain or enjoin the execution or delivery of any of the Bonds, or in any way contesting or affecting the validity of the Bonds or the Legal Documents or the consummation of the transactions contemplated thereby or contesting the

power of the City to enter into the Legal Documents; (iii) which may result in any material adverse change to the financial condition of the City or to its ability to make payment of principal or redemption price of and interest on the Bonds when due; or (iv) contesting the completeness or accuracy of the Preliminary Official Statement or the Official Statement or any supplement or amendment thereto or asserting that the Preliminary Official Statement or the Official Statement contained any untrue statement of a material fact or omitted to state any material fact required to be stated therein or necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, and there is no basis for any action, suit, proceeding, inquiry or investigation of the nature described in clause (i) through (iv) of this sentence.

(n) To the extent required by law, the City will undertake, pursuant to the Continuing Disclosure Certificate, to provide annual reports and notices of certain events. A description of this undertaking is set forth in the Preliminary Official Statement and will also be set forth in the Official Statement. Except as otherwise disclosed in the Preliminary Official Statement, the City has not failed to comply in all material respects with any previous undertakings with regard to Rule 15c2-12 to provide annual reports or notices of enumerated events in the past five years and, the City has been in material compliance during the past five years with its continuing disclosure obligations in accordance with Rule 15c2-12.

(o) Any certificate signed by any officer of the City authorized to execute such certificate in connection with the issuance, sale and delivery of the Bonds and delivered to the Underwriter shall be deemed a representation and warranty of the City to the Underwriter as to the statements made therein but not of the person signing such certificate.

(p) The City will promptly apply the proceeds of the Bonds to refund the Unfunded Liability as of the date of issuance of the Bonds and to pay costs associated with the issuance and delivery of the Bonds.

(q) During the period from the date hereof until the Closing Date, the City agrees to furnish the Underwriter with copies of any documents it files with any regulatory authority which are reasonably requested by the Underwriter.

(r) The City is not in material default, nor has the City been in material default at any time, as to the payment of principal or interest with respect to a material obligation issued by the City or with respect to a material obligation guaranteed by the City as guarantor.

(s) As of the date hereof, the City does not have any revenue bonds, capital lease obligations, installment payment obligations or other material financial obligation, nor other material obligations secured by payments from the general fund of the City, except as disclosed in the Preliminary Official Statement and the Official Statement.

(t) The default judgment dated \_\_\_\_\_, 2022 entered in favor of the City in connection with *City of Vernon v. All Persons Interested, etc.* was duly entered, the appeal period has run without any appeal having been filed, and the default judgment is in full force and effect.

(u) The City had, prior to the adoption of the Resolution, and has, in full force and effect, a Debt Management Policy that complies with Government Code section 8855(i).

**Section 7. Conditions to the Obligations of the Underwriter.** The Underwriter has entered into this Purchase Agreement in reliance upon the representations and warranties of the City contained herein. The obligations of the Underwriter to accept delivery of and pay for the Bonds on the date of the Closing shall be subject, at the option of the Underwriter, to the accuracy in all respects of the statements of the officers and other officials of the City, as well as authorized representatives of the City Attorney, Bond Counsel, Disclosure Counsel and the Trustee made in any certificates or other documents furnished pursuant to the provisions hereof, to the performance by the City of its obligations to be performed hereunder at or prior to the date of the Closing, and to the following additional conditions:

(a) The representations, warranties and covenants of the City contained herein shall be true, complete and correct at the date hereof and at the time of the Closing, as if made on the date of the Closing;

(b) At the time of Closing, the Legal Documents shall be in full force and effect as valid and binding agreements between or among the various parties thereto, and the Legal Documents and the Preliminary Official Statement and the Official Statement shall not have been amended, modified or supplemented except as may have been agreed to in writing by the Underwriter, and all such reasonable actions as, in the opinion of Bond Counsel, shall reasonably deem necessary in connection with the transactions contemplated hereby;

(c) At the time of the Closing, no default shall have occurred or be existing under the Legal Documents, or any other agreement or document pursuant to which any of the City's financial obligations were executed and delivered, and the City shall not be in default in the payment of principal or interest with respect to any of its financial obligations, which default would result in any material adverse change to the financial condition of the City or adversely impact its ability to make payment of principal or redemption price of and interest on the Bonds when due;

(d) In recognition of the desire of the City and the Underwriter to effect a successful public offering of the Bonds, and in view of the potential adverse impact of any of the following events on such a public offering, this Purchase Agreement shall be subject to termination in the absolute discretion of the Underwriter by notification, in writing, to the City prior to delivery of and payment for the Bonds, if at any time prior to such time, regardless of whether any of the following statements of fact were in existence or known of on the date of this Purchase Agreement:

(i) there shall have occurred any outbreak or escalation of hostilities, declaration by the United States of America of a national emergency or war or other calamity or crisis the effect of which on financial markets is materially adverse such as to make it, in the sole judgment of the Underwriter, impractical to proceed with the purchase or delivery of the Bonds as contemplated by the Official Statement (exclusive of any amendment or supplement thereto); or

(ii) a general banking moratorium shall have been declared by federal, State or New York authorities, or the general suspension of trading on any national securities exchange; or

(iii) any event shall occur which makes untrue any statement or results in an omission to state a material fact necessary to make the statements in the Preliminary Official Statement and the Official Statement, in the light of the circumstances under which they were made, not misleading, which event, in the reasonable opinion of the Underwriter would materially or adversely affect the ability of the Underwriter to market the Bonds; or

(iv) any legislation, ordinance, rule or regulation shall be introduced in, or be enacted by any governmental body, department or agency of the State, or a decision by any court of competent jurisdiction within the State shall be rendered which materially adversely affects the market price of the Bonds; or

(v) the marketability of the Bonds or the market price thereof, in the reasonable opinion of the Underwriter, has been materially adversely affected by an amendment to the Constitution of the United States of America or by any legislation in or by the Congress of the United States of America or by the State, or the amendment of legislation pending as of the date of this Purchase Agreement in the Congress of the United States of America, or the recommendation to Congress or endorsement for passage (by press release, other form of notice or otherwise) of legislation by the President of the United States of America, the Treasury Department of the United States of America, the Internal Revenue Service or the Chairman or ranking minority member of the Committee on Finance of the United States Senate or the Committee on Ways and Means of the United States House of Representatives, or the proposal for consideration of legislation by either such Committee or by any member thereof, or the presentment of legislation for consideration as an option by either such Committee, or by the staff of the Joint Committee on Taxation of the Congress of the United States of America, or the favorable reporting for passage of legislation to either House of the Congress of the United States of America by a Committee of such House to which such legislation has been referred for consideration; or

(vi) an order, decree or injunction shall have been issued by any court of competent jurisdiction, or order, ruling, regulation (final, temporary or proposed), official statement or other form of notice or communication issued or made by or on behalf of the Securities and Exchange Commission, or any other governmental agency having jurisdiction of the subject matter, to the effect that: (i) obligations of the general character of the Bonds, or the Bonds, including any or all underlying arrangements, are not exempt from registration under the Securities Act of 1933, as amended, or that the Trust Agreement is not exempt from qualification under the Trust Indenture Act of 1939; or (ii) the issuance, offering or sale of obligations of the general character of the Bonds, or the issuance, offering or sale of the Bonds, including any or all underlying obligations, as contemplated hereby or by the Preliminary Official Statement and the Official Statement, is or would be in violation of the federal securities laws as amended and then in effect; or

(vii) legislation shall be introduced, by amendment or otherwise, or be enacted by the House of Representatives or the Senate of the Congress of the United States of America, or a decision by a court of the United States of America shall be rendered, or a stop order, ruling, regulation or official statement by or on behalf of the Securities and Exchange Commission or other governmental agency having jurisdiction of the subject matter shall be made or proposed, to the effect that the issuance, offering or sale of obligations of the general character of the Bonds, as contemplated hereby or by the Preliminary Official Statement and the Official Statement, is or would be in violation of any provision of the Securities Act of 1933, as amended and as then in effect, or the Securities Exchange Act of 1934, as amended and as then in effect, or the Trust Indenture Act of 1939, as amended and as then in effect, or with the purpose or effect of otherwise prohibiting the issuance, offering or sale of the Bonds or obligations of the general character of the Bonds, as contemplated hereby or by the Preliminary Official Statement and the Official Statement; or

(viii) additional material restrictions not in force as of the date hereof shall have been imposed upon trading in securities generally by any governmental authority or by any national

securities exchange, which, in the Underwriter's reasonable opinion, materially adversely affects the marketability or market price of the Bonds; or

(ix) the New York Stock Exchange, or other national securities exchange or association or any governmental authority, shall impose as to the Bonds, or obligations of the general character of the Bonds, any material restrictions not now in force, or increase materially those now in force, with respect to the extension of credit by or the charge to the net capital requirements of broker dealers; or

(x) trading in securities on the New York Stock Exchange or the American Stock Exchange shall have been suspended or limited or minimum prices have been established on either such exchange which, in the Underwriter's reasonable opinion, materially adversely affects the marketability or market price of the Bonds; or

(xi) any rating of the Bonds or the rating of any general fund obligations of the City shall have been downgraded or withdrawn by a national rating service, which, in the reasonable opinion of the Underwriter, materially adversely affects the market price of the Bonds; or

(xii) any action shall have been taken by any government in respect of its monetary affairs which, in the reasonable opinion of the Underwriter, has a material adverse effect on the United States securities market, rendering the marketing and sale of the Bonds, or enforcement of sale contracts with respect thereto impracticable; or

(xiii) the commencement of any action, suit or proceeding described in Section 6(m).

(e) At or prior to the Closing, the Underwriter shall receive or have received the following documents, in each case to the reasonable satisfaction, in form and substance, of the Underwriter and \_\_\_\_\_, \_\_\_\_\_, California ("**Underwriter's Counsel**"):

(i) a copy of the default judgment, dated \_\_\_\_\_, 2022, entered in favor of the City in connection with *City of Vernon v. All Persons Interested, etc.*, Case No \_\_\_\_\_ filed in the Superior Court of California, County of Los Angeles;

(ii) all resolutions relating to the Bonds adopted by the City and certified by an authorized official of the City, authorizing the execution and delivery of the Legal Documents and the delivery of the Bonds and the Official Statement;

(iii) the Legal Documents duly executed and delivered by the respective parties thereto, with only such amendments, modifications or supplements as may have been agreed to in writing by the Underwriter; and

(iv) the approving opinion of Bond Counsel, dated the date of Closing and addressed to the City, in substantially the form attached as Appendix \_\_ to the Preliminary Official Statement and the Official Statement, together with a reliance letter thereon addressed to the Underwriter;

(v) a supplemental opinion of Bond Counsel dated the date of Closing and addressed to the Underwriter, to the effect that:

(A) the statements on the cover of the Official Statement and in the Official Statement under the captions [“INTRODUCTION,” “THE BONDS,” “SECURITY AND SOURCE OF PAYMENT FOR THE BONDS,” “VALIDATION,” and “TAX MATTERS,” and in APPENDIX \_ — “SUMMARY OF CERTAIN PROVISIONS OF THE TRUST AGREEMENT” and APPENDIX \_ — “PROPOSED FORM OF BOND COUNSEL OPINION,”] and excluding any material that may be treated as included under such captions and appendices by any cross-reference, insofar as such statements expressly summarize provisions of the Bonds, the Trust Agreement, and Bond Counsel’s final opinion relating to the Bonds, are accurate in all material respects as of the date of Closing;

(B) this Purchase Agreement has been duly authorized, executed and delivered by the City and is the valid, legal and binding agreement of the City enforceable in accordance with its terms, except that the rights and obligations under the Purchase Agreement are subject to bankruptcy, insolvency, reorganization, moratorium, fraudulent conveyance and other similar laws affecting creditors’ rights, to the application of equitable principles if equitable remedies are sought, to the exercise of judicial discretion in appropriate cases and to limitations on legal remedies against public agencies in the State, and provided that no opinion is expressed with respect to any indemnification or contribution provisions contained therein; and

(C) the Bonds are not subject to the registration requirements of the Securities Act of 1933, as amended, and the Trust Agreement is exempt from qualification under the Trust Indenture Act of 1939, as amended;

(vi) the Official Statement, executed on behalf of the City;

(vii) evidence that the rating on the Bonds is as described in the Official Statement;

(viii) a certificate, dated the date of Closing, signed by a duly authorized officer of the City satisfactory in form and substance to the Underwriter to the effect that: (i) the representations, warranties and covenants of the City contained in this Purchase Agreement are true and correct in all material respects on and as of the date of Closing with the same effect as if made on the date of the Closing by the City, and the City has complied with all of the terms and conditions of the Purchase Agreement required to be complied with by the City at or prior to the date of Closing; (ii) to the best of such officer’s knowledge, no event affecting the City has occurred since the date of the Official Statement which should be disclosed in the Official Statement for the purposes for which it is to be used or which is necessary to disclose therein in order to make the statements and information therein not misleading in any material respect; (iii) the information and statements contained in the Official Statement (other than information relating to DTC and its book entry system) did not as of its date and do not as of the Closing contain an untrue statement of a material fact or omit to state any material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading in any material respect; (iv) the City is not in breach of or default under any applicable law or administrative regulation of the State or the United States of America or any applicable judgment or decree or any loan agreement, indenture, bond, note, resolution, agreement or other instrument to which the City is a party or is otherwise subject, which would have a material adverse impact on the City’s ability to perform its obligations under the Legal Documents, and no event has occurred and is continuing which, with the passage of time or the giving of notice, or both, would constitute such a default or an event of default under any

such instrument; and (v) no further consent is required for inclusion of its audited financial statements in the Preliminary Official Statement and the Official Statement;

(ix) an opinion dated the date of Closing and addressed to the Underwriter, the Trustee and the Bond Counsel, of the City Attorney of the City of Vernon, substantially in the form attached as Exhibit B hereto;

(x) a letter of Stradling Yocca Carlson & Rauth, Newport Beach, California, Disclosure Counsel to the City dated the date of Closing and addressed to the Underwriter substantially to the effect that, on the basis of the information made available to them in the course of their participation in the preparation of the Official Statement as disclosure counsel, but without having undertaken to determine or verify independently, or assuming any responsibility for, the accuracy, completeness or fairness of any of the statements contained in the Official Statement, no facts have come to the attention of the personnel in such firm directly involved in rendering legal advice and assistance to the City in connection with the preparation of the Official Statement which caused them to believe that (A) the Preliminary Official Statement as of its date or as of \_\_\_\_\_, 2022 (excluding therefrom financial, demographic and statistical data; forecasts, projections, estimates, assumptions and expressions of opinions; statements relating to DTC, Cede & Co. and the operation of the book-entry system; statements relating to the treatment of the Bonds or the interest, discount or premium, if any, thereon or therefrom for tax purposes under the law of any jurisdiction; and the statements contained in the Preliminary Official Statement under the caption [“TAX MATTERS,”] and in [Appendix \_ and Appendices \_ through \_] to the Preliminary Official Statement; as to all of which they express no view) contained any untrue statement of a material fact or omitted to state a material fact necessary in order to make the statements made therein, in the light of the circumstances under which they were made, not misleading, except for such information as is permitted to be excluded from the Preliminary Official Statement pursuant to Rule 15c2-12 of the Securities Exchange Act of 1934, as amended, including but not limited to information as to pricing, yields, interest rates, maturities, amortization, redemption provisions, debt service requirements, Underwriter’s discount and CUSIP numbers or (B) the Official Statement as of its date or as of the Closing Date (excluding therefrom financial, demographic and statistical data; forecasts, projections, estimates, assumptions and expressions of opinions; statements relating to DTC, Cede & Co. and the operation of the book-entry system, statements relating to the treatment of the Bonds or the interest, discount or premium, if any, thereon or therefrom for tax purposes under the law of any jurisdiction; and the statements contained in the Official Statement under the caption [“TAX MATTERS,”] and in [Appendix \_ and Appendices \_ through \_] to the Official Statement; as to all of which they express no view) contained any untrue statement of a material fact or omitted to state a material fact necessary in order to make the statements made therein, in the light of the circumstances under which they were made, not misleading;

(xi) an opinion of counsel to the Trustee, addressed to the Underwriter and the City, dated the date of the Closing, to the effect that:

(A) the Trustee is a national banking association duly organized and validly existing under the laws of the United States of America, having full corporate power to undertake the trust created under the Trust Agreement;

(B) the Trust Agreement has been duly authorized, executed and delivered by the Trustee and, assuming due authorization, execution and delivery by the other parties thereto, the Trust Agreement constitutes the valid, legal and binding obligations of the Trustee

enforceable in accordance with their terms, except as enforcement thereof may be limited by bankruptcy, insolvency or other laws affecting the enforcement of creditors' rights generally and by the application of equitable principles, if equitable remedies are sought;

(C) the Trustee has duly authenticated the Bonds upon the order of City;

(D) the Trustee's actions in executing and delivering the Trust Agreement are in full compliance with, and do not conflict with any applicable law or governmental regulation and, to the best of such counsel's knowledge, after reasonable inquiry with respect thereto, do not conflict with or violate any contract to which the Trustee is a party or any administrative or judicial decision by which the Trustee is bound;

(E) no consent, approval, authorization or other action by any governmental or regulatory authority having jurisdiction over the banking or trust powers of the Trustee that has not been obtained is or will be required for the execution and delivery of the Bonds or the consummation by the Trustee of its obligations under the Trust Agreement; and

(F) there is no action, suit, proceeding, inquiry or investigation at law or in equity before or by any court or public body pending or, to the best of such counsel's knowledge, threatened against or affecting the Trustee, which would materially adversely impact the Trustee's ability to complete the transactions contemplated by the Trust Agreement.

(xii) a certificate, dated the date of Closing, signed by a duly authorized officer of the Trustee satisfactory in form and substance to the Underwriter, to the effect that:

(A) the Trustee is duly organized and existing as a national banking association under the laws of the United States of America, having the full corporate power and authority to enter into and perform its duties under the Trust Agreement;

(B) the Trustee is duly authorized to enter into the Trust Agreement and has duly executed and delivered the Trust Agreement, and assuming due authorization and execution by the other parties thereto, the Trust Agreement is legal, valid and binding upon the Trustee and enforceable against such party in accordance with its terms;

(C) the Trustee has duly authenticated the Bonds under the Trust Agreement and delivered the Bonds to or upon the order of the Underwriter;

(D) no consent, approval, authorization or other action by any governmental or regulatory authority having jurisdiction over the banking or trust powers of the Trustee that has not been obtained is required for the execution and delivery of the Bonds or the consummation by the Trustee of its obligations under the Trust Agreement; and

(E) there is no action, suit, proceeding, inquiry or investigation at law or in equity before or by any court or public body pending or, to the best of such counsel's knowledge, threatened against or affecting the Trustee, which would materially adversely impact the Trustee's ability to complete the transactions contemplated by the Trust Agreement.

(xiii) the preliminary and final forms required to be delivered to the California Debt and Investment Advisory Commission pursuant to section 53583 of the Government Code of the State of California and section 8855(i) and (j) of the Government Code;

(xiv) a copy of the executed Blanket Issuer Letter of Representations by and between the City and DTC relating to the book-entry system;

(xv) an opinion of \_\_\_\_\_, \_\_\_\_\_, California, as Underwriter's Counsel, in form and substance acceptable to the Underwriter, substantially to the effect that:

(A) the Bonds are exempt from registration pursuant to the Securities Act of 1933, as amended, and the Trust Agreement is exempt from qualification pursuant to the Trust Indenture Act of 1939, as amended;

(B) based upon an examination which they have made, and without having undertaken to determine independently or assuming any responsibility for the accuracy or completeness or fairness of the statements, and based on its participation in the conferences (which did not extend beyond the date of the Official Statement), and in reliance thereon, on oral and written statements and representations of the City and others and on the records, documents, certificates, opinions and matters therein mentioned, such counsel advises the Underwriter as a matter of fact and not opinion that, during the course of such counsel's representation of the Underwriter on this matter, (a) as of the date of the Preliminary Official Statement and as of \_\_\_\_\_, 2022, no facts had come to the attention of the attorneys in such counsel's firm rendering legal services to the Underwriter in connection with the Preliminary Official Statement which caused it to believe that the Preliminary Official Statement contained any untrue statement of a material fact or omitted to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading, and (b) as of the date of the Official Statement and as of the Closing Date, no facts had come to the attention of the attorneys in such counsel's firm rendering legal service to the Underwriter in connection with the Official Statement which caused it to believe as of the date of the Official Statement and as of the Closing Date that the Official Statement contained or contains any untrue statement of a material fact or omitted or omits to state any material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading; provided that, such counsel expressly excludes from the scope of this paragraph and expresses no view or opinion about (i) with respect to the Preliminary Official Statement, any difference in information contained therein compared to what is contained in the Official Statement, whether or not related to pricing or sale of the Bonds, and whether any such difference is material and should have been included in the Preliminary Official Statement, and (ii) with respect to both the Preliminary Official Statement and the Official Statement, any CUSIP numbers, financial, accounting, statistical or economic, engineering or demographic data or forecasts, numbers, charts, tables, graphs, estimates, projections, assumptions or expressions of opinion, management discussion and analysis, environmental matters, environmental litigation, any statements about compliance with prior continuing disclosure undertakings, information relating to DTC and its book-entry system, [Appendix \_ and Appendices \_ through \_] thereto, and information relating to ratings, rating agencies, tax exemption, included or referred to therein or omitted therefrom, which such counsel expressly excludes from the scope of this paragraph and as to which such counsel expresses no opinion or view, and no responsibility is undertaken or view expressed with respect to any other disclosure document, materials or activity, or as to any information from another document or source referred to by or incorporated by reference in the Preliminary Official Statement or the Official Statement; and

(C) the Continuing Disclosure Certificate, together with Section 5(o) of this Purchase Agreement, satisfies the requirements contained in Rule 15c2-12 for an undertaking for the benefit of the holders of the Bonds to provide the information at the times and in the manner

required by Rule 15c2-12; provided that, for purposes of such opinion, Underwriter's Counsel will not be expressing any view regarding the content of the Official Statement that is not expressly stated in numbered clause (ii) above;

(xvi) a Rule 15c2-12 certificate, dated the date of the Preliminary Official Statement and executed by the City;

(xvii) such additional legal opinions, Bonds, proceedings, instruments or other documents as the Underwriter or Underwriter's Counsel may reasonably request.

If the City shall be unable to satisfy the conditions to the obligations of the Underwriter to purchase, accept delivery of and pay for the Bonds contained in this Purchase Agreement, this Purchase Agreement shall terminate, and except as set forth in Section 9 hereof, neither the Underwriter nor the City shall be under further obligation hereunder.

**Section 8. Changes in Official Statement.** Within 90 days after the Closing or within 25 days following the "end of the underwriting period" (as defined in Rule 15c2-12), whichever occurs first, if any event relating to or affecting the Bonds, the Trustee, or the City shall occur as a result of which it is necessary, in the reasonable opinion of the Underwriter, to amend or supplement the Official Statement in order to make the Official Statement not misleading in any material respect in the light of the circumstances existing at the time it is delivered to a purchaser, the City will forthwith prepare and furnish to the Underwriter an amendment or supplement that will amend or supplement the Official Statement so that it will not contain an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances existing at the time the Official Statement is delivered to purchaser, not misleading. The City shall cooperate with the Underwriter in the filing by the Underwriter of such amendment or supplement to the Official Statement with the MSRB. The Underwriter acknowledges that the "end of the underwriting period" will be the date of Closing unless the Underwriter otherwise notifies the City in writing that it still owns some or all of the Bonds.

**Section 9. Expenses.**

(a) Whether or not the Underwriter accepts delivery of and pays for the Bonds as set forth herein, it shall be under no obligation to pay, and the City shall pay out of the proceeds of the Bonds or any other legally available funds of the City, all expenses incidental to the performance of the City's obligations hereunder, including but not limited to the cost of printing and delivering the Legal Documents to the Underwriter, the costs of printing and shipping and electronic distribution of the Preliminary Official Statement and the Official Statement in reasonable quantities, the fees and disbursements of the City, the Trustee and its counsel, Bond Counsel, Disclosure Counsel, City Attorney, the City's actuary, accountants, engineers, appraisers, economic consultants and any other experts or consultants retained by the City in connection with the issuance and sale of the Bonds, rating agency fees, advertising expenses, and any other expenses not specifically enumerated in paragraph (b) of this section incurred in connection with the issuance and sale of the Bonds. The City shall pay out of the proceeds of the Bonds, for any expenses incurred by the Underwriter on behalf of the City's employees and representatives which are incidental to implementing this Purchase Agreement, including meals, transportation, and lodging of those employees and representatives.

(b) Whether or not the Bonds are delivered to the Underwriter as set forth herein, the City shall be under no obligation to pay, and the Underwriter shall be responsible for and pay (which may be included as an expense component of the Underwriter's discount), MSRB, CUSIP Bureau and CDIAAC fees and expenses to qualify the Bonds for sale under any "blue sky" laws, and all other expenses incurred by the Underwriter in connection with its public offering and distribution of the Bonds not specifically enumerated in paragraph (a) of this section, including the cost of preparing this Purchase Agreement and other Underwriter documents, travel expenses and the fees and disbursements of Underwriter's Counsel.

**Section 10. Notices.** Any notice or other communication to be given to the Underwriter under this Purchase Agreement may be given by delivering the same in writing to Stifel, Nicolaus & Company, Incorporated, 515 South Figueroa St., Suite 1800, Los Angeles, California 90071, Attention: Thomas Jacob. Any notice or communication to be given to the City under this Purchase Agreement may be given by delivering the same in writing to the City of Vernon, at the address first set forth above, Attention: City Administrator. All notices or communications hereunder by any party shall be given and served upon each other party.

**Section 11. Parties in Interest.** This Purchase Agreement is made solely for the benefit of the City and the Underwriter (including the successors or assigns thereof) and no other person shall acquire or have any right hereunder or by virtue hereof. All representations, warranties and agreements of the City in this Purchase Agreement shall remain operative and in full force and effect regardless of any investigation made by or on behalf of the Underwriter and shall survive the delivery of and payment for the Bonds.

**Section 12. Counterparts.** This Purchase Agreement may be executed by the parties hereto in separate counterparts, each of which when so executed and delivered shall be an original, but all such counterparts shall together constitute but one and the same instrument.

**Section 13. Governing Law.** This Purchase Agreement shall be governed by and construed in accordance with the laws of the State.

**STIFEL, NICOLAUS & COMPANY,  
INCORPORATED**

By: \_\_\_\_\_  
Authorized Officer

Accepted:

**CITY OF VERNON**

By: \_\_\_\_\_  
City Administrator

Time of Execution: \_\_\_\_ : \_\_\_\_

**EXHIBIT A**  
**MATURITY SCHEDULE**

<i>Maturity Date</i> <i>(August 1)</i>	<i>Principal Amount</i>	<i>Interest Rate</i>	<i>Yield</i>
	\$	%	%

**EXHIBIT B**

**FORM OF CITY ATTORNEY OPINION**

\_\_\_\_\_, 2022

City of Vernon  
4305 S Santa Fe Ave  
Vernon, California 90058

Stifel, Nicolaus & Company, Incorporated  
515 South Figueroa Street, Suite 1800  
Los Angeles, California 90071

City of Vernon  
City of Vernon 2022 Taxable Pension Obligation Bonds

Ladies and Gentlemen:

I am the duly appointed City Attorney for the City of Vernon (the “City”) and I have represented the City in connection with the issuance and sale by the City of \$\_\_\_\_\_ aggregate principal amount of its City of Vernon 2022 Taxable Pension Obligation Bonds (the “Bonds”). I have examined and relied upon originals (or copies certified or otherwise identified to our satisfaction) of such documents, records and other instruments as I deem necessary or appropriate for the purposes of this opinion, including, without limitation: (i) those documents relating to the existence, organization and operation of the City; (ii) Resolution Nos. \_\_\_\_ and \_\_\_\_, adopted by a majority of the City Council of the City (the “City Council”) on \_\_\_\_\_, 2022 and \_\_\_\_\_, 2022, respectively (each a “Resolution” and collectively, the “Resolutions”); (iii) all necessary documentation of the City relating to the authorization, execution and delivery of the Trust Agreement, dated as of \_\_\_\_\_ 1, 2022 (the “Trust Agreement”), between the City and The Bank of New York Mellon Trust Company, N.A., as trustee; (iv) the default judgment dated \_\_\_\_\_, 2022, entered in favor of the City in connection with *City of Vernon v. All Persons Interested, etc.*, Case No. \_\_\_\_\_ filed in the Superior Court of California, County of Los Angeles; (v) the Purchase Agreement, dated \_\_\_\_\_, 2022 (the “Purchase Agreement”), executed by Stifel, Nicolaus & Company, Incorporated, and accepted by the City; (vi) the Preliminary Official Statement, dated \_\_\_\_\_, 2022 (the “Preliminary Official Statement”), relating to the Bonds; (vii) the Official Statement, dated \_\_\_\_\_, 2022 (the “Official Statement”), relating to the Bonds; (viii) the Continuing Disclosure Certificate, dated \_\_\_\_\_, 2022 (the “Continuing Disclosure Certificate”), of the City appointing The Bank of New York Mellon Trust Company, N.A., as dissemination agent; and (ix) such other records, documents, certificates, opinions, and other matters as are in our judgment necessary or appropriate to enable us to render the opinions expressed herein. All capitalized terms used herein and not otherwise defined shall have the meaning given to such terms as set forth in the Trust Agreement.

Based on the foregoing, and with regard to State of California (the “State”) law and United States federal law, I am of the opinion that:

(a) The City is a municipal corporation of the State, duly organized and validly existing pursuant to the Constitution and laws of the State.

(b) The Resolutions of the City approving and authorizing the issuance of the Bonds and the execution and delivery of the Trust Agreement, the Purchase Agreement, and the Continuing Disclosure Certificate (collectively, the “Legal Documents”) and approving and authorizing the delivery of the Official Statement and other actions of the City was duly adopted at meetings of the governing body of the City which were called and held pursuant to law and with all public notice required by law and at which a quorum was present and acting throughout, and the Resolutions are now in full force and effect and has not been amended or superseded in any way.

(c) Except as disclosed in the Preliminary Official Statement and in the Official Statement, there is no action, suit or proceeding pending and served on the City, or to the best of my knowledge, threatened against the City to (i) restrain or enjoin the execution or delivery of the Legal Documents (ii) in any way contesting or affecting the validity of the Legal Documents, the Resolution or the authority of the City to enter into the Legal Documents, or (iii) in any way contesting or affecting the powers of the City in connection with any action contemplated by the Official Statement, the Resolution or the Legal Documents.

(d) The execution and delivery of the Legal Documents and compliance with the provisions thereof, do not and will not in any material respect conflict with or constitute on the part of the City a breach of or default under any agreement or other instrument to which the City is a party or by which it is bound or any existing law, regulation, court order or consent decree to which the City is subject, which breach or default has or may have a material adverse effect on the ability of the City to perform its obligations under the Legal Documents.

(e) No authorization, approval, consent, or other order of the State or any other governmental body within the State is required for the valid authorization, execution and delivery of the Legal Documents or the consummation by the City of the transactions on its part contemplated therein, except such as have been obtained and except such as may be required under state securities or blue sky laws in connection with the purchase and distribution of the Bonds by the Underwriter, as to which I express no opinion.

Very truly yours,