




**ENGINEER OF WORK**

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineers:

  
\_\_\_\_\_  
1) Registered Engineer  
(PQPS Gas Sensor Replacement)

8/29/24  
\_\_\_\_\_  
Date

Seal



  
\_\_\_\_\_  
2) Registered Engineer  
(PQPS VFD Replacement)

8/27/24  
\_\_\_\_\_  
Date

Seal:



  
\_\_\_\_\_  
3) For City Engineer

8/27/24  
\_\_\_\_\_  
Date

Seal:



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## REQUIRED DOCUMENTS SCHEDULE DURING BIDDING AND AWARDING

The Bidder's attention is directed to the City's Municipal Code §22.0807(d)(2) for important information regarding grounds for debarment for failure to submit required documentation.

The specified Equal Opportunity Contracting Program (EOCP) forms are available for download from the City's web site at:

<http://www.sandiego.gov/eoc/forms/index.shtml>

ITEM	DOCUMENT TO BE SUBMITTED	WHEN DUE	FROM
1.	Bid Bond (PDF via PlanetBids)	At Time of Bid	ALL BIDDERS
2.	Contractors Certification of Pending Actions	At Time of Bid	ALL BIDDERS
3.	Mandatory Disclosure of Business Interests	At Time of Bid	ALL BIDDERS
4.	Debarment and Suspension Certification for Prime Contractors	At Time of Bid	ALL BIDDERS
5.	Debarment and Suspension Certification for Subcontractors, Suppliers & Mfgs	At Time of Bid	ALL BIDDERS
6.	Bid Bond (Original)	By 5PM 1 working day after bid opening	ALL BIDDERS
7.	SLBE Good Faith Effort Documentation	By 5PM 3 working days after bid opening	ALL BIDDERS
8.	Form AA60 – List of Work Made Available	By 5PM 3 working days after bid opening with Good Faith Effort (GFE) documentation	ALL BIDDERS
9.	If the Contractor is a Joint Venture: <ul style="list-style-type: none"> <li>• Joint Venture Agreement</li> <li>• Joint Venture License</li> </ul>	Within 10 working days of receipt by bidder of contract forms	AWARDED BIDDER
10.	Payment & Performance Bond; Certificates of Insurance & Endorsements; and Signed Contract Agreement Page	Within 10 working days of receipt by bidder of contract forms and NOI	AWARDED BIDDER
11.	In-Use Off-Road Diesel Fueled Fleet Regulation (OFF-ROAD REGULATION) Compliance	Within 10 working days of receipt by bidder of contract forms and NOI	AWARDED BIDDER

ITEM	DOCUMENT TO BE SUBMITTED	WHEN DUE	FROM
12.	Listing of "Other Than First Tier" Subcontractors	Within 10 working days of receipt by bidder of contract forms	AWARDED BIDDER

## NOTICE INVITING BIDS

1. **SUMMARY OF WORK:** This is the City of San Diego's (City) solicitation process to acquire Construction services for **PQPS Gas Sensor Replacement and PQPS VFD Replacement**. For additional information refer to Attachment A.
2. **FULL AND OPEN COMPETITION:** This solicitation is subject to full and open competition and may be bid by Contractors on the City's approved Prequalified Contractors List. For information regarding the Contractors Prequalified list visit the City's web site: <http://www.sandiego.gov>.
3. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **\$1,208,000.00**.
4. **BID DUE DATE AND TIME ARE: October 17, 2024 at 2:00 PM.**
5. **PREVAILING WAGE RATES APPLY TO THIS CONTRACT:** Refer to Attachment D.
6. **LICENSE REQUIREMENT:** To be eligible for award of this contract, Prime contractor must possess the following licensing classification: **C-10**
7. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** Subcontracting participation percentages apply to this contract.
  - 7.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

1. SLBE participation	<b>2.0%</b>
2. ELBE participation	<b>3.4%</b>
3. Total mandatory participation	<b>5.4%</b>
  - 7.2. The current list of Certified SLBE/ELBE Firms to be used for outreach for this project is posted to the Documents tab on PlanetBids.
  - 7.3. The Bid may be declared non-responsive if the Bidder fails to meet the following requirements:
    - 7.3.1. Include SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; OR
    - 7.3.2. Submit Good Faith Effort (GFE) documentation, saved in searchable Portable Document Format (PDF), demonstrating the Bidder made a good faith effort to conduct outreach to and include SLBE-ELBE Subcontractors as required in this solicitation by 5PM 3 Working Days after the Bid opening if the overall mandatory participation percentage is not met.

**All submittals in searchable PDF shall be submitted electronically within the prescribed time identified in the contract documents via PlanetBids by invitation to the point of contact named in the bid provided by the Contract Specialist to all bidders.**

**8. NON-MANDATORY PRE-BID MEETING AND SITE VISIT:**

**8.1. ONLINE PRE-BID MEETING:**

Prospective Bidders are **Encouraged** to attend the Pre-Bid Meeting.

The Pre-Bid Meeting will be held on **Wednesday, September 18, 2024**, at **10:30 AM** (PDT) at:

**Microsoft Teams** [Need help?](#)

[Join the meeting now](#)

Meeting ID: 294 028 900 197

Passcode: Pn4ZQU

**Dial in by phone**

[+1 945-468-5511,,460554004#](#) United States, Dallas

[Find a local number](#)

Phone conference ID: 460 554 004#

For organizers: [Meeting options](#) | [Reset dial-in PIN](#)

**Please Note:** You will need to join the meeting with a computer, tablet or smartphone with the **Microsoft Teams** in order to sign in via the Chat feature as attendance at the meeting will be evidenced by the Chat sign-in. The Chat feature will also be used for attendees to ask any questions.

The purpose of the meeting is to discuss the scope of the Project, submittal requirements, and any Equal Opportunity Contracting Program requirements and reporting procedures.

Upon entering the meeting, all attendees must use the chat feature to sign in with the following information: Name of firm, Attendee's name, Phone number and Email address.

**8.2. PRE-BID SITE VISIT:** All those wishing to submit a bid are **encouraged** to visit the Work Site with the Engineer. The purpose of the Site visit is to acquaint Bidders with the Site conditions. To request a sign language or oral interpreter for this visit, call the Purchasing & Contracting Department, Public Works Division at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. The Pre-Bid Site Visit is scheduled as follows:

**Time: 9:30 AM**

**Date: September 23, 2024**

**Location: Penasquitos Pump station at 10150 Cara Way, San Diego, CA, 92131**

**9. AWARD PROCESS:**

- 9.1.** The Award of this contract is contingent upon the Contractor's compliance with all conditions of Award as stated within these documents and within the Notice of Intent to Award.
- 9.2.** Upon acceptance of bids and determination of the apparent low bidder, the City will prepare the contract documents for execution within approximately 21 days of the date of the bid opening. The City will then award the contract upon receipt of properly signed Contract, bonds, and insurance documents.
- 9.3.** This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form by the City Attorney's Office.
- 9.4.** The low Bid will be determined by the Base Bid.
- 9.5.** Once the low Bid has been determined, the City may, at its sole discretion, award the contract for the Base Bid alone.

**10. SUBMISSION OF QUESTIONS:**

- 10.1.** The Director (or Designee) of the Purchasing & Contracting Department is the officer responsible for opening, examining, and evaluating the competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. Any questions related to this solicitation shall be submitted to:

Brittany Friedenreich at [BFriedenreic@sandiego.gov](mailto:BFriedenreic@sandiego.gov)

- 10.2.** Questions received less than 14 days prior to the date for opening of Bids may not be considered.
- 10.3.** Questions or clarifications deemed by the City to be material shall be answered via issuance of an addendum and posted to the City's online bidding service.
- 10.4.** Only questions answered by formal written addenda shall be binding. Oral and other interpretations or clarifications shall be without legal effect. It is the Bidder's responsibility to be informed of any addenda that have been issued and to include all such information in its Bid.



## INSTRUCTIONS TO BIDDERS

### 1. PREQUALIFICATION OF CONTRACTORS:

- 1.1. Contractors submitting a Bid must be pre-qualified for the total amount proposed, including all alternate items, prior to the date of submittal. Bids from contractors who have not been pre-qualified as applicable and Bids that exceed the maximum dollar amount at which contractors are pre-qualified may be deemed **non-responsive** and ineligible for award.
- 1.2. The completed application must be submitted online no later than 2 weeks prior to the bid opening.
- 1.3. **Joint Venture Bidders Cumulative Maximum Bidding Capacity:** For projects with an engineer's estimate of \$30,000,000 or greater, Joint Ventures submitting bids may be deemed responsive and eligible for award if the cumulative maximum bidding capacity of the individual Joint Venture entities is equal to or greater than the total amount proposed.
  - 1.3.1. Each of the entities of the Joint Venture must have been previously prequalified at a minimum of \$15,000,000.
  - 1.3.2. Bids submitted with a total amount proposed of less than \$30,000,000 are not eligible for Cumulative Maximum Bidding Capacity prequalification. To be eligible for award in this scenario, the Joint Venture itself or at least one of the Joint Venture entities must have been prequalified for the total amount proposed.
  - 1.3.3. Bids submitted by Joint Ventures with a total amount proposed of \$30,000,000 or greater on a project with an engineer's estimate of less than \$30,000,000 are not eligible for Cumulative Maximum Bidding Capacity prequalification.
  - 1.3.4. The Joint Venture designated as the Apparent Low Bidder shall provide evidence of its corporate existence and furnish good and approved bonds in the name of the Joint Venture within 14 Calendar Days of receipt by the Bidder of a form of contract for execution.
- 1.4. Complete information and links to the on-line prequalification application are available at:  
  
<http://www.sandiego.gov/cip/bidopps/prequalification>
- 1.5. Due to the City's responsibility to protect the confidentiality of the contractors' information, City staff will not be able to provide information regarding contractors' prequalification status over the telephone. Contractors may access real-time information about their prequalification status via their vendor profile on [PlanetBids.™](#)

2. **ELECTRONIC FORMAT RECEIPT AND OPENING OF BIDS:** Bids will be received in electronic format (eBids) EXCLUSIVELY at the City of San Diego's electronic bidding (eBidding) site, at: <http://www.sandiego.gov/cip/bidopps/> and are due by the date, and time shown on the cover of this solicitation.
- 2.1. **BIDDERS MUST BE PRE-REGISTERED** with the City's bidding system and possess a system-assigned Digital ID in order to submit an electronic bid.
- 2.2. The City's bidding system will automatically track information submitted to the site including IP addresses, browsers being used and the URLs from which information was submitted. In addition, the City's bidding system will keep a history of every login instance including the time of login, and other information about the user's computer configuration such as the operating system, browser type, version, and more. Because of these security features, Contractors who disable their browsers' cookies will not be able to log in and use the City's bidding system.
- 2.3. The City's electronic bidding system is responsible for bid tabulations. Upon the bidder's or proposer's entry of their bid, the system will ensure that all required fields are entered. **The system will not accept a bid for which any required information is missing.** This includes all necessary pricing, subcontractor listing(s) and any other essential documentation and supporting materials and forms requested or contained in these solicitation documents.
- 2.4. **BIDS REMAIN SEALED UNTIL BID DEADLINE.** eBids are transmitted into the City's bidding system via hypertext transfer protocol secure (https) mechanism using SSL 128-256 bit security certificates issued from Verisign/Thawte which encrypts data being transferred from client to server. Bids submitted prior to the "Bid Due Date and Time" are not available for review by anyone other than the submitter who has until the "Bid Due Date and Time" to change, rescind or retrieve its proposal should it desire to do so.
- 2.5. **BIDS MUST BE SUBMITTED BY BID DUE DATE AND TIME.** Once the bid deadline is reached, no further submissions are accepted into the system. Once the Bid Due Date and Time has lapsed, bidders, proposers, the general public, and City staff are able to immediately see the results on line. City staff may then begin reviewing the submissions for responsiveness, EOCB compliance and other issues. The City may require any Bidder to furnish statement of experience, financial responsibility, technical ability, equipment, and references.
- 2.6. **RECAPITULATION OF THE WORK.** Bids shall not contain any recapitulation of the Work. Conditional Bids may be rejected as being non-responsive. Alternative proposals will not be considered unless called for.
- 2.7. **BIDS MAY BE WITHDRAWN** by the Bidder only up to the bid due date and time.

**2.7.1. Important Note:** Submission of the electronic bid into the system may not be instantaneous. Due to the speed and capabilities of the user's internet service provider (ISP), bandwidth, computer hardware and other variables, it may take time for the bidder's submission to upload and be received by the City's eBidding system. It is the bidder's sole responsibility to ensure their bids are received on time by the City's eBidding system. The City of San Diego is not responsible for bids that do not arrive by the required date and time.

**2.8. ACCESSIBILITY AND AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE:** To request a copy of this solicitation in an alternative format, contact the Purchasing & Contracting Department, Public Works Division Contract Specialist listed on the cover of this solicitation at least five (5) working days prior to the Bid/Proposal due date to ensure availability.

**3. ELECTRONIC BID SUBMISSIONS CARRY FULL FORCE AND EFFECT:**

**3.1.** The bidder, by submitting its electronic bid, acknowledges that doing so carries the same force and full legal effect as a paper submission with a longhand (wet) signature.

**3.2.** By submitting an electronic bid, the bidder certifies that the bidder has thoroughly examined and understands the entire Contract Documents (which consist of the plans and specifications, drawings, forms, affidavits and the solicitation documents), and that by submitting the eBid as its bid proposal, the bidder acknowledges, agrees to and is bound by the entire Contract Documents, including any addenda issued thereto, and incorporated by reference in the Contract Documents.

**3.3.** The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certification, forms and affidavits submitted as part of this bid are true and correct.

**3.4.** The Bidder agrees to the construction of the project as described in Attachment "A-Scope of Work" for the City of San Diego, in accordance with the requirements set forth herein for the electronically submitted prices. The Bidder guarantees the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent.

**4. BIDS ARE PUBLIC RECORDS:** Upon receipt by the City, Bids shall become public records subject to public disclosure. It is the responsibility of the respondent to clearly identify any confidential, proprietary, trade secret or otherwise legally privileged information contained within the Bid. General references to sections of the California Public Records Act (PRA) will not suffice. If the Contractor does not provide applicable case law that clearly establishes that the requested information is exempt from the disclosure requirements of the PRA, the City shall be free to release the information when required in accordance with the PRA, pursuant

to any other applicable law, or by order of any court or government agency, and the Contractor will hold the City harmless for release of this information.

**5. CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:**

**5.1. Prior** to the Award of the Contract or Task Order, you and your Subcontractors and Suppliers must register with the City's web-based vendor registration and bid management system. For additional information go to:

<http://www.sandiego.gov/purchasing/bids-contracts/vendorreg>

**5.2.** The City may not award the contract until registration of all subcontractors and suppliers is complete. In the event this requirement is not met within the time frame specified in the Notice of Intent to Award letter, the City reserves the right to rescind the Notice of Award / Intent to Award and to make the award to the next responsive and responsible bidder / proposer

**6. JOINT VENTURE CONTRACTORS:** Provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 14 Calendar Days after receiving the Contract forms.

**7. INSURANCE REQUIREMENTS:**

**7.1.** All certificates of insurance and endorsements required by the contract are to be provided upon issuance of the City's Notice of Intent to Award letter.

**7.2.** Refer to sections 5-4, "INSURANCE" of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.

**8. REFERENCE STANDARDS:** Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

Title	Edition	Document Number
Standard Specifications for Public Works Construction ("The GREENBOOK") <a href="http://www.greenbookspecs.org/">http://www.greenbookspecs.org/</a>	2021	ECPI010122-01
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")* <a href="https://www.sandiego.gov/ecp/edocref/greenbook">https://www.sandiego.gov/ecp/edocref/greenbook</a>	2021	ECPI010122-02
City of San Diego Standard Drawings* <a href="https://www.sandiego.gov/ecp/edocref/standarddraw">https://www.sandiego.gov/ecp/edocref/standarddraw</a>	2021	ECPI010122-03
Citywide Computer Aided Design and Drafting (CADD) Standards <a href="https://www.sandiego.gov/ecp/edocref/drawings">https://www.sandiego.gov/ecp/edocref/drawings</a>	2018	PWPI010119-04
California Department of Transportation (CALTRANS) Standard Specifications <a href="https://dot.ca.gov/programs/design/july-2023-ccs-standard-plans-and-standard-specifications">https://dot.ca.gov/programs/design/july-2023-ccs-standard-plans-and-standard-specifications</a>	2023	ECPD092023-05

Title	Edition	Document Number
CALTRANS Standard Plans <a href="https://dot.ca.gov/programs/design/july-2023-ccs-standard-plans-and-standard-specifications">https://dot.ca.gov/programs/design/july-2023-ccs-standard-plans-and-standard-specifications</a>	2023	ECPD092023-06
California Manual on Uniform Traffic Control Devices Revision 8 (CA MUTCD Rev 8) <a href="https://dot.ca.gov/programs/safety-programs/camutcd">https://dot.ca.gov/programs/safety-programs/camutcd</a>	2014	ECPD032324-07
<p><b>NOTE:</b> *Available online under Engineering Documents and References at: <a href="https://www.sandiego.gov/ecp/edocref/">https://www.sandiego.gov/ecp/edocref/</a></p> <p>*Electronic updates to the Standard Drawings may also be found in the link above</p>		

9. **CITY'S RESPONSES AND ADDENDA:** The City, at its discretion, may respond to any or all questions submitted in writing via the City's eBidding web site in the **form of an addendum**. No other responses to questions, oral or written shall be of any force or effect with respect to this solicitation. The changes to the Contract Documents through addenda are made effective as though originally issued with the Bid. The Bidders shall acknowledge the receipt of Addenda at the time of bid submission.
10. **CITY'S RIGHTS RESERVED:** The City reserves the right to cancel the Notice Inviting Bids at any time, and further reserves the right to reject submitted Bids, without giving any reason for such action, at its sole discretion and without liability. Costs incurred by the Bidder(s) as a result of preparing Bids under the Notice Inviting Bids shall be the sole responsibility of each bidder. The Notice Inviting Bids creates or imposes no obligation upon the City to enter a contract.
11. **CONTRACT PRICING:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth herein. The Bidder agrees to perform construction services for the City of San Diego in accordance with these contract documents for the prices listed below. The Bidder further agrees to guarantee the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee may be extended, by mutual consent of the parties, by the number of days required for the City to obtain all items necessary to fulfill all contractual conditions.
12. **SUBCONTRACTOR INFORMATION:**
- 12.1. **LISTING OF SUBCONTRACTORS.** In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act" of the California Public Contract Code, the Bidder shall provide the **NAME** and **ADDRESS** of each Subcontractor who will perform work, labor, render services or who specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also state within the description, whether the subcontractor is a **CONSTRUCTOR, CONSULTANT** or **SUPPLIER**. The Bidder shall state the **DIR REGISTRATION NUMBER** for all subcontractors and shall further state within the description, the **PORTION** of the work which will be performed by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed

shall be stated for all subcontractors listed. Failure to comply with this requirement may result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions – Section 3-2, "Self-Performance", which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which Bidders are seeking recognition towards achieving any mandatory, voluntary (or both) subcontracting participation goals.

Additionally, pursuant to California Senate Bill 96 and in accordance with the requirements of Labor Code sections 1771.1 and 1725.5, by submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the California Department of Industrial Relations (DIR). **The Bidder shall provide the name, address, license number, DIR registration number of any Subcontractor – regardless of tier** - who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement pursuant to the contract.

**12.2. LISTING OF SUPPLIERS.** Any Bidder seeking the recognition of Suppliers of equipment, materials, or supplies obtained from third party Suppliers towards achieving any mandatory or voluntary (or both) subcontracting participation goals shall provide, at a minimum, the **NAME, LOCATION (CITY), DIR REGISTRATION NUMBER** and the **DOLLAR VALUE** of each supplier. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for materials and supplies unless vendor manufactures or substantially alters materials and supplies, in which case, 100% will be credited. The Bidder is to indicate within the description whether the listed firm is a supplier or manufacturer. If no indication is provided, the listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage.

**12.3. LISTING OF SUBCONTRACTORS OR SUPPLIERS FOR ALTERNATES.** For subcontractors or suppliers to be used on alternate items, bidder shall use the provided **"Subcontractors For Alternates"** form and shall indicate for each alternate subcontract whether it is an additive or deductive alternate; the subcontractor's name, location, phone number, email address, CA license number, and DIR registration number; whether the subcontractor is a designer, constructor or supplier; the type of work the subcontractor will be performing; and the dollar value of the subcontract for that alternate item. Failure to comply with this requirement may result in the bid being rejected as nonresponsive and ineligible for award.

**13. SUBMITTAL OF "OR EQUAL" ITEMS:** See Section 4-6, "Trade Names" in The WHITEBOOK and as amended in the SSP.

**14. AWARD:**

**14.1.** The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.

- 14.2.** Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening and award the Contract approximately within 7 days of receipt of properly executed Contract, bonds, and insurance documents.
- 14.3.** This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.
- 15. SUBCONTRACT LIMITATIONS:** The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 3-2, "SELF-PERFORMANCE" in The GREENBOOK and as amended in the SSP which requires the Contractor to self-perform not less than the specified amount. Failure to comply with this requirement shall render the bid **non-responsive** and ineligible for award.
- 16. AVAILABILITY OF PLANS AND SPECIFICATIONS:** Contract Documents may be obtained by visiting the City's website: <http://www.sandiego.gov/cip/>. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Purchasing & Contracting Department, Public Works Division.
- 17. ONLY ONE BID PER CONTRACTOR SHALL BE ACCEPTED:** No person, firm, or corporation shall be allowed to make, file, or be interested in more than one (1) Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a sub-proposal to a Bidder, or who has quoted prices on materials to a Bidder, is not hereby disqualified from submitting a sub-proposal or quoting prices to other Bidders or from submitting a Bid in its own behalf. Any Bidder who submits more than one bid will result in the rejection of all bids submitted.
- 18. SAN DIEGO BUSINESS TAX CERTIFICATE:** The Contractor and Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, First floor and submit to the Contract Specialist upon request or as specified in the Contract Documents. Tax Identification numbers for both the Bidder and the listed Subcontractors must be submitted on the City provided forms within these documents.
- 19. BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY) FOR DESIGN-BID-BUILD CONTRACTS:**
- 19.1.** For bids \$250,000 and above, bidders shall submit Bid Security at bid time. Bid Security shall be in one of the following forms: a cashier's check, or a properly certified check upon some responsible bank; or an approved corporate surety bond payable to the City of San Diego for an amount of not less than 10% of the total bid amount.
- 19.2.** This check or bond, and the monies represented thereby, will be held by the City as a guarantee that the Bidder, if awarded the contract, will in good faith enter into the contract and furnish the required final performance and payment bonds.
- 19.3.** The Bidder agrees that in the event of the Bidder's failure to execute this contract and provide the required final bonds, the money represented by the cashier's or certified check will remain the property of the City; and the Surety agrees that it will pay to the City the damages, not exceeding the sum of 10% of the amount of the Bid, that the City may suffer as a result of such failure.

- 19.4. At the time of bid submission, bidders must upload and submit an electronic PDF copy of the aforementioned bid security. Whether in the form of a cashier's check, a properly certified check or an approved corporate surety bond payable to the City of San Diego, the bid security must be uploaded to the City's eBidding system. By 5PM, 1 working day after the bid opening date, all bidders must provide the City with the original bid security.
- 19.5. Failure to submit the electronic version of the bid security at the time of bid submission AND failure to provide the original by 5PM, 1 working day after the bid opening date shall cause the bid to be rejected and deemed **non-responsive**.

Original Bid Bond shall be submitted to:  
Purchasing & Contracting Department, Public Works Division  
1200 3rd Ave., Suite 200, MS 56P  
San Diego, California, 92101  
To the Attention of the Contract Specialist on the Front Page of this solicitation.

**20. AWARD OF CONTRACT OR REJECTION OF BIDS:**

- 20.1. This contract may be awarded to the lowest responsible and reliable Bidder.
- 20.2. Bidders shall complete ALL eBid forms as required by this solicitation. Incomplete eBids will not be accepted.
- 20.3. The City reserves the right to reject any or all Bids, to waive any informality or technicality in Bids received, and to waive any requirements of these specifications as to bidding procedure.
- 20.4. Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City within 3 Working Days of the bid opening, written notice from the Bidder which shows proof of honest, credible, clerical error of a material nature, free from fraud or fraudulent intent; and of evidence that reasonable care was observed in the preparation of the Bid.
- 20.5. A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with the San Diego Municipal Code.
- 20.6. The City of San Diego will not discriminate in the award of contracts with regard to race, religion creed, color, national origin, ancestry, physical handicap, marital status, sex or age.
- 20.7. Each Bid package properly signed as required by these specifications shall constitute a firm offer which may be accepted by the City within the time specified herein.
- 20.8. The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of the base bid and any proposed alternates or options as detailed herein.



**21. BID RESULTS:**

- 21.1.** The availability of the bids on the City's eBidding system shall constitute the public announcement of the apparent low bidder. In the event that the apparent low bidder is subsequently deemed non-responsive or non-responsible, a notation of such will be made on the eBidding system. The new ranking and apparent low bidder will be adjusted accordingly.
- 21.2.** To obtain the bid results, view the results on the City's web site, or request the results by U.S. mail and provide a self-addressed, stamped envelope. If requesting by mail, be sure to reference the bid name and number. The bid tabulations will be mailed to you upon their completion. The results will not be given over the telephone.

**22. THE CONTRACT:**

- 22.1.** The Bidder to whom award is made shall execute a written contract with the City of San Diego and furnish good and approved bonds and insurance certificates specified by the City within 14 days after receipt by Bidder of a form of contract for execution unless an extension of time is granted to the Bidder in writing.
- 22.2.** If the Bidder takes longer than 14 days to fulfill these requirements, then the additional time taken shall be added to the Bid guarantee. The Contract shall be made in the form adopted by the City, which includes the provision that no claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
- 22.3.** If the Bidder to whom the award is made fails to enter into the contract as herein provided, the award may be annulled and the Bidder's Guarantee of Good Faith will be subject to forfeiture. An award may be made to the next lowest responsible and reliable Bidder who shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made.
- 22.4.** Pursuant to the San Diego City Charter section 94, the City may only award a public works contract to the lowest responsible and reliable Bidder. The City will require the Apparent Low Bidder to (i) submit information to determine the Bidder's responsibility and reliability, (ii) execute the Contract in form provided by the City, and (iii) furnish good and approved bonds and insurance certificates specified by the City within 14 Days, unless otherwise approved by the City, in writing after the Bidder receives notification from the City, designating the Bidder as the Apparent Low Bidder and formally requesting the above mentioned items.
- 22.5.** The award of the Contract is contingent upon the satisfactory completion of the above-mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee and approval as to form by the City Attorney's Office. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder

who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.

- 23. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK:** The Bidder shall examine carefully the Project Site, the Plans and Specifications, other materials as described in the Special Provisions, Section 3-9, "TECHNICAL STUDIES AND SUBSURFACE DATA", and the proposal forms (e.g., Bidding Documents). The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of work, the quantities of materials to be furnished, and as to the requirements of the Bidding Documents Proposal, Plans, and Specifications.
- 24. CITY STANDARD PROVISIONS:** This contract is subject to the following standard provisions. See The WHITEBOOK for details.
- 24.1.** The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.
  - 24.2.** The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.
  - 24.3.** The City of San Diego Municipal Code §22.3004 for Contractor Standards.
  - 24.4.** The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.
  - 24.5.** Sections 1777.5, 1777.6, and 1777.7 of the State of California Labor Code concerning the employment of apprentices by contractors and subcontractors performing public works contracts.
  - 24.6.** The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).
  - 24.7.** The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.
- 25. PRE-AWARD ACTIVITIES:**
- 25.1.** The contractor selected by the City to execute a contract for this Work shall submit the required documentation as specified herein and in the Notice of Intent to Award. Failure to provide the information as specified may result in the Bid being rejected as **non-responsive**.
  - 25.2.** The decision that bid is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

**PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND****FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:**

Southern Contracting Company , a corporation, as principal, and  
NATIONWIDE MUTUAL INSURANCE COMPANY , a corporation authorized to do  
business in the State of California, as Surety, hereby obligate themselves, their successors and  
assigns, jointly and severally, to The City of San Diego a municipal corporation in the sum of **One  
Million Five Hundred Sixty Seven Thousand Eight Hundred Dollars (\$1,567,800)** for the faithful  
performance of the annexed contract, and in the sum of **One Million Five Hundred Sixty Seven  
Thousand Eight Hundred Dollars (\$1,567,800)** for the benefit of laborers and materialmen  
designated below.

**Conditions:**

If the Principal shall faithfully perform the annexed contract with the City of San Diego,  
California, then the obligation herein with respect to a faithful performance shall be void; otherwise it  
shall remain in full force.

If the Principal shall promptly pay all persons, firms and corporations furnishing materials for  
or performing labor in the execution of this contract, and shall pay all amounts due under the  
California Unemployment Insurance Act then the obligation herein with respect to laborers and  
materialmen shall be void; otherwise it shall remain in full force.

The obligation herein with respect to laborers and materialmen shall inure to the benefit of  
all persons, firms and corporations entitled to file claims under the provisions of Article 2. Claimants,  
(iii) public works of improvement commencing with Civil Code Section 9100 of the Civil Code of the  
State of California.

Changes in the terms of the annexed contract or specifications accompanying same or  
referred to therein shall not affect the Surety's obligation on this bond, and the Surety hereby waives  
notice of same.

The Surety shall pay reasonable attorney's fees should suit be brought to enforce the  
provisions of this bond.

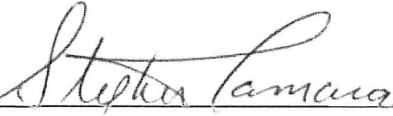
The Surety expressly agrees that the City of San Diego may reject any contractor or  
subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default  
by the Principal.

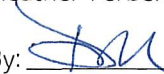
The Surety shall not utilize the Principal in completing the improvements and work specified  
in the Agreement in the event the City terminates the Principal for default.

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND (continued)

THE CITY OF SAN DIEGO

APPROVED AS TO FORM

By: 

Heather Ferbert, City Attorney  
By: 

Print Name: Stephen Samara  
Principal Contract Specialist  
Purchasing & contracting Dept.

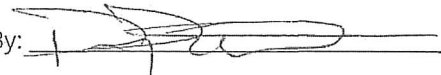
Print Name: Bonny Hou  
Deputy City Attorney

Date: 1/13/2025

Date: 1/14/25

CONTRACTOR  
SOUTHERN CONTRACTING COMPANY

SURETY  
NATIONWIDE MUTUAL INSURANCE COMPANY

By: 

By:   
Attorney-In-Fact

Print Name: PHILIP E. WATERMAN, PRESIDENT

Print Name: JOHN G. MALONEY, ATTORNEY-IN-FACT

Date: 11-13-2024

Date: NOVEMBER 13, 2024

1100 LOCUST STREET, DEPARTMENT 2006  
DES MOINES, IA 50391-2006

Local Address of Surety

949/606-3819

Local Phone Number of Surety

\$10,603.00

PREMIUM IS FOR CONTRACT TERM  
AND IS SUBJECT TO ADJUSTMENT  
BASED ON FINAL CONTRACT PRICE

Premium

7901227410

Bond Number

**CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT**

CIVIL CODE § 1189

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 California

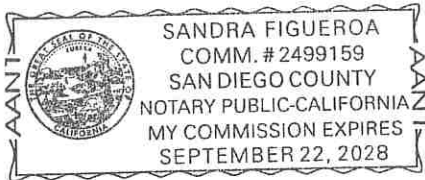
County of SAN DIEGO

}

On 11/13/2024 before me, SANDRA FIGUEROA, NOTARY PUBLIC  
*Date Here Insert Name and Title of the Officer*

personally appeared JOHN G. MALONEY  
*Name(s) of Signer(s)*

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 of which the person(s) acted, executed the instrument.



Place Notary Seal and/or Stamp Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature [Handwritten Signature]  
*Signature of Notary Public*

**OPTIONAL**

*Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.*

**Description of Attached Document**

Title or Type of Document: \_\_\_\_\_

Document Date: \_\_\_\_\_ Number of Pages: \_\_\_\_\_

Signer(s) Other Than Named Above: \_\_\_\_\_

**Capacity(ies) Claimed by Signer(s)**

Signer's Name: JOHN G. MALONEY

Signer's Name: \_\_\_\_\_

Corporate Officer – Title(s): \_\_\_\_\_

Corporate Officer – Title(s): \_\_\_\_\_

Partner –  Limited  General

Partner –  Limited  General

Individual  Attorney in Fact

Individual  Attorney in Fact

Trustee  Guardian of Conservator

Trustee  Guardian of Conservator

Other: \_\_\_\_\_

Other: \_\_\_\_\_

Signer is Representing: \_\_\_\_\_

Signer is Representing: \_\_\_\_\_

Power of Attorney

KNOW ALL MEN BY THESE PRESENTS THAT:

Nationwide Mutual Insurance Company, an Ohio corporation

hereinafter referred to severally as the "Company" and collectively as "the Companies" does hereby make, constitute and appoint:

HELEN MALONEY; JOHN G MALONEY; MARK D IATAROLA; SANDRA FIGUEROA; TRACY LYNN RODRIGUEZ;

each in their individual capacity, its true and lawful attorney-in-fact, with full power and authority to sign, seal, and execute on its behalf any and all bonds and undertakings, and other obligatory instruments of similar nature, in penalties not exceeding the sum of

UNLIMITED

and to bind the Company thereby, as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Company; and all acts of said Attorney pursuant to the authority given are hereby ratified and confirmed.

This power of attorney is made and executed pursuant to and by authority of the following resolution duly adopted by the board of directors of the Company:

"RESOLVED, that the president, or any vice president be, and each hereby is, authorized and empowered to appoint attorneys-in-fact of the Company, and to authorize them to execute and deliver on behalf of the Company any and all bonds, forms, applications, memorandums, undertakings, recognizances, transfers, contracts of indemnity, policies, contracts guaranteeing the fidelity of persons holding positions of public or private trust, and other writings obligatory in nature that the business of the Company may require; and to modify or revoke, with or without cause, any such appointment or authority; provided, however, that the authority granted hereby shall in no way limit the authority of other duly authorized agents to sign and countersign any of said documents on behalf of the Company."

"RESOLVED FURTHER, that such attorneys-in-fact shall have full power and authority to execute and deliver any and all such documents and to bind the Company subject to the terms and limitations of the power of attorney issued to them, and to affix the seal of the Company thereto; provided, however, that said seal shall not be necessary for the validity of any such documents."

This power of attorney is signed and sealed under and by the following bylaws duly adopted by the board of directors of the Company.

Execution of Instruments. Any vice president, any assistant secretary or any assistant treasurer shall have the power and authority to sign or attest all approved documents, instruments, contracts, or other papers in connection with the operation of the business of the company in addition to the chairman of the board, the chief executive officer, president, treasurer or secretary; provided, however, the signature of any of them may be printed, engraved, or stamped on any approved document, contract, instrument, or other papers of the Company.

IN WITNESS WHEREOF, the Company has caused this instrument to be sealed and duly attested by the signature of its officer the 1st day of April, 2024.

[Handwritten signature of Antonio C. Albanese]

Antonio C. Albanese, Vice President of Nationwide Mutual Insurance Company

ACKNOWLEDGMENT

STATE OF NEW YORK COUNTY OF KINGS: ss

On this 1st day of April, 2024, before me came the above-named officer for the Company aforesaid, to me personally known to be the officer described in and who executed the preceding instrument, and he acknowledged the execution of the same, and being by me duly sworn, deposes and says, that he is the officer of the Company aforesaid, that the seal affixed hereto is the corporate seal of said Company, and the said corporate seal and his signature were duly affixed and subscribed to said instrument by the authority and direction of said Company.



Sharon Laburda
Notary Public, State of New York
No. 01LA6427697
Qualified in Kings County
Commission Expires January 3, 2026

[Handwritten signature of Sharon Laburda]
Notary Public
My Commission Expires
January 3, 2026

CERTIFICATE

I, Lezlie F. Chimienti, Assistant Secretary of the Company, do hereby certify that the foregoing is a full, true and correct copy of the original power of attorney issued by the Company; that the resolution included therein is a true and correct transcript from the minutes of the meetings of the boards of directors and the same has not been revoked or amended in any manner; that said Antonio C. Albanese was on the date of the execution of the foregoing power of attorney the duly elected officer of the Company, and the corporate seal and his signature as officer were duly affixed and subscribed to the said instrument by the authority of said board of directors; and the foregoing power of attorney is still in full force and effect.

IN WITNESS WHEREOF, I have hereunto subscribed my name as Assistant Secretary, and affixed the corporate seal of said Company this 13TH day of

NOVEMBER, 2024

[Handwritten signature of Lezlie F. Chimienti]

Assistant Secretary

**CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT**

**CIVIL CODE § 1189**

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 California )  
County of San Diego )  
On 11/18/2024 before me, Lynn R. Murison-Eroles, Notary Public  
*Date Here Insert Name and Title of the Officer*  
personally appeared Philip E. Waterman  
*Name(s) of Signer(s)*

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 of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.



Signature *Lynn R. Murison-Eroles*  
*Signature of Notary Public*

Place Notary Seal Above

**OPTIONAL**

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

**Description of Attached Document**

Title or Type of Document: Performance Bond, Labor and Materialmen's Bond

Document Date: 11/13/2024 Number of Pages: 2

Signer(s) Other Than Named Above: \_\_\_\_\_

**Capacity(ies) Claimed by Signer(s)**

Signer's Name: Philip E. Waterman

Corporate Officer — Title(s): President

Partner —  Limited  General

Individual  Attorney in Fact

Trustee  Guardian or Conservator

Other: \_\_\_\_\_

Signer Is Representing: \_\_\_\_\_

Signer's Name: \_\_\_\_\_

Corporate Officer — Title(s): \_\_\_\_\_

Partner —  Limited  General

Individual  Attorney in Fact

Trustee  Guardian or Conservator

Other: \_\_\_\_\_

Signer Is Representing: \_\_\_\_\_

## ATTACHMENTS



**ATTACHMENT A**  
**SCOPE OF WORK**

## SCOPE OF WORK

1. **SCOPE OF WORK:** PQPS Gas Sensor Replacement: Replacement of two (2) sets of three (3) gas sensors (Oxygen, Methane Gases, and Hydrogen Sulfide) with updated gas sensors and controllers. Work Also includes demolishing the old system, re-pulling wires, installing the new sensors, coordinating the new sensors into the DCS system and starting the new system up.

PQPS VFD Replacement: The Penasquitos Sewer Pump Station VFD Replacement Project includes the removal and replacement of four (4) Variable Frequency Drives (VFDs). This includes demolishing the old system, re-pulling new wires as necessary, installing the new VFDs, integrating the new VFDs into the DCS system in coordination with the Public Utilities Department (PUD), starting the new system up, and all work in accordance with the plans and specifications.

- 1.1. The Work shall be performed in accordance with:

- 1.1.1. The Notice Inviting Bids and Plans numbered **100408-01-D** through **100408-08-D** for PQPS Gas Sensor Replacement, and **100406-01-D** through **100406-21-D** for PQPS VFD Replacement, inclusive.

2. **LOCATION OF WORK:** The location of the Work is as follows:

See **Appendix E – Location Maps**

3. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **330 Working Days**.

**ATTACHMENT B**

**RESERVED**

**ATTACHMENT C**  
**EQUAL OPPORTUNITY CONTRACTING PROGRAM**

## EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP)

### SECTION A - GENERAL REQUIREMENTS

#### A. INTRODUCTION.

1. This document sets forth the following specifications:
  - a) The City's general EOCP requirements for all Construction Contracts.
  - b) Special Provisions for Contracts subject to SLBE and ELBE requirements only.
2. Additional requirements may apply for state or federally funded projects.
3. These requirements shall be included as Contract provisions for all Subcontracts.
4. The City specified forms, instructions, and guides are available for download from the EOCP's web site at: <http://www.sandiego.gov/eoc/forms/index.shtml>

#### B. GENERAL.

1. The City of San Diego promotes equal employment and subcontracting opportunities.
2. The City is committed to ensuring that taxpayer dollars spent on public Contracts are not paid to businesses that practice discrimination in employment or subcontracting.
3. The City encourages all companies seeking to do business with the City to share this commitment.

#### C. DEFINITIONS.

1. For the purpose of these requirements: Terms "Bid" and "Proposal", "Bidder" and "Proposer", "Subcontractor" and "Subconsultant", "Contractor" and "Consultant", "Contractor" and "Prime Contractor", "Consultant" and "Professional Service Provider", "Suppliers" and "Vendors", "Suppliers" and "Dealers", and "Suppliers" and "Manufacturers" may have been used interchangeably.
2. The following definitions apply:
  - a) **Emerging Business Enterprise (EBE)** - A for-profit business that is independently owned and operated; that is not a subsidiary or franchise of another business and whose gross annual receipts do not exceed the amount set by the City Manager and that meets all other criteria set forth in regulations implementing Municipal Code Chapter 2, Article 2, Division 36. The City Manager shall review the threshold amount for EBEs on an annual basis and adjust as necessary to reflect changes in the marketplace.
  - b) **Emerging Local Business Enterprise (ELBE)** - A Local Business Enterprise that is also an Emerging Business Enterprise.

- c) **Minority Business Enterprise (MBE)** - A certified business that is at least fifty-one percent (51%) owned by one or more minority individuals, or, in the case of a publicly owned business at least fifty-one percent (51%) of the stock is owned by one or more minority individuals; and (2) whose daily business operations are managed and directed by one or more minorities owners. Minorities include the groups with the following ethnic origins: African, Asian Pacific, Asian Subcontinent, Hispanic, Native Alaskan, Native American, and Native Hawaiian.
- d) **Women Business Enterprise (WBE)** - A certified business that is at least fifty-one percent (51%) owned by a woman or women, or, in the case of a publicly owned business at least fifty-one percent (51%) of the stock is owned by one or more women; and (2) whose daily business operations are managed and directed by one or more women owners.
- e) **Disadvantaged Business Enterprise (DBE)** - a certified business that is at least fifty-one percent (51%) owned by socially and economically disadvantaged individuals, or, in the case of a publicly owned business at least fifty-one percent (51%) of the stock is owned by one or more socially and economically disadvantaged individuals; and (2) whose daily business operations are managed and directed by one or more socially and economically disadvantaged owners.
- f) **Disabled Veteran Business Enterprise (DVBE)** - A certified business that is at least fifty-one percent (51%) owned by one or more disabled veterans; and (2) business operations must be managed and controlled by one or more disabled veterans. Disabled Veteran is a veteran of the U.S. military, naval, or air service; the veteran must have a service-connected disability of at least 10% or more; and the veteran must reside in California.
- g) **Other Business Enterprise (OBE)** - Any business which does not otherwise qualify as a Minority, Woman, Disadvantaged, or Disabled Veteran Business Enterprise.
- h) **Small Business Enterprise (SBE)** - A for-profit business that is independently owned and operated; that is not a subsidiary or franchise of another business and whose gross annual receipts do not exceed the amount set by the City Manager and that meets all other criteria set forth in regulations implementing Municipal Code Chapter 2, Article 2, Division 36. The City Manager shall review the threshold amount for SBEs on an annual basis and adjust as necessary to reflect changes in the marketplace. A business certified as a Micro Business (MB) or a Disabled Veteran Business Enterprise (DVBE) by the State of California and that has provided proof of such certification to the City Manager shall be deemed to be an SBE.

- i) **Small Local Business Enterprise (SLBE)** - A Local Business Enterprise that is also a Small Business Enterprise.

**D. CITY'S EQUAL OPPORTUNITY COMMITMENT.**

**1. Nondiscrimination in Contracting Ordinance.**

- a) You, your Subcontractors, and Suppliers shall comply with the requirements of the City's Nondiscrimination in Contracting Ordinance, San Diego Municipal Code §§22.3501 through 22.3517.

You shall not discriminate on the basis of race, gender, gender expression, gender identity, religion, national origin, ethnicity, sexual orientation, age, or disability in the solicitation, selection, hiring, or treatment of subcontractors, vendors, or suppliers. You shall provide equal opportunity for Subcontractors to participate in subcontracting opportunities. You understand and agree that the violation of this clause shall be considered a material breach of the Contract and may result in Contract termination, debarment, or other sanctions.

You shall include the foregoing clause in all Contracts between you and your Subcontractors and Suppliers.

- b) **Disclosure of Discrimination Complaints.** As part of its Bid or Proposal, you shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against you in a legal or administrative proceeding alleging that you discriminated against your employees, Subcontractors, vendors, or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.
- c) Upon the City's request, You agree to provide to the City, within 60 Calendar Days, a truthful and complete list of the names of all Subcontractors and Suppliers that you have used in the past 5 years on any of your Contracts that were undertaken within the San Diego County, including the total dollar amount paid by you for each Subcontract or supply Contract.
- d) You further agree to fully cooperate in any investigation conducted by the City pursuant to the City's Nondiscrimination in Contracting Ordinance, Municipal Code §§22.3501 through 22.3517. You understand and agree that violation of this clause shall be considered a material breach of the Contract and may result in remedies being ordered against you up to and including contract termination, debarment, and other sanctions for the violation of the provisions of the Nondiscrimination in Contracting Ordinance. You further understand and agree that the procedures, remedies, and sanctions provided for in the Nondiscrimination in Contracting Ordinance apply only to violations of the Ordinance.

**E. EQUAL EMPLOYMENT OPPORTUNITY OUTREACH PROGRAM.**

1. You, your Subcontractors, and Suppliers shall comply with the City's Equal Employment Opportunity Outreach Program, San Diego Municipal Code §§22.2701 through 22.2707.

You shall not discriminate against any employee or applicant for employment on any basis prohibited by law. You shall provide equal opportunity in all employment practices. You shall ensure that your Subcontractors comply with this program. Nothing in this section shall be interpreted to hold you liable for any discriminatory practices of your Subcontractors.

You shall include the foregoing clause in all Contracts between you and your Subcontractors and Suppliers.

2. If the Contract is competitively solicited, the selected Bidder shall submit a Work Force Report (Form BB05) within 10 Working Days after receipt by the Bidder to the City for approval as specified in the Notice of Intent to Award letter.
3. The selected Bidder shall submit an Equal Employment Opportunity Plan if a Work Force Report is submitted and if the City determines that there are under-representations when compared to County Labor Force Availability data.
4. If the selected Bidder submits an Equal Employment Opportunity Plan, it shall include the following assurances:
  - a) You shall maintain a working environment free of discrimination, harassment, intimidation, and coercion at all Sites and in all facilities at which your employees are assigned to Work.
  - b) You shall review your EEO Policy annually with all on-Site supervisors involved in employment decisions.
  - c) You shall disseminate and review your EEO Policy with all employees at least once a year, post the policy statement and EEO posters on all company bulletin boards and job sites, and document every dissemination, review, and posting with a written record to identify the time, place, employees present, subject matter, and disposition of meetings.
  - d) You shall review, at least annually, all supervisors' adherence to and performance under the EEO Policy and maintain written documentation of these reviews.
  - e) You shall discuss your EEO Policy Statement with Subcontractors with whom you anticipate doing business, including the EEO Policy Statement in your Subcontracts, and provide such documentation to the City upon request.



- f) You shall document and maintain a record of all Bid solicitations and outreach efforts to and from Subcontractors, contractor associations, and other business associations.
- g) You shall disseminate your EEO Policy externally through various media, including the media of people of color and women, in advertisements to recruit. Maintain files documenting these efforts and provide copies of these advertisements to the City upon request.
- h) You shall disseminate your EEO Policy to union and community organizations.
- i) You shall provide immediate written notification to the City when any union referral process has impeded your efforts to maintain your EEO Policy.
- j) You shall maintain a current list of recruitment sources, including those outreaching to people of color and women, and provide written notification of employment opportunities to these recruitment sources with a record of the organizations' responses.
- k) You shall maintain a current file of names, addresses and phone numbers of each walk-in applicant, including people of color and women, and referrals from unions, recruitment sources, or community organizations with a description of the employment action taken.
- l) You shall encourage all present employees, including people of color and women employees, to recruit others.
- m) You shall maintain all employment selection process information with records of all tests and other selection criteria.
- n) You shall develop and maintain documentation for on-the-job training opportunities, participate in training programs, or both for all of your employees, including people of color and women, and establish apprenticeship, trainee, and upgrade programs relevant to your employment needs.
- o) You shall conduct, at least annually, an inventory and evaluation of all employees for promotional opportunities and encourage all employees to seek and prepare appropriately for such opportunities.
- p) You shall ensure that the company's working environment and activities are non-segregated except for providing separate or single-user toilets and necessary changing facilities to assure privacy between the sexes.

**F. SUBCONTRACTING.**

1. The City encourages all eligible business enterprises to participate in City contracts as a Contractor, Subcontractor, and joint venture partner with you, your Subcontractors, or your Suppliers. You are encouraged to take positive steps to diversify and expand your Subcontractor solicitation base and to offer

subcontracting opportunities to all eligible business firms including SLBEs, ELBEs, MBEs, WBEs, DBEs, DVBES, and OBEs.

2. For Subcontractor participation level requirements, see the Contract Documents where applicable.
3. For the purposes of achieving the mandatory Subcontractor participation percentages, City percentage calculations will not account for the following:
  - a) "Field Orders" and "City Contingency" Bid items.
  - b) Alternate Bid items.
  - c) Allowance Bid items designated as "EOC Type II".
4. Allowance Bid items designated as "EOC Type I" will be considered as part of the Base Bid and will be included in the percentage calculation.
5. Each joint venture partner shall be responsible for a clearly defined Scope of Work. In addition, an agreement shall be submitted and signed by all parties identifying the extent to which each joint venture partner shares in ownership, control, management, risk, and profits of the joint venture.

**G. LISTS OF SUBCONTRACTORS AND SUPPLIERS.**

1. You shall comply with the Subletting and Subcontracting Fair Practices Act, Public Contract Code §§4100 through 4113, inclusive.
2. You shall list all Subcontractors who will receive more than 0.5% of the total Bid amount or \$10,000, whichever is greater on the form provided in the Contract Documents (Subcontractors list).
3. The Subcontractors list shall include the Subcontractor's name, telephone number including area code, physical address, Scope of Work, the dollar amount of the proposed Subcontract, the California contractor license number, the Public Works contractor registration number issued pursuant to Section 1725.5 of the Labor Code, and the Subcontractor's certification status with the name of the certifying agency.
4. The listed Subcontractor shall be appropriately licensed pursuant to Contractor License Laws.
5. For Design-Build Contracts, refer to the RFQ and RFP for each Project or Task Order.

**H. SUBCONTRACTOR AND SUPPLIER SUBSTITUTIONS.**

1. Listed Subcontractors and Suppliers shall not be substituted without the Express authorization of the City or its duly authorized agent.
2. Request for Subcontractor or Supplier substitution shall be made in writing to Purchasing & Contracting Department, Public Works Division, Attention Contract Specialist, 1200 3rd Ave., Suite 200, MS 56P, San Diego, CA 92101 with a copy to the Engineer.

3. The request shall include a thorough explanation of the reason(s) for the substitution, including dollar amounts and a letter from each substituted Subcontractor or Supplier stating that they (the Subcontractors or Suppliers) release all interest in working on the Project and written confirmation from the new Subcontractor or Supplier stating that they agree to work on the Project along with the dollar value of the Work to be performed.
4. Written approval of the substitution request shall be received by you or from the City or its authorized officer prior to any unlisted Subcontractor or Supplier performing Work on the Project.
5. Substitution of Subcontractors and Suppliers without authorization shall subject you to those penalties set forth in Public Contract Code §4110.
6. Requests for Supplier substitution shall be made in writing at least 10 Days prior to the provision of materials, supplies, or services by the proposed Supplier and shall include proof of written notice to the originally listed Supplier of the proposed substitution.
7. A Contractor whose Bid is accepted shall not:
  - a) Substitute a person as Subcontractor or Supplier in place of the Subcontractor or Supplier listed in the original bid, except that the City, or its duly authorized officer, may consent to the substitution of another person as a Subcontractor or Supplier in any of the following situations:
    - i. When the Subcontractor or Supplier listed in the Bid, after having a reasonable opportunity to do so, fails or refuses to execute a written Contract for the scope of work specified in the subcontractor's bid and at the price specified in the subcontractor's bid, when that written contract, based upon the general terms, conditions, plans, and specifications for the project involved or the terms of the subcontractor's written bid, is presented to the subcontractor by the prime contractor.
    - ii. When the listed Subcontractor or Supplier becomes insolvent or the subject of an order for relief in bankruptcy.
    - iii. When the listed Subcontractor or Supplier fails or refuses to perform his or her subcontract.
    - iv. When the listed Subcontractor fails or refuses to meet bond requirements as set forth in Public Contract Code §4108.
    - v. When you demonstrate to the City or its duly authorized officer, subject to the provisions set forth in Public Contract Code §4107.5, that the name of the Subcontractor was listed as the result of an inadvertent clerical error.
    - vi. When the listed Subcontractor is not licensed pursuant to Contractor License Law.

- vii. When the City, or its duly authorized officer, determines that the Work performed by the listed Subcontractor or that the materials or supplies provided by the listed Supplier are substantially unsatisfactory and not in substantial accordance with the Plans and specifications or that the Subcontractor or Supplier is substantially delaying or disrupting the progress of the Work.
  - viii. When the listed Subcontractor is ineligible to work on a public works project pursuant to §§1777.1 or 1777.7 of the Labor Code.
  - ix. When the City or its duly authorized agent determines that the listed Subcontractor is not a responsible contractor.
- b) Permit a Contract to be voluntarily assigned or transferred or allow it to be performed by anyone other than the original Subcontractor, Supplier listed in the original Bid without the consent of the City, or its duly authorized officer.
  - c) Other than in the performance of "Change Orders" causing changes or deviations from the Contract, sublet or subcontract any portion of the Work, or contract for materials or supplies in excess of 0.5% of your total bid or \$10,000, whichever is greater, as to which his or her original Bid did not designate a Subcontractor or Supplier.
8. Following receipt of notice from you of the proposed substitution of a Subcontractor or Supplier, the listed Subcontractor or Supplier who has been so notified shall have 5 Working Days within which to submit written objections to the substitution to the Contract Specialist with a copy to the Engineer. Failure to file these written objections shall constitute the listed Subcontractor or Supplier's consent to the substitution. If written objections are filed, the City shall give notice in writing of at least 5 Working Days to the listed Subcontractor or Supplier of a hearing by the City on your request for substitution.

**I. PROMPT PAYMENT.**

- 1. You or your Subcontractors shall pay to any subcontractor, not later than 7 Calendar Days of receipt of each progress payment, unless otherwise agreed to in writing, the respective amounts allowed you on account of the Work performed by the Subcontractors, to the extent of each Subcontractor's interest therein. In cases of Subcontractor performance deficiencies, you shall make written notice of any withholding to the Subcontractor with a copy to the Contracts Specialist. Upon correction of the deficiency, you shall pay the Subcontractor the amount previously withheld within 14 Calendar Days after payment by the City.
- 2. Any violation of California Business and Professions Code, §7108.5 concerning prompt payment to Subcontractors shall subject the violating Contractor or

Subcontractor to the penalties, sanctions, and other remedies of that section. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to you or your Subcontractor in the event of a dispute involving late payment or nonpayment by the Prime Contractor, deficient subcontract performance, or noncompliance by a Subcontractor.

**J. PROMPT PAYMENT OF FUNDS WITHHELD TO SUBCONTRACTORS.**

1. The City will hold retention from you and will make prompt and regular incremental acceptances of portions, as determined by the Engineer, of the Work and pay retention to you based on these acceptances.
2. You or your Subcontractors shall return all monies withheld in retention from a Subcontractor within 30 Calendar Days after receiving payment for Work satisfactorily completed and accepted including incremental acceptances of portions of the Work by the City.
3. Federal law (49CFR26.29) requires that any delay or postponement of payment over 30 Calendar Days may take place only for good cause and with the City's prior written approval. Any violation of this provision by you or your Subcontractor shall subject you or your Subcontractor to the penalties, sanctions, and other remedies specified in §7108.5 of the Business and Professions Code.
4. These requirements shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to you or your Subcontractor in the event of a dispute involving late payment or nonpayment by you, deficient subcontract performance, or noncompliance by a Subcontractor.

**K. CERTIFICATION.**

1. The City accepts certifications of DBE, DVBE, MBE, SMBE, SWBE, or WBE by any of the following certifying agencies:
  - a) Current certification by the State of California Department of Transportation (CALTRANS) as DBE, SMBE, or SWBE.
  - b) Current MBE, WBE, or DVBE certification from the California Public Utilities Commission.
  - c) DVBE certification is received from the State of California's Department of General Services, Office of Small and Minority Business.
  - d) Current certification by the City of Los Angeles as DBE, WBE, or MBE.
  - e) Subcontractors' valid proof of certification status (copies of MBE, WBE, DBE, or DVBE certifications) shall be submitted as required.

**L. CONTRACT RECORDS AND REPORTS.**

1. You shall maintain records of all subcontracts and invoices from your Subcontractors and Suppliers for work on this project. Records shall show

name, telephone number including area code, and business address of each Subcontractor, Supplier, and joint venture partner, and the total amount actually paid to each firm. Project relevant records, regardless of tier, may be periodically reviewed by the City.

2. You shall retain all records, books, papers, and documents pertinent to the Contract for a period of not less than 5 years after Notice of Completion and allow access to said records by the City's authorized representatives.
3. You shall submit the following reports using the City's web-based contract compliance (Prism® portal):
  - a. **Monthly Payment.** You shall submit Monthly Payment Reporting by the 10<sup>th</sup> day of the subsequent month. Incomplete and/or delinquent reporting may cause payment delays, non-payment of invoices, or both.
4. The records maintained under item 1, described above, shall be consolidated into a Final Summary Report, certified as correct by an authorized representative of the Contractor. The Final Summary Report shall include all subcontracting activities and be sent to the EOCP Program Manager prior to Acceptance. Failure to comply may result in assessment of liquidated damages or withholding of retention. The City will review and verify 100% of subcontract participation reported in the Final Summary Report prior to approval and release of final retention to you. In the event your Subcontractors are owed money for completed Work, the City may authorize payment to subcontractor via a joint check from the withheld retention.

## EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP)

### SECTION B - SLBE-ELBE SUBCONTRACTING REQUIREMENTS

**THESE SPECIAL PROVISIONS SUPPLEMENT THE POLICIES AND REQUIREMENTS ESTABLISHED BY THE CITY OF SAN DIEGO EQUAL OPPORTUNITY CONTRACTING PROGRAM SPECIFIED IN THE CITY'S GENERAL EOCP REQUIREMENTS.**

#### **A. GENERAL.**

1. It is the City's policy to encourage greater availability, capacity development, and contract participation by SLBE and ELBE firms in City contracts. This policy is, in part, intended to further the City's compelling interest to stimulate economic development through the support and empowerment of the local community, ensure that it is neither an active nor passive participant in marketplace discrimination, and promote equal opportunity for all segments of the contracting community.
2. The City is committed to maximizing subcontracting opportunities for all qualified and available firms.
3. This policy applies to City-funded construction contracts. Bidders shall be fully informed of this policy as set forth in these specifications. Mandatory or voluntary subcontracting percentages, Bid Discounts, and restricted competitions are specified in the Contract Documents.
4. You shall make subcontracting opportunities available to a broad base of qualified Subcontractors and shall achieve the minimum SLBE-ELBE Subcontractor participation identified for your project.
5. Failure to subcontract the specified minimum (mandatory) percentages of the Bid to qualified available SLBE-ELBE Subcontractors will cause a Bid to be rejected as non-responsive unless the Bidder has demonstrated compliance with the affirmative steps as specified in the City's document titled "Small Local Business (SLBE) Program, INSTRUCTIONS FOR BIDDERS COMPLETING THE GOOD FAITH EFFORT SUBMITTAL" and has submitted documentation showing that all required positive efforts were made prior to the Bid submittal due date. The required Good Faith Effort (GFE) documentation shall be submitted to the Contract Specialist. The instructions for completing the good faith effort submittal can be found on the City's website:  
<https://www.sandiego.gov/sites/default/files/legacy/eoc/pdf/slbeinst.pdf>
6. The current list of certified SLBE-ELBE firms and information for completing the GFE submittal can be found on the City's EOC Department website:  
<http://www.sandiego.gov/eoc/programs/slbe>
7. These requirements may be waived, at the City's sole discretion, on projects deemed inappropriate for subcontracting participation.

## B.

### DEFINITIONS.

1. The following definitions shall be used in conjunction with these specifications:

- a) **Bid Discount** – Additional inducements or enhancements in the bidding process that are designed to increase the chances for the selection of SLBE firms in competition with other firms.
- b) **Commercially Useful Function** – An SLBE-ELBE performs a commercially useful function when it is responsible for the execution of the Work and is carrying out its responsibilities by actually performing, managing, and supervising the Work involved. To perform a commercially useful function, the SLBE-ELBE shall also be responsible, with respect to materials and supplies used on the Contract, for negotiating price, determining quantity and quality, ordering the material, and installing (where applicable) and paying for the material itself.

To determine whether an SLBE-ELBE is performing a commercially useful function, an evaluation will be performed of the amount of Work subcontracted, normal industry practices, whether the amount the SLBE-ELBE firm is to be paid under the contract is commensurate with the Work it is actually performing and the SLBE-ELBE credit claimed for its performance of the Work, and other relevant factors. Specifically, an SLBE-ELBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of meaningful and useful SLBE-ELBE participation, when in similar transactions in which SLBE-ELBE firms do not participate, there is no such role performed.

- c) **Good Faith Efforts (GFE)** – Documentation of the Bidder's intent to comply with SLBE Program goals and procedures included in the City's SLBE Program, Instructions for Completing Good Faith Effort Submittal available from the City's EOCP website or the Contract Specialist.
- d) **Independently Owned, Managed, and Operated** – Ownership of a SLBE-ELBE firm shall be direct, independent, and by individuals only. Business firms that are owned by other businesses or by the principals or owners of other businesses that cannot themselves qualify under the SLBE-ELBE eligibility requirements shall not be eligible to participate in the Program. Moreover, the day-to-day management of the SLBE-ELBE firm shall be direct and independent of the influence of any other businesses that cannot themselves qualify under the SLBE-ELBE eligibility requirements.
- e) **Joint Venture** – An association of two or more persons or business entities that is formed for the single purpose of carrying out a single defined business enterprise for which purpose they combine their



capital, efforts, skills, knowledge, or property. Joint ventures shall be established by written agreement to qualify for this program.

- f) **Local Business Enterprise (“LBE”)** – A firm having a Principal Place of Business and a Significant Employment Presence in San Diego County, California that has been in operation for 12 consecutive months and a valid business tax certificate. This definition is subsumed within the definition of Small Local Business Enterprise.
- g) **Minor Construction Program** – A program developed for bidding exclusively among SLBE-ELBE Construction firms.
- h) **Principal Place of Business** – A location wherein a firm maintains a physical office and through which it obtains no less than 50% of its overall customers or sales dollars.
- i) **Protégé** – A firm that has been approved and is an active participant in the City’s Mentor-Protégé Program and that has signed the required program participation agreement and has been assigned a mentor.
- j) **Significant Employee Presence** – No less than 25% of a firm’s total number of employees are domiciled in San Diego County.

**C. SUBCONTRACTOR PARTICIPATION.**

- 1. For the purpose of satisfying subcontracting participation requirements, only 1<sup>st</sup> tier SLBE–ELBE Subcontractors will be recognized as participants in the Contract according to the following criteria:
  - a) For credit to be allowed toward a respective participation level, all listed SLBE-ELBE firms shall have been certified by the Bid due date.
  - b) The Subcontractor shall perform a commercially useful function for credit to be allowed toward subcontractor participation levels. The Subcontractor shall be required by you to be responsible for the execution of a distinct element of the Work and shall carry out its responsibility by actually performing and supervising its own workforce.
  - c) If the Bidder is seeking the recognition of materials, supplies, or both towards achieving any mandatory subcontracting participation level, the Bidder shall indicate on Form AA40 – Named Equipment/Material Supplier List with the Bid the following:
    - i. If the materials or supplies are obtained from a SLBE-ELBE manufacturer, the Bidder will receive 100% of the cost of the materials or supplies toward SLBE participation. For the purposes of counting SLBE-ELBE participation, a manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the Contract and of the general character described by the specifications.

- ii. If the materials or supplies are obtained from a SLBE-ELBE supplier, the Bidder will receive 60% of the cost of the materials or supplies toward SLBE participation. For the purposes of counting SLBE-ELBE participation a Supplier is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the Contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a supplier, the firm shall be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a supplier in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business if the person both owns and operates distribution equipment for the products. Any supplementing of the suppliers' own distribution equipment shall be by a long-term lease agreement and shall not be on an ad hoc or contract-by-contract basis.
  - iii. If the materials or supplies are obtained from a SLBE-ELBE, which is neither a manufacturer nor a supplier, the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, fees or transportation charges for the delivery of materials or supplies required on a job site will be counted toward SLBE-ELBE participation, provided the fees are reasonable and not excessive as compared with fees customarily allowed for similar services. No portion of the cost of the materials and supplies themselves will be counted toward SLBE-ELBE participation.
- d) If the Bidder is seeking the recognition of SLBE-ELBE Trucking towards achieving any mandatory subcontracting participation level, the Bidder shall indicate it on Form AA35 - List of Subcontractors with the Bid. The following factors will be evaluated in determining the credit to be allowed toward the respective participation level:
- i. The SLBE-ELBE shall be responsible for the management and supervision of the entire trucking operation for which it is getting credit on a particular Contract and there shall not be a contrived arrangement for the purpose of counting SLBE-ELBE participation.
  - ii. The SLBE-ELBE shall itself own and operate at least 1 fully licensed, insured, and operational truck used on the Contract.

- iii. The SLBE-ELBE receives credit for the total value of the transportation services it provides on the Contract using trucks it owns, insures, and operates using drivers it employs.
- iv. The SLBE-ELBE may lease trucks from another SLBE-ELBE firm including an owner-operator who is certified as a SLBE-ELBE. The SLBE-ELBE who leases trucks from another SLBE-ELBE receives credit for the total value of the transportation services the lessee SLBE-ELBE provides on the contract.
- v. The SLBE-ELBE may also lease trucks from a non-SLBE-ELBE firm, including an owner-operator. The SLBE-ELBE who leases trucks from a non-SLBE-ELBE is entitled to credit for the total value of transportation services provided by non-SLBE-ELBE lessees not to exceed the value of transportation services provided by SLBE-ELBE owned trucks on the contract. Additional participation by non-SLBE-ELBE lessees receive credit only for the fee or commission it receives as a result of the lease arrangement.
- vi. A lease shall indicate that the SLBE-ELBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the SLBE-ELBE so long as the lease gives the SLBE-ELBE absolute priority for use of the leased truck.

**D. SLBE-ELBE SUBCONTRACTOR PARTICIPATION PERCENTAGES.**

1. Contracts valued at \$1,500,000 and above will be considered Major Public Works Contracts and will include a mandatory Subcontractor participation requirement for SLBE-ELBE firms.
  - a) The Bidder shall achieve the mandatory Subcontractor participation requirement or demonstrate GFE.
  - b) The Bidders shall indicate the participation on Forms AA35 - List of Subcontractors and AA40 - Named Equipment/Material Supplier List as applicable regardless of the dollar value.
  - c) An SLBE-ELBE Bidder may count its own participation toward achieving the mandatory goal as long as the SLBE-ELBE Bidder performs 51% of the Contract Price.
2. Contracts Valued over \$1,000,000 and under \$1,500,000 will also be considered Major Public Works Contracts and will include the mandatory subcontractor participation requirements described above and the following:
  - a) 5% bid discount for SLBE-ELBE firms.
  - b) Non-certified Contractor will receive 5% bid discount if they achieve the specified mandatory Subcontracting participations.
  - c) Bid discounts shall not apply if the award will result in a total contract cost of \$50,000 in excess of the apparent lowest Bid.

- d) In the event of a tie bid between a SLBE-ELBE Bidder and a non-SLBE-ELBE Bidder, the SLBE-ELBE Bidder will be awarded the Contract.
  - e) In the event of a tie bid between a discounted Bid and a non-discounted Bid, the discounted Bid will be awarded the Contract.
- 3. Contracts valued over \$500,000 up to \$1,000,000 will be considered Minor Public Works Contracts and will be awarded through a competitive Bid process open only to City certified SLBE-ELBE firms. If there are no bidders or no responsible bidders, the Contract will be made available to all Bidders and will be subject to requirements listed in items 1 and 2 for Major Public Works Contracts above.
  - 4. Contracts valued at \$500,000 and below will also be considered Minor Public Works Contracts and will be awarded through a competitive bid process open only to City certified ELBEs unless there are less than 2 firms available at which it will be awarded through a competitive process open only to the City certified SLBE-ELBE firms. If there are no bidders or no responsible bidders, the Contract will be made available to all Bidders and subject to requirements listed in items 1 and 2 for Major Public Works Contracts above.

**E. JOINT VENTURES.**

- 1. The City may allow for Joint Venture bid discounts on some Contracts. Contracts that allow for Joint Venture bid discounts will be designated in Bid documents. A firm that is bidding or competing for City Contracts may partner with a certified SLBE or ELBE to compete for Contracts as a Joint Venture.
- 2. A Joint Venture shall be between two entities with the same discipline or license as required by the City. Joint ventures will receive bid discounts depending on the SLBE or ELBE percentage of participation. To be eligible for a discount, a Joint Venture Agreement shall be approved by the City at the time of Bid submittal. The maximum allowable discount shall be 5%. The parties shall agree to enter in the relationship for the life of the projects.
- 3. Joint Venture shall submit a Joint Venture Management Plan, a Joint Venture Agreement, or both at least 2 weeks prior to the Bid due date. Copies of the Joint Venture applications are available upon request to the Contract Specialist. Each agreement or management plan shall include the following:
  - a) Detailed explanation of the financial contribution for each partner.
  - b) List of personnel and equipment used by each partner.
  - c) Detailed breakdown of the responsibilities of each partner.
  - d) Explanation of how the profits and losses will be distributed.
  - e) Description of the bonding capacity of each partner.
  - f) Management or incentive fees available for any one of the partners (if any).

4. Each Joint Venture partner shall perform a Commercially Useful Function. An SLBE or ELBE that relies on the resources and personnel of a non-SLBE or ELBE firm will not be deemed to perform a Commercially Useful Function.
5. Each Joint Venture partner shall possess licenses appropriate for the discipline for which a proposal is being submitted. If a Joint Venture is bidding on a single trade project, at the time of bid submittal, each Joint Venture partner shall possess the requisite specialty license for that trade bid.
6. The SLBE or ELBE partner shall clearly define the portion of the Work to be performed. This Work shall be of the similar type of Work the SLBE or ELBE partner performs in the normal course of its business. The Joint Venture Participation Form shall specify the Bid items to be performed by each individual Joint Venture partner. Lump sum Joint Venture participation shall not be acceptable.
7. Responsibilities of the SLBE or ELBE Joint Venture Partner:
  - a) The SLBE or ELBE partner shall share in the control, management responsibilities, risks and profits of the Joint Venture in proportion with the level of participation in the project.
  - b) The SLBE or ELBE partner shall perform Work that is commensurate with its experience.
  - c) The SLBE or ELBE partner shall use its own employees and equipment to perform its portion of the Work.
  - d) The Joint Venture as a whole shall perform Bid items that equal or exceed 50% of the Contract Price, excluding the cost of manufactured items, in order to be eligible for a Joint Venture discount.

**F. MAINTAINING PARTICIPATION LEVELS.**

1. Credit and preference points are earned based on the level of participation proposed prior to the award of the Contract. Once the Project begins you shall achieve and maintain the SLBE-ELBE participation levels for which credit and preference points were earned. You shall maintain the SLBE-ELBE percentages indicated at the Award of Contract and throughout the Contract Time.
2. If the City modifies the original Scope of Work, you shall make reasonable efforts to maintain the SLBE-ELBE participation for which creditor preference points were earned. If participation levels will be reduced, approval shall be received from the City prior to making changes.
3. You shall notify and obtain written approval from the City in advance of any reduction in subcontract scope, termination, or substitution for a designated SLBE-ELBE Subcontractor. Failure to do so shall constitute a material breach of the Contract.
4. If you fail to maintain the SLBE-ELBE participation listed at the time the Contract is awarded and have not received prior approval from the City, the

City may declare you in default and will be considered grounds for debarment under Chapter 2, Article 2, Division 8, of the San Diego Municipal Code.

**G. SUBCONTRACTING EFFORTS REVIEW AND EVALUATION.**

1. Documentation of your subcontracting efforts will be reviewed by EOCB to verify that you made subcontracting opportunities available to a broad base of qualified Subcontractors, negotiated in good faith with interested Subcontractors, and did not reject any bid for unlawful discriminatory reasons. The EOCB review is based on the federal “Six Good Faith Efforts” model.
2. The GFEs are required methods to ensure that all ELBE and SLBE firms have had the opportunity to compete for the City’s Public Works procurements. The Six Good Faith Efforts, also known as affirmative steps, attract and utilize ELBE and SLBE firms:
  - a) Ensure ELBE firms are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities.
  - b) Make information of forthcoming opportunities available to SLBE-ELBE firms and arrange time for Contracts and establish delivery schedules, where requirements permit, in a way that encourages and facilitates participation by SLBE-ELBE firms in the competitive process. This includes posting solicitations for Bids or proposals to SLBE-ELBE firms for a minimum of 10 Working Days before the Bid or Proposal due date.
  - c) Consider in the contracting process whether firms competing for large Contracts could subcontract with SLBE-ELBE firms.
  - d) Encourage contracting with a consortium of ELBE-SLBE firms when a Contract is too large for one of these firms to handle individually.
  - e) Use the services and assistance of the City’s EOC Office and the SLBE-ELBE Directory.
  - f) If you award subcontracts, require your Subcontractors to take the steps listed above.

**H. GOOD FAITH EFFORT DOCUMENTATION.**

1. If the specified SLBE-ELBE Subcontractor participation percentages are not met, you shall submit information necessary to establish that adequate GFEs were taken to meet the Contract Subcontractor participation percentages. See the City’s document titled “Small Local Business (SLBE) Program, INSTRUCTIONS FOR BIDDERS COMPLETING THE GOOD FAITH EFFORT SUBMITTAL.” The instructions for completing the good faith effort submittal can be found on the City’s website:

<https://www.sandiego.gov/sites/default/files/legacy/eoc/pdf/slbegfeinst.pdf>

**I. SUBCONTRACTOR SUBSTITUTION.**

1. Evidence of fraud or discrimination in the substitution of Subcontractors will result in sanctions including assessment of penalty fines, termination of Contract, or debarment. This section does not replace applicable California Public Contract Code.

**J. FALSIFICATION OF SUB-AGREEMENT AND FRAUD.**

1. Falsification or misrepresentation of a sub-agreement as to company name, Contract amount or actual Work performed by Subcontractors, or any falsification or fraud on the part your submission of documentation and forms pursuant to this program, will result in sanctions against you including assessment of penalty fines, termination of the Contract, or debarment. Instances of falsification or fraud which are indicative of an attempt by you to avoid subcontracting with certain categories of Subcontractors on the basis of race, gender, gender expression, gender identity, religion, national origin, ethnicity, sexual orientation, age, or disability shall be referred to the Equal Opportunity Contracting Program's Investigative Unit for possible violations of Article 2, Division 35 of the City Administrative Code, §§22.3501 et seq. (Nondiscrimination in Contracting).

**K. RESOURCES.**

1. The current list of certified SLBE-ELBE firms and information for completing the GFE submittal can be found on the City's EOC Department website:  
<http://www.sandiego.gov/eoc/programs/slbe>
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**ATTACHMENT D**  
**PREVAILING WAGE**



## PREVAILING WAGE

1. **PREVAILING WAGE RATES:** Pursuant to San Diego Municipal Code section 22.3019, construction, alteration, demolition, repair and maintenance work performed under this Contract is subject to State prevailing wage laws. For construction work performed under this Contract cumulatively exceeding \$25,000 and for alteration, demolition, repair and maintenance work performed under this Contract cumulatively exceeding \$15,000, the Contractor and its subcontractors shall comply with State prevailing wage laws including, but not limited to, the requirements listed below.
  - 1.1. **Compliance with Prevailing Wage Requirements.** Pursuant to sections 1720 through 1861 of the California Labor Code, the Contractor and its subcontractors shall ensure that all workers who perform work under this Contract are paid not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations (DIR). This includes work performed during the design and preconstruction phases of construction including, but not limited to, inspection and land surveying work.
    - 1.1.1. Copies of such prevailing rate of per diem wages are on file at the City and are available for inspection to any interested party on request. Copies of the prevailing rate of per diem wages also may be found at <http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>. Contractor and its subcontractors shall post a copy of the prevailing rate of per diem wages determination at each job site and shall make them available to any interested party upon request.
    - 1.1.2. The wage rates determined by the DIR refer to expiration dates. If the published wage rate does not refer to a predetermined wage rate to be paid after the expiration date, then the published rate of wage shall be in effect for the life of this Contract. If the published wage rate refers to a predetermined wage rate to become effective upon expiration of the published wage rate and the predetermined wage rate is on file with the DIR, such predetermined wage rate shall become effective on the date following the expiration date and shall apply to this Contract in the same manner as if it had been published in said publication. If the predetermined wage rate refers to one or more additional expiration dates with additional predetermined wage rates, which expiration dates occur during the life of this Contract, each successive predetermined wage rate shall apply to this Contract on the date following the expiration date of the previous wage rate. If the last of such predetermined wage rates expires during the life of this Contract, such wage rate shall apply to the balance of the Contract.
  - 1.2. **Penalties for Violations.** Contractor and its subcontractors shall comply with California Labor Code section 1775 in the event a worker is paid less than the prevailing wage rate for the work or craft in which the worker is employed. This shall be in addition to any other applicable penalties allowed under Labor Code sections 1720 – 1861.

- 1.3. Payroll Records.** Contractor and its subcontractors shall comply with California Labor Code section 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. Contractor shall require its subcontractors to also comply with section 1776. Contractor and its subcontractors shall submit weekly certified payroll records online via the City's web-based Labor Compliance Program. Contractor is responsible for ensuring its subcontractors submit certified payroll records to the City.
- 1.3.1.** Contractor and their subcontractors shall also furnish records specified in Labor Code section 1776 directly to the Labor Commissioner in the manner required by Labor Code section 1771.4.
- 1.4. Apprentices.** Contractor and its subcontractors shall comply with California Labor Code sections 1777.5, 1777.6 and 1777.7 concerning the employment and wages of apprentices. Contractor is held responsible for the compliance of their subcontractors with sections 1777.5, 1777.6 and 1777.7.
- 1.5. Working Hours.** Contractor and their subcontractors shall comply with California Labor Code sections 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to eight hours a day and forty hours a week, unless all hours worked in excess of 8 hours per day are compensated at not less than 1½ times the basic rate of pay; and (ii) specify penalties to be imposed on contractors and subcontractors of \$25 per worker per day for each day the worker works more than 8 hours per day and 40 hours per week in violation of California Labor Code sections 1810 through 1815.
- 1.6. Required Provisions for Subcontracts.** Contractor shall include at a minimum a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.
- 1.7. Labor Code Section 1861 Certification.** Contractor in accordance with California Labor Code section 3700 is required to secure the payment of compensation of its employees and by signing this Contract, Contractor certifies that "I am aware of the provisions of Section 3700 of the California 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."
- 1.8. Labor Compliance Program.** The City has its own Labor Compliance Program authorized in August 2011 by the DIR. The City will withhold contract payments when payroll records are delinquent or deemed inadequate by the City or other governmental entity, or it has been established after an investigation by the City or other governmental entity that underpayment(s) have occurred. For questions or assistance, please contact the City of San Diego's Prevailing Wage Unit at [PWDPprevailingWage@sandiego.gov](mailto:PWDPprevailingWage@sandiego.gov).

- 1.9. Contractor and Subcontractor Registration Requirements.** This project is subject to compliance monitoring and enforcement by the DIR. A contractor or subcontractor shall not be qualified to bid on, be listed in a bid or proposal, subject to the requirements of section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, unless currently registered and qualified to perform public work pursuant to Labor Code section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.
- 1.9.1.** A Contractor's inadvertent error in listing a subcontractor who is not registered pursuant to Labor Code section 1725.5 in response to a solicitation shall not be grounds for filing a bid protest or grounds for considering the bid non-responsive provided that any of the following apply: (1) the subcontractor is registered prior to bid opening; (2) within twenty-four hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in Labor Code section 1725.5; or (3) the subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.
- 1.9.2.** By submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the DIR in compliance with Labor Code sections 1771.1 and 1725.5, and Contractor shall provide proof of registration for themselves and all listed subcontractors to the City at the time of bid or proposal due date or upon request.
- 1.10. Stop Order.** For Contractor or its subcontractors engaging in the performance of any public work contract without having been registered in violation of Labor Code sections 1725.5 or 1771.1, the Labor Commissioner shall issue and serve a stop order prohibiting the use of the unregistered contractors or unregistered subcontractor(s) on ALL public works until the unregistered contractor or unregistered subcontractor(s) is registered. Failure to observe a stop order is a misdemeanor.
- 1.11. List of all Subcontractors.** The Contractor shall provide the list of subcontractors (regardless of tier), along with their DIR registration numbers, utilized on this Contract prior to any work being performed; and the Contractor shall provide a complete list of all subcontractors with each invoice. Additionally, Contractor shall provide the City with a complete list of all subcontractors (regardless of tier) utilized on this contract within ten working days of the completion of the contract, along with their DIR registration numbers. The City shall withhold final payment to Construction Management Professional until at least thirty (30) days after this information is provided to the City.

**1.12. Exemptions for Small Projects.** There are limited exemptions for installation, alteration, demolition, or repair work done on projects of \$25,000 or less. The Contractor shall still comply with Labor Code sections 1720 et. seq. The only recognized exemptions are listed below:

**1.12.1.** Registration. The Contractor will not be required to register with the DIR for small projects. (Labor Code section 1771.1).

**1.12.2.** Certified Payroll Records. The records required in Labor Code section 1776 shall be required to be kept and submitted to the City of San Diego, but will not be required to be submitted online with the DIR directly. The Contractor will need to keep those records for at least three years following the completion of the Contract. (Labor Code section 1771.4).

**1.12.3.** List of all Subcontractors. The Contractor shall not be required to hire only registered subcontractors and is exempt from submitting the list of all subcontractors that is required in section 1.11. above. (Labor code section 1773.3).

**ATTACHMENT E**  
**SUPPLEMENTARY SPECIAL PROVISIONS**

## SUPPLEMENTARY SPECIAL PROVISIONS

The following Supplementary Special Provisions (SSP) modifies the following documents:

1. The **2021 Edition** of the Standard Specifications for Public Works Construction (The "GREENBOOK").
2. The **2021 Edition** of the City of San Diego Standard Specifications for Public Works Construction (The "WHITEBOOK"), including the following:
  - a) General Provisions (A) for all Construction Contracts.

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### SECTION 1 – GENERAL, TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS

**1-2 TERMS AND DEFINITIONS.** To the "WHITEBOOK":

To item 47, "Holiday", ADD the following:

<b>Holiday</b>	<b>Observed On</b>
Juneteenth	June 19

To item 55, "Normal Working Hours", DELETE in its entirety and SUBSTITUTE with the following:

**Normal Working Hours:** Normal Working Hours shall be **7:00 AM to 3:30 PM, Monday through Friday**, inclusive. Saturdays, Sundays, and City Holidays are excluded. Unless otherwise specified on the Traffic Control Permits.

### SECTION 2 - SCOPE OF THE WORK

**2-2 PERMITS, FEES, AND NOTICES.** To the "WHITEBOOK", ADD the following:

2. The City will obtain, at no cost to you, the following permits:
  - a) Building Permit
  - b) Fire Dept. Permit (Gas Sensor Project)

**2-2.3 Payment.** To the "WHITEBOOK", item 1, DELETE in its entirety and SUBSTITUTE with the following:

1. The payment for work associated with implementing Building Permits and inspections shall be included in the respective Allowance Bid Items for **"Building Permits (EOC Type I) - Gas Sensor and Building Permits (EOC Type I) - VFD"**.

### SECTION 3 – CONTROL OF THE WORK

**3-2 SELF-PERFORMANCE.** To the “GREENBOOK”, DELETE in its entirety and SUBSTITUTE with the following:

1. You shall perform, with your own organization, Contract Work amounting to at least **50%** of the Base Bid.

**3-7.6.1 Use of Computer Aided Drafting and Design.** To the “WHITEBOOK”, Item 1, DELETE in its entirety and SUBSTITUTE the following:

1. Use AutoCAD for the preparation of Plans and As-Built drawings in accordance with the City's CADD Standards.

**3-13.3 General.** To the “WHITEBOOK”, item 7, DELETE in its entirety and SUBSTITUTE with the following:

7. If installed, you shall provide the City and property owner a copy of the manufacturer's warranty for Variable Frequency Drive- equipment.
  - a. You shall involve the manufacturer in the installation and startup as needed to secure an extended 5-year Manufacturer warranty for each VFD as specified in the Contract Documents and Technical Specifications.
  - b. Nothing in here is intended to limit any manufacturer's warranty which provides the City with greater warranty rights than set forth in this section or the Contract Documents.
  - c. The warranty shall include all components. The form of the warranty shall be approved by the Engineer in accordance with 3-13.3.2, “Warranty Format Requirements”.

### SECTION 4 - CONTROL OF MATERIALS

**4-6 TRADE NAMES.** To the “WHITEBOOK”, ADD the following:

11. You shall submit your list of proposed substitutions for an “equal” item **no later than 5 Working Days after the issuance of the Notice of Intent to Award** and on the City's Product Submittal Form available at:

<https://www.sandiego.gov/ecp/edocref/>

### SECTION 5 – LEGAL RELATIONS AND RESPONSIBILITIES

**5-4 INSURANCE.** To the “GREENBOOK”, DELETE in its entirety and SUBSTITUTE with the following:

**5-4 INSURANCE.**

1. The insurance provisions herein shall not be construed to limit your indemnity and defense duties set forth in the Contract.

#### **5-4.1**

#### **Policies and Procedures.**

1. You shall procure the insurance described below, at your sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or Subcontractors.
2. Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
3. You shall maintain this insurance as required by this Contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this Contract. Your duties under the Contract, including your indemnity obligations, are not limited to the insurance coverage required by this Contract.
4. If you maintain broader coverage or higher limits than the minimums shown below, City requires and shall be entitled to the broader coverage or the higher limits maintained by you. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to City.
5. Your payment for insurance shall be included in the Contract Price you bid. You are not entitled to any additional payment from the City to cover your insurance, unless the City specifically agrees to payment in writing. Do not begin any Work under this Contract or allow any Subcontractors to begin work, until you have provided, and the City has approved, all required insurance.
6. Policies of insurance shall provide that the City is entitled to 30 days advance written notice of cancellation or non-renewal of the policy or 10 days advance written notice for cancellation due to non-payment of premium. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage and to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

#### **5-4.2**

#### **Types of Insurance.**

##### **5-4.2.1**

#### **General Liability Insurance.**

1. Commercial General Liability Insurance shall be written on the current version of the ISO Occurrence form CG 00 01 07 98 or an equivalent form providing coverage at least as broad.
2. The policy shall cover liability arising from premises and operations, XCU (explosions, underground, and collapse), independent contractors, products/completed operations, personal injury and advertising injury, bodily injury, property damage, and liability assumed under an insured's contract (including the tort liability of another assumed in a business contract).
3. There shall be no endorsement or modification limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. You shall



maintain the same or equivalent insurance for at least 10 years following completion of the Work.

4. All costs of defense shall be outside the policy limits. Policy coverage shall be in liability limits of not less than the following:

<u>General Annual Aggregate Limit</u>	<u>Limits of Liability</u>
Other than Products/Completed Operations	\$10,000,000
Products/Completed Operations Aggregate Limit	\$10,000,000
Personal Injury Limit	\$5,000,000
Each Occurrence	\$5,000,000

**5-4.2.2 Commercial Automobile Liability Insurance.**

1. You shall provide a policy or policies of Commercial Automobile Liability Insurance written on the current version of the ISO form CA 00 01 12 90 or later version or equivalent form providing coverage at least as broad in the amount of \$1,000,000 combined single limit per accident, covering bodily injury and property damage for owned, non-owned, and hired automobiles (“Any Auto”).
2. All costs of defense shall be outside the limits of the policy.

**5-4.2.3 Workers’ Compensation Insurance and Employers Liability Insurance.**

1. In accordance with the provisions of California Labor Code section 3700, you shall provide, at your expense, Workers’ Compensation Insurance and Employers Liability Insurance to protect you against all claims under applicable state workers’ compensation laws. The City, its elected officials, and employees will not be responsible for any claims in law or equity occasioned by your failure to comply with this requirement.
2. Statutory Limits shall be provided for Workers’ Compensation Insurance as required by the state of California, and Employer’s Liability Insurance with limits of no less than \$1,000,000 per accident for bodily injury or disease.
3. By signing and returning the Contract, you certify that you are aware of the provisions of California’s Workers’ Compensation laws, including Labor Code section 3700, which requires every employer to be insured against liability for workers’ compensation or to undertake self-insurance, and that you will comply with these provisions before commencing the Work..

**5-4.2.4 Contractors Pollution Liability Insurance.**

1. You shall procure and maintain at your expense or require your Subcontractor, as described below, to procure and maintain Contractors Pollution Liability Insurance applicable to the Work being performed, with a limit no less than \$2,000,000 per claim or occurrence and \$4,000,000 aggregate per policy period of one year.

2. All costs of defense shall be outside the limits of the policy.
3. You shall obtain written approval from the City for any insurance provided by your Subcontractor instead of you.
4. For approval of a substitution of your Subcontractor's insurance, you shall certify that all activities for which the Contractors Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance. The deductible shall not exceed \$25,000 per claim unless the City has provided prior, written approval.
5. Occurrence based policies shall be procured before the Work commences. Claims Made policies shall be procured before the Work commences, shall be maintained for the Contract Time, and shall include a 12-month extended Claims Discovery Period applicable to this contract or the existing policy or policies that shall continue to be maintained for 12 months after the completion of the Work without advancing the retroactive date.

**5-4.3 Rating Requirements.** Except for the State Compensation Insurance Fund, all insurance required by this Contract shall be carried only by responsible insurance companies with a rating of, or equivalent to, at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the state of California, and that have been approved by the City.

**5-4.3.1 Non-Admitted Carriers.** The City will accept insurance provided by non-admitted, "surplus lines" carriers only if the carrier is authorized to do business in the state of California and is included on the List of Approved Surplus Lines Insurers (LASLI list).

All policies of insurance carried by non-admitted carriers shall be subject to all of the requirements for policies of insurance provided by admitted carriers described in this Contract.

**5-4.4 Evidence of Insurance.** You shall furnish the City with original Certificates of Insurance, including all required amendatory endorsements (or copies of the applicable policy language effecting coverage required by this clause), prior to your commencement of Work under this Contract. In addition, The City reserves the right to require complete, certified copies of all required insurance policies, including endorsements, required by these specifications, at any time.

**5-4.5 Policy Endorsements.**

**5-4.5.1 Commercial General Liability Insurance.**

**5-4.5.1.1 Additional Insured.** To the fullest extent permitted by law and consistent with the limiting provisions set forth at California Civil Code section 2782, California Insurance Code section 11580.04, and any applicable successor statutes limiting indemnification of public agencies that bind the City, the policy or policies shall be endorsed to include

as an Additional Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:

1. Ongoing operations performed by you or on your behalf,
2. your products,
3. your work, e.g., your completed operations performed by you on your behalf, or
4. premises owned, leased, controlled, or used by you.

**5-4.5.1.2 Primary and Non-Contributory Coverage.** The policy shall be endorsed to provide that the coverage with respect to operations, including the completed operations, if appropriate, of the Named Insured is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives. Further, it shall provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

**5-4.5.1.3 Project General Aggregate Limit.** The policy or policies shall be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments which arise from the Work shall reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit shall be in addition to the aggregate limit provided for the products-completed operations hazard.

**5-4.5.2 Workers' Compensation Insurance and Employers Liability Insurance.**

**5-4.5.2.1 Waiver of Subrogation.** The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.

**5-4.5.2.2 Workers' Compensation Insurance for Work In, Over, or Alongside Navigable Waters.** In addition to the Workers' Compensation Insurance required under the General Conditions of this Contract, you shall provide additional insurance coverage for claims brought under the Longshore and Harbor Workers' Compensation Act, the Jones Act, general maritime law, and any other applicable federal or state laws, relating to your Work in, over, or alongside navigable waters.

**5-4.5.3 Contractors Pollution Liability Insurance Endorsements.**

**5-4.5.3.1 Additional Insured.** To the fullest extent permitted by law and consistent with the limiting provisions set forth at California Civil Code section 2782, California Insurance Code section 11580.04, and any applicable successor statutes limiting indemnification of public agencies that bind the City, the policy or policies shall be endorsed to include

as an Additional Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:

1. Ongoing operations performed by you or on your behalf,
2. your products,
3. your work, e.g., your completed operations performed by you on your behalf, or
4. premises owned, leased, controlled, or used by you.

**5-4.5.3.2 Primary and Non-Contributory Coverage.** The policy or policies shall be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

**5-4.5.3.3 Severability of Interest.** For Contractors Pollution Liability Insurance, the policy or policies shall provide that your insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.

**5-4.6 Deductibles and Self-Insured Retentions.** You shall disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided. The City may require you to purchase coverage with a lower retention or provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or City.

**5-4.7 Reservation of Rights.** The City reserves the right, from time to time, to review your insurance coverage, limits, deductibles, and self-insured retentions to determine if they are acceptable to the City. The City will reimburse you, without overhead, profit, or any other markup, for the cost of additional premium for any coverage requested by the Engineer, but not required by this Contract.

**5-4.8 Notice of Changes to Insurance.** You shall notify the City, in writing, 30 days prior to any material change to the policies of insurance provided under this Contract. This written notice is in addition to the requirements of paragraph 6 of Section 5-4.1.

**5-4.9 Excess Insurance.** Policies providing excess coverage shall follow the form of the primary policy or policies, including, all endorsements.

**5-10.2.1 Public Notice by Contractor.** To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

**5-10.2.1 Public Notice by Contractor.**

1. Post Project Identification Signs in accordance with 3-11.2, "Project Identification Signs".

2. No less than 5 and no more than 10 Working Days in advance of Project construction activities and utility service interruptions, you shall notify all critical facilities, businesses, institutions, property owners, residents, or any other impacted stakeholders within a minimum 300-foot (90 m) radius of the Project i.e., work area and any other affected areas as shown on the "Notification of Planned Water Shutdown" when you perform the Work.
3. The notification process must be repeated for delays and long pauses in construction activities. Verbal and written notifications, such as door hangers, shall be sent to critical facilities (including but not limited to police stations, fire stations, hospitals, and schools). A copy of written notifications sent to any critical facility shall also be sent to the Engineer.
4. You shall keep records of the people contacted, along with the dates of notification, and shall provide the record e.g., time-stamped pictures of the notices, to the Engineer upon request. You shall identify all other critical facilities that need to be notified.
5. Verbal and written notifications shall also include specific impacts from the construction of the City facilities, e.g., fire hydrants, air vacuum and blow-off devices, pedestrian ramps, and sidewalks, e.g., the loss of parking, access, and impact to private property, e.g., landscaping.
6. Furnish and distribute public notices in the form of door hangers using the City's format to all occupants and/or property owners along streets and all critical facilities such as police stations, fire stations, hospitals, and schools.
7. Where Work is to be performed at least 5 and at most 10 Working Days before starting construction, survey activities, or impacting the community as approved by the Engineer.
8. Within 5 Working Days of the completion or pausing of your construction activities where Work was performed, you shall distribute public notices in the form of door hangers, which outline the anticipated dates of Asphalt Resurfacing, Slurry Seal, Sidewalk, or Curb Ramp Work. Upon resuming construction activities, you shall redistribute door hangers.
9. "No Parking" signs shall be placed 72 hours before the scheduled construction activities and must include the name and phone number of the Contractor. The Contractor shall document the placement of the signs with time-stamped pictures.
10. Leave the door hanger notices on or at the front door of each dwelling and apartment unit and at each commercial building tenant abutting each street block segment.
11. Where the front doors of apartment units are inaccessible or occupants are unavailable, distribute the door hanger notices to the apartment manager or security officer and leave your contact information, such as business cards.
12. Provide time-stamped pictures of the notices to the Engineer.

13. Door Hanger Material: You shall use Blanks/USA brand, Item Number DHJ5B6WH, 1¼ inch (31.8 mm) Holes (removed), 2-up Jumbo Door Hanger in Bristol White, or approved equal.
14. Door hangers shall include the funding source if project is funded in part by State Gas Tax Revenue (SB1).
15. Mailed Notice Material: You shall use Cougar by Domtar, Item Number 2834, or approved equal.
16. For all Work on private property, contact each owner and occupant individually a minimum of 15 Working Days before the Work. If the Work has been delayed, re-notify owners and occupants of the new Work schedule, as directed by the Engineer.
17. A sample of public notices will be included in the Contract.

## **SECTION 6 – PROSECUTION AND PROGRESS OF THE WORK**

**6-1.1 Construction Schedule.** To the "WHITEBOOK", ADD the following:

3. Refer to the Sample City Invoice materials in **Appendix D – Sample City Invoice** and use the format shown.

**6-3.1 General.** To the "WHITEBOOK", item 3, subitem d, DELETE in its entirety and SUBSTITUTE with the following:

- d) 30 Calendar Days for full depth asphalt final mill and resurfacing work required per SDG-107, "Pavement Restoration for Asphalt Concrete Surfaced Streets - Major Excavation".

**ADD:**

**6-6.1.1 Environmental Document.**

1. The City of San Diego has prepared a **Notice of Exemption** for **PQPS Gas Sensor Replacement**, Project No. **B-22035.02.06**, as referenced in the Contract Appendix. You shall comply with all requirements of the **Notice of Exemption** as set forth in **Appendix A**.
2. The City of San Diego has prepared a **Notice of Exemption** for **PQPS VFD Replacement**, Project No. **B-22032.02.06**, as referenced in the Contract Appendix. You shall comply with all requirements of the **Notice of Exemption** as set forth in **Appendix A**.
3. Compliance with the City's environmental document shall be included in the Contract Price, unless separate bid items have been provided.

**6-9 LIQUIDATED DAMAGES.** To the "WHITEBOOK", item 2, DELETE in its entirety and SUBSTITUTE with the following:

2. The execution of the Contract shall constitute agreement between you and the City that the liquidated damage amount described in the table below is the value of the

damage caused by your failure to complete the Work within the allotted time. Such sum shall not be construed as a penalty and may be deducted from your payments if such delay occurs.

<b>Contract Value</b>	<b>Liquidated Damages Daily Amount</b>
Less than \$200,001	\$1,000
\$200,001 to \$500,000	\$1,500
\$500,001 to \$1,000,000	\$2,000
\$1,000,001 to \$2,000,000	\$2,500
\$2,000,001 to \$5,000,000	\$3,000
\$5,000,001 to \$10,000,000	\$5,500
\$10,000,001 to \$20,000,000	\$6,500
Greater Than \$20,000,000	\$7,000

**SECTION 7 – MEASUREMENT AND PAYMENT**

**7-3.1**

**General.** To the “WHITEBOOK”, ADD the following:

4. The Each Bid item for **“Remove and Replace H2S Gas Sensor-Gas Sensor”** shall include, and not be limited to, full compensation for furnishing all labor, tools and materials, equipment and incidentals for executing all the necessary work, including the demolition of existing gas sensors and appurtenances, the installation of the gas sensors and various components, conduits, cables, seal fittings, conduit boxes and any other appurtenances specified in the Plans, Contract Documents, and Technical Specifications.
5. The Each Bid item for **“Remove and Replace Oxygen Sensor-Gas Sensor”** shall include, and not be limited to, full compensation for furnishing all labor, tools and materials, equipment and incidentals for executing all the necessary work, including the demolition of existing gas sensors and appurtenances, the installation of the gas sensors and various components, conduits, cables, seal fittings, conduit boxes and any other appurtenances specified in the Plans, Contract Documents, and Technical Specifications.
6. The Each Bid item for **“Remove and Replace Explosive Gas Sensor-Gas Sensor”** shall include, and not be limited to, full compensation for furnishing all labor, tools and materials, equipment and incidentals for executing all the necessary work, including the demolition of existing gas sensors and appurtenances, the installation of the gas sensors and various components, conduits, cables, seal fittings, conduit boxes and any other appurtenances specified in the Plans, Contract Documents, and Technical Specifications.

7. The Linear Feet Bid item for “**#16 AWG 3/C Shielded Cable-Gas Sensor**” shall include, and not be limited to, full compensation for furnishing all labor, tools, materials, equipment, and incidentals for doing all the work, including but not limited to pulling, termination, testing, etc., as specified in the Plans, Contract Documents, and Technical Specifications.
8. The Each Bid item for “**Testing and Commissioning-Gas Sensor**” shall include, and not be limited to, for furnishing all labor, tools, materials, equipment, and incidentals for doing all the work, including but not limited to fine tuning of sensors, coordination with the city for proper operation with existing DCS, as shown on the plans and as specified in the Standard Specifications and these Special Provisions.
9. The Each Bid item for “**Demolition, Removal and Initial Studies-VFD**” shall include, and not be limited to, all field investigation work, studies, submittals, and calculations as required prior to demolition for each complete functional VFD replacement. Included is demolition, removal, handling, disposal, and preparation work for each existing Variable Frequency Drive and associated materials, components, and appurtenances to meet field conditions as specified in the Plans, Contract Documents, and Technical Specifications.
10. The Each Bid item for “**500 HP Variable Frequency Drive for Pump-VFD**” shall include, and not be limited to, the payment for procurement, factory acceptance testing, storage, staging, and installing each new VFD, inclusive of all labor, tools, equipment, associated materials, components, appurtenances, and spare parts necessary to meet field conditions for each complete functional VFD, as specified in the Plans, Contract Documents, and Technical Specifications.
11. The Each Bid item for “**Instrumentation and Controls-VFD**” shall include the furnishing and installation of all instrumentation equipment, cables, conduits, panels, DCS components, etc. for each complete functional VFD as specified in the Plans, Contract Documents and Technical Specifications. Included is coordination for City performed Distributed Control System (DCS) programming. VFDs not included under this bid item.
12. The Each Bid item for “**Startup and Commissioning-VFD**” shall include start-up, testing, integration, commissioning, and training of Electrical Systems and Instrumentation and Control Systems as necessary for each complete functional VFD and as specified in the Plans, Contract Documents, and Technical Specifications. This Bid Item includes finalized Loop Drawings, and Manufacturer involvement as specified in the Contract Documents and Technical Specifications and required to secure each extended warranty.
13. The Each Bid item for “**Extended Manufacturer Warranty-VFD**” shall include payment for an extended 5-year (60-Month) manufacturer warranty for each Variable Frequency Drive (VFD).



13. The Each Bid item for “**Extended Manufacturer Warranty-VFD**” shall include payment for an extended 5-year (60-Month) manufacturer warranty for each Variable Frequency Drive (VFD).

**7-3.9 Field Orders.** To the “WHITEBOOK”, DELETE in its entirety and SUBSTITUTE with the following:

1. If the cumulative total of Field Order items of Work does not exceed the “Field Orders” Bid Item, the City shall pay those Field Orders as shown below:

**TABLE 7-3.9  
FIELD ORDER LIMITS**

Contract Price	Maximum Each Field Order Work Amount
Less than \$1,000,001	\$10,000
\$1,000,001 to \$5,000,000	\$20,000
\$5,000,001 to \$10,000,000	\$25,000
\$10,000,001 to \$30,000,000	\$40,000
Greater than \$30,000,000	\$70,000

**7-3.11 Compensation Adjustments for Price Index Fluctuations.** To the “WHITEBOOK”, ADD the following:

5. This Contract **is not** subject to the provisions of The “WHITEBOOK” for Compensation Adjustments for Price Index Fluctuations for paving asphalt.

## TECHNICALS

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## SECTION 26 05 02

### BASIC ELECTRICAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 RELATED SECTIONS

- A. Requirements specified within this section apply to Division 26, Electrical. Work specified herein shall be performed as if specified in the individual sections.

##### 1.2 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  1. National Electrical Contractors Association (NECA): National Electrical Installation Standards.
  2. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. Z535.4, Product Safety Signs and Labels.
  3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
  4. Underwriters Laboratories, Inc. (UL).

##### 1.3 QUALITY ASSURANCE

- A. Provide the Work in accordance with NFPA 70. Where required by Authority Having Jurisdiction (AHJ), material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ, in order to provide a basis for approval under the NEC.
- B. Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories Inc. shall conform to those standards and shall have an applied UL listing mark or label.
- C. Provide materials and equipment acceptable to AHJ for Class, Division, and Group of hazardous area indicated.

##### 1.4 ENVIRONMENTAL CONDITIONS

- A. The following areas are classified hazardous.. Use materials and methods required for such areas.
  1. Screen Room.
  2. Dumpster Room.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.
- B. Material and equipment installed in heated and ventilated areas shall be capable of continuous operation at their specified ratings within an ambient temperature range of 40 degrees F to 104 degrees F.

### **2.2 EQUIPMENT FINISH**

- A. Manufacturer's standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in accordance with light gray color finish as approved by Engineer.

### **2.3 NAMEPLATES**

- A. Material: Laminated plastic.
- B. Attachment Screws: Stainless steel.
- C. Color: Black, engraved to a white core.
- D. Letter Height:
  - 1. Pushbuttons/Selector Switches: 1/8 inch.
  - 2. Other electrical equipment: 1/4 inch.

### **2.4 SIGNS AND LABELS**

- A. Sign size, lettering, and color shall be in accordance with NEMA Z535.4.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned. Contractor shall be responsible for actual location of equipment and devices and for proper routing and support of raceways, subject to approval of Engineer.
- B. Check approximate locations of light fixtures, switches, electrical outlets, equipment, and other electrical system components shown on Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify Engineer in writing.
- C. Install work in accordance with NECA Standard of Installation, unless otherwise specified.
- D. Keep openings in boxes and equipment closed during construction.

- E. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of Engineer. Carefully perform cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces to original condition.

### **3.2 ANCHORING AND MOUNTING**

- A. Equipment anchoring and mounting shall be in accordance with manufacturer's requirements.

### **3.3 COMBINING CIRCUITS INTO COMMON RACEWAY**

- A. Drawings show each homerun circuit to be provided. Do not combine power or control circuits into common raceways without authorization of Engineer.
- B. Homerun circuits shown on Drawings indicate functional wiring requirements for power and control circuits. Circuits may be combined into common raceways in accordance with the following requirements:
  - 1. Analog control circuits from devices in same general area to same destination.
    - a. No power or AC discrete control circuits shall be combined in same conduit with analog circuits.
    - b. No Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, paging system circuits shall be combined with power or Class 1 circuits.
    - c. Analog circuits shall be continuous from source to destination. Do not add TJB, splice, or combine into a multi-pair cable without authorization of Engineer.
    - d. Raceways shall be sized per General Circuit and Raceway Schedule and do not exceed 40 percent fill.
      - 1) Changes shall be documented on record drawings.
    - e. Discrete control circuits from devices in the same general area to the same destination.
      - 1) No power or analog control circuits shall be combined in same conduit with discrete circuits.
      - 2) No Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, and paging system circuits shall be combined with power or Class 1 circuits.
    - f. Raceways shall be sized per the General Circuit and Raceway Schedule and do not exceed 40 percent fill.
      - 1) Changes shall be documented on record drawings.

### **3.4 CLEANING AND TOUCHUP PAINTING**

- A. Cleaning: Throughout the Work, clean interior and exterior of devices and equipment by removing debris and vacuuming.
- B. Touchup Paint:
  - 1. Touchup scratches, scrapes and chips on exterior and interior surfaces of devices and equipment with finish matching type, color, and consistency and type of surface of original finish.
  - 2. If extensive damage is done to equipment paint surfaces, refinish entire equipment in a manner that provides a finish equal to or better than factory finish, that meets requirements of Specification, and is acceptable to Engineer.

### **3.5 PROTECTION FOLLOWING INSTALLATION**

- A. Protect materials and equipment from corrosion, physical damage, and effects of moisture on insulation and contact surfaces.
- B. When equipment intended for indoor installation is installed at Contractor's convenience in areas where subject to dampness, moisture, dirt or other adverse atmosphere until completion of construction, ensure adequate protection from these atmospheres is provided and acceptable to Engineer.

**END OF SECTION**

**SECTION 26 05 05**

**CONDUCTORS**

**PART 1 - GENERAL**

**1.1 REFERENCES**

- A. The following is a list of standards which may be referenced in this section:
1. Association of Edison Illuminating Companies (AEIC): CS 8, Specification for Extruded Dielectric Shielded Power Cables Rated 5 kV through 46 kV.
  2. ASTM International (ASTM):
    - a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
    - b. B3, Standard Specification for Soft or Annealed Copper Wire.
    - c. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
    - d. B496, Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors.
  3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
    - a. 48, Standard 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 500 kV.
    - b. 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V.
    - c. 404, Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500000 V.
  4. Insulated Cable Engineer's Association, Inc. (ICEA):
    - a. S-58-679, Standard for Control Cable Conductor Identification.
    - b. S-73-532, Standard for Control Thermocouple Extensions and Instrumentation Cables.
    - c. T-29-520, Conducting Vertical Cable Tray Flame Tests with Theoretical Heat Input of 210,000 Btu/hour.
  5. National Electrical Manufacturers' Association (NEMA):
    - a. CC 1, Electric Power Connectors for Substations.
    - b. WC 57, Standard for Control, Thermocouple Extension, and Instrumentation Cables.



- c. WC 70, Standard for Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
- d. WC 71, Standard for Nonshielded Cables Rated 2001-5000 Volts for Use in the Distribution of Electric Energy.
- e. WC 74, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.
- 6. National Fire Protection Association (NFPA):
  - a. 70, National Electrical Code (NEC).
  - b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- 7. Telecommunications Industry Association (TIA): TIA-568-C, Commercial Building Telecommunications Cabling Standard.
- 8. Underwriters Laboratories Inc. (UL):
  - a. 13, Standard for Safety for Power-Limited Circuit Cables.
  - b. 44, Standard for Safety for Thermoset-Insulated Wires and Cables.
  - c. 62, Standard for Safety for Flexible Cord and Cables.
  - d. 486A-486B, Standard for Safety for Wire Connectors.
  - e. 486C, Standard for Safety for Splicing Wire Connectors.
  - f. 510, Standard for Safety for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
  - g. 854, Standard for Safety for Service-Entrance Cables.
  - h. 1072, Standard for Safety for Medium-Voltage Power Cables.
  - i. 1277, Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
  - j. 1569, Standard for Safety for Metal-Clad Cables.
  - k. 1581, Standard for Safety for Reference Standard for Electrical Wires, Cables, and Flexible Cords.

## 1.2 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Wire and cable.
- B. Informational Submittals:
  - 1. Certified Factory Test Report for conductors 600 volts and below.

### 1.3 QUALITY ASSURANCE

- A. Authority Having Jurisdiction (AHJ):
  - 1. Provide the Work in accordance with NFPA 70. Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
  - 2. Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories Inc. shall conform to those standards and shall have an applied UL listing mark.
- B. Terminations and Splices for Conductors above 600 Volts: Work shall be done by journeyman lineman with splicing credentials or electrician certified to use materials approved for cable splices and terminations.

## PART 2 - PRODUCTS

### 2.1 300-VOLT RATED CABLE

- A. General:
  - 1. Type PLTC, meeting requirements of UL 13 and NFPA 70, Article 725.
  - 2. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.
  - 3. Suitable for installation in open air, in cable trays, or conduit.
  - 4. Minimum Temperature Rating: 105 degrees C.
  - 5. Passes Vertical Tray Flame Test.
  - 6. Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.
- B. Type 21, 16 AWG, Twisted, Shielded Triad Instrumentation Cable: Single triad, designed for noise rejection for process control, computer, or data log applications meeting requirements of NEMA WC 57.
  - 1. Outer Jacket: 35-mil nominal thickness.
  - 2. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer, overlapped to provide 100 percent coverage.
  - 3. Dimension: 0.28-inch nominal OD.
  - 4. Conductors:
    - a. Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8.
    - b. 20 AWG, seven-strand tinned copper drain wire.
    - c. Insulation: 15-mil PVC.
    - d. Color Code: Triad conductors; black, red, and white.

## PQPS GAS SENSOR REPLACEMENT

5. Manufacturers:
  - a. Okonite Co.
  - b. Alpha Wire Corp.
  
- C. Type 22, 18 AWG, Multitwisted, Shielded Pairs with a Common Overall Shield Instrumentation Cable: Designed for use as instrumentation, process control, and computer cable meeting NEMA WC 57.
  1. Conductors:
    - a. Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8.
    - b. Tinned copper drain wires.
    - c. Pair drain wire size AWG 20, group drain wire size AWG 18.
    - d. Insulation: 15-mil PVC.
    - e. Color Code: Pair conductors black and white; white conductor numerically printed for group identification.
    - f. Individual Pair Shield: 1.35-mil aluminum/mylar.
    - g. Cable Shield: 2.35-mil, double-faced aluminum/synthetic polymer, overlapped for 100 percent coverage.

2. Cable Sizes:

Number of Pairs	Maximum Outside Diameter (Inches)	Nominal Jacket Thickness (Mils)
4	0.50	50
8	0.66	60
12	0.79	60
16	0.91	60
24	1.13	70
36	1.31	70
50	1.55	80

3. Manufacturers:
  - a. Okonite Co.
  - b. Alpha Wire Corp.
  - c. Belden.
  
4. Manufacturers:
  - a. Okonite Co.
  - b. Alpha Wire Corp.

- c. Belden.

## 2.2 GROUNDING CONDUCTORS

- A. Equipment: Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.
- B. Direct Buried: Bare stranded copper.

## 2.3 ACCESSORIES FOR CONDUCTORS 600 VOLTS AND BELOW

- A. Tape:
  - 1. General Purpose, Flame Retardant: 7-mil, vinyl plastic, Scotch Brand 33+, rated for 90 degrees C minimum, meeting requirements of UL 510.
  - 2. Flame Retardant, Cold and Weather Resistant: 8.5-mil, vinyl plastic, Scotch Brand 88.
- B. Identification Devices:
  - 1. Sleeve:
    - a. Permanent, PVC, yellow or white, with legible machine-printed black markings.
    - b. Manufacturers and Products:
      - 1) Raychem; Type D-SCE or ZH-SCE.
      - 2) Brady, Type 3PS.
  - 2. Heat Bond Marker:
    - a. Transparent thermoplastic heat bonding film with acrylic pressure sensitive adhesive.
    - b. Self-laminating protective shield over text.
    - c. Machine printed black text.
    - d. Manufacturer and Product: 3M Co.; Type SCS-HB or approved equal.
  - 3. Marker Plate: Nylon, with legible designations permanently hot stamped on plate.
  - 4. Tie-On Cable Marker Tags:
    - a. Chemical-resistant white tag.
    - b. Size: 1/2 inch by 2 inches.
    - c. Manufacturer and Product: Raychem; Type CM-SCE or approved equal.
  - 5. Grounding Conductor: Permanent green heat-shrink sleeve, 2-inch minimum.
- C. Connectors and Terminations:
  - 1. Nylon, Self-Insulated Crimp Connectors:
    - a. Manufacturers and Products:

## PQPS GAS SENSOR REPLACEMENT

- 1) Thomas & Betts; Sta-Kon.
  - 2) Burndy; Insulug.
  - 3) ILSCO.
2. Nylon, Self-Insulated, Crimp Locking-Fork, Torque-Type Terminator:
    - a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
    - b. Seamless.
    - c. Manufacturers and Products:
      - 1) Thomas & Betts; Sta-Kon.
      - 2) Burndy; Insulink.
      - 3) ILSCO; ILSCONS.
  3. Self-Insulated, Freespring Wire Connector (Wire Nuts):
    - a. UL 486C.
    - b. Plated steel, square wire springs.
    - c. Manufacturers and Products:
      - 1) Thomas & Betts.
      - 2) Ideal; Twister.
  4. Self-Insulated, Set Screw Wire Connector:
    - a. Two piece compression type with set screw in brass barrel.
    - b. Insulated by insulator cap screwed over brass barrel.
    - c. Manufacturers:
      - 1) 3M Co.
      - 2) Thomas & Betts.
      - 3) Marrette.
- D. Cable Ties:
1. Nylon, adjustable, self-locking, and reusable.
  2. Manufacturer and Product: Thomas & Betts; TY-RAP or approved equal.
- E. Heat Shrinkable Insulation:
1. Thermally stabilized cross-linked polyolefin.
  2. Single wall for insulation and strain relief.
  3. Dual Wall, adhesive sealant lined, for sealing and corrosion resistance.
  4. Manufacturers and Products:
    - a. Thomas & Betts; SHRINK-KON.

- b. Raychem; RNF-100 and ES-2000.

## 2.4 PULLING COMPOUND

- A. Nontoxic, noncorrosive, noncombustible, nonflammable, water-based lubricant; UL listed.
- B. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable.
- C. Approved for intended use by cable manufacturer.
- D. Suitable for zinc-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways.
- E. Manufacturers:
  - 1. Ideal Co.
  - 2. Polywater, Inc.
  - 3. Cable Grip Co.
- F.

## 2.5 SOURCE QUALITY CONTROL

- A. Conductors 600 Volts and Below: Test in accordance with UL 44 and UL 854.
- B. Conductors Above 600 Volts: Test in accordance with NEMA WC 71 and AEIC CS 8 partial discharge level test for EPR insulated cable.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Conductor installation shall be in accordance with manufacturer's recommendations.
- B. Conductor and cable sizing shown is based on copper conductors, unless noted otherwise.
- C. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii.
- D. Terminate conductors and cables, unless otherwise indicated.
- E. Tighten screws and terminal bolts in accordance with UL 486A-486B for copper conductors and aluminum conductors.
- F. Cable Lugs: Provide with correct number of holes, bolt size, and center-to-center spacing as required by equipment terminals.
- G. Bundling: Where single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations are not wrapped together by some other means, bundle conductors from each conduit throughout their exposed length with cable ties placed at intervals not exceeding **12** inches on center.

- H. Ream, remove burrs, and clear interior of installed conduit before pulling wires or cables.
- I. Concrete-Encased Raceway Installation: Prior to installation of conductors, pull through each raceway a mandrel approximately 1/4 inch smaller than raceway inside diameter.
- J. Cable Tray Installation:
  - 1. Install wire and cable parallel and straight in tray.
  - 2. Bundle, in groups, wire and cable of same voltage having a common routing and destination; use cable ties, at maximum intervals of 8 feet.
  - 3. Clamp cable bundles prior to making end termination connections.
  - 4. Separate cables of different voltage rating in same cable tray with barriers.
  - 5. Fasten wires, cables, and bundles to tray with nylon cable straps at the following maximum intervals:
    - a. Horizontal Runs: 20 feet.
    - b. Vertical Runs: 5 feet.

### **3.2 CIRCUIT IDENTIFICATION**

- A. Identify power, instrumentation, and control conductor circuits at each termination, and in accessible locations such as manholes, handholes, panels, switchboards, motor control centers, pull boxes, and terminal boxes.
- B. Circuits Appearing in Circuit Schedules: Identify using circuit schedule designations.
- C. Circuits Not Appearing in Circuit Schedules:
  - 1. Assign circuit name based on device or equipment at load end of circuit.
  - 2. Where this would result in same name being assigned to more than one circuit, add number or letter to each otherwise identical circuit name to make it unique.
- D. Method:
  - 1. Conductors 3 AWG and Smaller: Identify with sleeves or heat bond markers.
  - 2. Cables and Conductors 2 AWG and Larger:
    - a. Identify with marker plates or tie-on cable marker tags.
    - b. Attach with nylon tie cord.
  - 3. Taped-on markers or tags relying on adhesives not permitted.

### **3.3 CONDUCTORS 600 VOLTS AND BELOW**

- 1.

- B. Control and Instrumentation Wiring:
1. Where terminals provided will accept such lugs, terminate control and instrumentation wiring, except solid thermocouple leads, with insulated, locking-fork compression lugs.
  2. Terminate with methods consistent with terminals provided, and in accordance with terminal manufacturer's instructions.
  3. Locate splices in readily accessible cabinets or junction boxes using terminal strips.
  4. Cable Protection:
    - a. Under Infinite Access Floors: May install without bundling.
    - b. All Other Areas: Install individual wires, pairs, or triads in flex conduit under floor or grouped into bundles at least 1/2 inch in diameter.
    - c. Maintain integrity of shielding of instrumentation cables.
    - d. Ensure grounds do not occur because of damage to jacket over shield.
- C. Extra Conductor Length: For conductors to be connected by others, install minimum 6 feet of extra conductor in freestanding panels and minimum 2 feet in other assemblies.

**END OF SECTION**



**SECTION 26 05 33**  
**RACEWAY AND BOXES**

**PART 1 - GENERAL**

**1.1 REFERENCES**

- A. The following is a list of standards which may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO): HB, Standard Specifications for Highway Bridges.
  2. ASTM International (ASTM):
    - a. A123/123M, Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
    - b. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
    - c. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
    - d. C857, Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
    - e. D149, Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
  3. Telecommunications Industry Association (TIA): 569B, Commercial Building Standard for Telecommunications Pathways and Spaces.
  4. National Electrical Contractor's Association, Inc. (NECA): Installation standards.
  5. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. C80.1, Electrical Rigid Steel Conduit (ERSC).
    - c. C80.3, Steel Electrical Metallic Tubing (EMT).
    - d. C80.5, Electrical Rigid Aluminum Conduit (ERAC).
    - e. C80.6, Electrical Intermediate Metal Conduit (EIMC).
    - f. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
    - g. TC 2, Electrical Polyvinyl Chloride (PVC) Conduit.
    - h. TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

- i. TC 6, Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation.
  - j. TC 14, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
  - k. VE 1, Metallic Cable Tray Systems.
6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
7. Underwriters Laboratories Inc. (UL):
- a. 1, Standard for Safety for Flexible Metal Conduit.
  - b. 5, Standard for Safety for Surface Metal Raceways and Fittings.
  - c. 6, Standard for Safety for Electrical Rigid Metal Conduit – Steel.
  - d. 6A, Standard for Safety for Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless.
  - e. 360, Standard for Safety for Liquid-Tight Flexible Steel Conduit.
  - f. 514B, Standard for Safety for Conduit, Tubing, and Cable Fittings.
  - g. 651, Standard for Safety for Schedule 40 and 80 Rigid PVC Conduit and Fittings.
  - h. 651A, Standard for Safety for Type EB and A Rigid PVC Conduit and HDPE Conduit.
  - i. 797, Standard for Safety for Electrical Metallic Tubing – Steel.
  - j. 870, Standard for Safety for Wireways, Auxiliary Gutters, and Associated Fittings.
  - k. 1242, Standard for Safety for Electrical Intermediate Metal Conduit – Steel.
  - l. 1660, Standard for Safety for Liquid-Tight Flexible Nonmetallic Conduit.
  - m. 1684, Standard for Safety for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
  - n. 2024, Standard for Safety for Optical Fiber and Communication Cable Raceway.

## 1.2 SUBMITTALS

### A. Action Submittals:

- 1. Manufacturer’s Literature:
  - a. PVC-coated rigid galvanized steel conduit, submittal to include copy of manufacturer’s warranty.
  - b. Conduit fittings.
  - c. Wireways.

B. Informational Submittals:

1. Manufacturer's certification of training for PVC-coated rigid galvanized steel conduit installer.

**1.3 QUALITY ASSURANCE**

A. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
2. Materials and equipment manufactured within scope of standards published by Underwriters Laboratories, Inc. shall conform to those standards and shall have an applied UL listing mark.

B. PVC-Coated, Rigid Galvanized Steel Conduit Installer: Certified by conduit manufacturer as having received minimum 2 hours of training on installation procedures.

**PART 2 - PRODUCTS**

**2.1 CONDUIT AND TUBING**

A. PVC-Coated Rigid Galvanized Steel Conduit:

1. Meet requirements of NEMA RN 1
2. Material:
  - a. Meet requirements of NEMA C80.1 and UL 6.
  - b. Exterior Finish: PVC coating, 40-mil nominal thickness; bond to metal shall have tensile strength greater than PVC.
  - c. Interior finish: Urethane coating, 2-mil nominal thickness.
3. Threads: Hot-dipped galvanized and factory coated with urethane.
4. Bendable without damage to interior or exterior coating.

**2.2 FITTINGS**

A. PVC-Coated Rigid Galvanized Steel Conduit:

1. Meet requirements of UL 514B.
2. Fittings: Rigid galvanized steel type, PVC coated by conduit manufacturer.
3. Conduit Bodies: Cast metal hot-dipped galvanized or urethane finish. Cover shall be of same material as conduit body. PVC coated by conduit manufacturer.
4. Finish: 40-mil PVC exterior, 2-mil urethane interior.
5. Overlapping pressure-sealing sleeves.

6. Conduit Hangers, Attachments, and Accessories: PVC-coated.
  7. Manufacturers:
    - a. Robroy Industries.
    - b. Ocal.
  8. Expansion Fitting:
    - a. Manufacturer and Product: Ocal; OCAL-BLUE XJG or approved equal.
- B. Not Used.
- a. .

### **2.3 OUTLET AND DEVICE BOXES**

- A. PVC-Coated Cast Metal:
1. Type: One-piece.
  2. Material: Malleable iron, cast ferrous metal, or cast aluminum.
  3. Coating:
    - a. Exterior Surfaces: 40-mil PVC.
    - b. Interior Surfaces: 2-mil urethane.
  4. Manufacturers:
    - a. Robroy Industries.
    - b. Ocal.
    - c.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Conduit and tubing sizes shown are based on use of copper conductors. Reference Section 26 05 05, Conductors, concerning conduit sizing for aluminum conductors.
- B. Comply with NECA Installation Standards.
- C. Crushed or deformed raceways not permitted.
- D. Maintain raceway entirely free of obstructions and moisture.
- E. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.
- F. Aluminum Conduit: Do not install in direct contact with concrete. Install in PVC sleeve or cored hole through concrete walls and slabs.
- G. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.

- H. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.
- I. Group raceways installed in same area.
- J. Proximity to Heated Piping: Install raceways minimum 12 inches from parallel runs.
- K. Follow structural surface contours when installing exposed raceways. Avoid obstruction of passageways.
- L. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes.
- M. Block Walls: Do not install raceways in same horizontal course or vertical cell with reinforcing steel.
- N. Install watertight fittings in outdoor, underground, or wet locations.
- O. Paint threads and cut ends, before assembly of fittings, galvanized conduit, PVC-coated galvanized conduit, or IMC installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound.
- P. Metal conduit shall be reamed, burrs removed, and cleaned before installation of conductors, wires, or cables.
- Q. Do not install raceways in concrete equipment pads, foundations, or beams without Engineer approval.
- R. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.
- S. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.
- T. Install conduits for fiber optic cables, telephone cables, and Category 6 data cables in strict conformance with the requirements of TIA 569B.

### 3.2 CONDUIT APPLICATION

- A. Diameter: Minimum 3/4 inch.
- B. Exterior, Exposed:
  - 1. PVC-coated rigid galvanized steel.
- C. Interior, Exposed:
  - 1. Rigid galvanized steel.
  - 2. D: Intermediate metal.
  - 3. Electric metallic tubing for ceiling portion of lighting circuits.
  - 4. PVC-coated rigid galvanized steel.

### 3.3 SUPPORT

- A. Support from structural members only, at intervals not exceeding NFPA 70 requirements. Do not exceed 8 feet in any application. Do not support from piping, pipe supports, or other raceways.
- B. Multiple Adjacent Raceways: Provide ceiling trapeze. For trapeze-supported conduit, allow 20 percent extra space for future conduit.
- C. Application/Type of Conduit Strap:
  - 1. Not Used.
  - 2. Rigid Steel or EMT Conduit: Zinc coated steel, pregalvanized steel or malleable iron.
  - 3. PVC-Coated Rigid Steel Conduit: PVC-coated metal.
  - 4. Nonmetallic Conduit: Nonmetallic or PVC-coated metal.
- D. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:
  - 1. Wood: Wood screws.
  - 2. Hollow Masonry Units: Toggle bolts.
  - 3. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.
  - 4. Steelwork: Machine screws.
  - 5. Location/Type of Hardware:
    - a. Dry, Noncorrosive Areas: Galvanized.
    - b. Wet, Noncorrosive Areas: Stainless steel.
    - c. Corrosive Areas: Stainless steel.
- E. Nails or wooden plugs inserted in concrete or masonry for attaching raceway not permitted. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.
- F. Support aluminum conduit on concrete surfaces with stainless steel or nonmetallic spacers, or aluminum or nonmetallic framing channel.

### 3.4 BENDS

- A. Install concealed raceways with a minimum of bends in the shortest practical distance.
- B. Make bends and offsets of longest practical radius. Bends in conduits and ducts being installed for fiber optic cables shall be not less than 20 times cable diameter, 15 inches minimum.
- C. Install with symmetrical bends or cast metal fittings.
- D. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.

- E. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.
- F. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run, and raceways are same size.
- G. PVC Conduit:
  - 1. Bends 30 Degrees and Larger: Provide factory-made elbows.
  - 2. 90-Degree Bends: Provide rigid steel elbows, PVC-coated where direct buried.
  - 3. Use manufacturer's recommended method for forming smaller bends.
- H. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.
- I. .

### **3.5 OUTLET AND DEVICE BOXES**

- A. General:
  - 1. Install plumb and level.
  - 2. Install suitable for conditions encountered at each outlet or device in wiring or raceway system, sized to meet NFPA 70 requirements.
  - 3. Open no more knockouts in sheet steel device boxes than are required; seal unused openings.
  - 4. Install galvanized mounting hardware in industrial areas.
- B. Size:
  - 1. Depth: Minimum 2 inches, unless otherwise required by structural conditions. Box extensions not permitted.
    - a. Hollow Masonry Construction: Install with sufficient depth such that conduit knockouts or hubs are in masonry void space.
  - 2. Ceiling Outlet: Minimum 4-inch octagonal device box, unless otherwise required for installed fixture.
  - 3. Switch and Receptacle: Minimum 2-inch by 4-inch device box.
- C. Locations:
  - 1. Drawing locations are approximate.
  - 2. To avoid interference with mechanical equipment or structural features, relocate outlets as directed by Engineer.
  - 3. Light Fixture: Install in symmetrical pattern according to room layout, unless otherwise shown.
- D. Mounting Height:
  - 1. General:

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- a. Dimensions given to centerline of box.
  - b. Where specified heights do not suit building construction or finish, adjust up or down to avoid interference.
  - c. Do not straddle CMU block or other construction joints.
2. Light Switch:
    - a. 48 inches above floor.
    - b. When located next to door, install on lock side of door.
  3. Thermostat: 54 inches above floor.
  4. Telephone Outlet:
    - a. 15 inches above floor.
    - b. 6 inches above counter tops.
    - c. Wall Mounted: 52 inches above floor.
  5. Convenience Receptacle:
    - a. General Interior Areas: 15 inches above floor.
    - b. General Interior Areas (Counter Tops): Install device plate bottom or side flush with top of backsplash, or 6 inches above counter tops without backsplash.
    - c. Industrial Areas, Workshops: 48 inches above floor.
    - d. Outdoor Areas: 24 inches above finished grade.
  6. Special-Purpose Receptacle: 15 inches above floor or as shown.
  7. Switch, Motor Starting: 48 inches above floor, unless otherwise indicated on Drawings.
- E. Flush Mounted:
1. Install with concealed conduit.
  2. Install proper type extension rings or plaster covers to make edges of boxes flush with finished surface.
  3. Holes in surrounding surface shall be no larger than required to receive box.
- F. Supports:
1. Support boxes independently of conduit by attachment to building structure or structural member.
  2. Install bar hangers in frame construction or fasten boxes directly as follows:
    - a. Wood: Wood screws.
    - b. Concrete or Brick: Bolts and expansion shields.
    - c. Hollow Masonry Units: Toggle bolts.



- d. Steelwork: Machine screws.
- 3. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.
- 4. Provide plaster rings where necessary.
- 5. Boxes embedded in concrete or masonry need not be additionally supported.
- G. Install separate junction boxes for flush or recessed lighting fixtures where required by fixture terminal temperature.
- H. Boxes Supporting Fixtures: Provide means of attachment with adequate strength to support fixture.

### **3.6 JUNCTION AND PULL BOXES**

- A. General:
  - 1. Install plumb and level.
  - 2. Installed boxes shall be accessible.
  - 3. Do not install on finished surfaces.
  - 4. Use outlet boxes as junction and pull boxes wherever possible and allowed by applicable codes.
  - 5. Use conduit bodies as junction and pull boxes where no splices are required and allowed by applicable codes.
  - 6. Install pull boxes where necessary in raceway system to facilitate conductor installation.
  - 7. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.
  - 8. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.
- B. Flush Mounted:
  - 1. Install with concealed conduit.
  - 2. Holes in surrounding surface shall be no larger than required to receive box.
  - 3. Make edges of boxes flush with final surface.
- C. Mounting Hardware:
  - 1. Noncorrosive Dry Areas: Galvanized.
  - 2. Noncorrosive Wet Areas: Stainless steel.
  - 3. Corrosive Areas: Stainless steel.
- D. Supports:
  - 1. Support boxes independently of conduit by attachment to building structure or structural member.

2. Install bar hangers in frame construction or fasten boxes directly as follows:
    - a. Wood: Wood screws.
    - b. Concrete or Brick: Bolts and expansion shields.
    - c. Hollow Masonry Units: Toggle bolts.
    - d. Steelwork: Machine screws.
  3. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.
  4. Boxes embedded in concrete or masonry need not be additionally supported.
- E. At or Below Grade:
1. Install boxes for below grade conduit flush with finished grade in locations outside of paved areas, roadways, or walkways.
  2. If adjacent structure is available, box may be mounted on structure surface just above finished grade in accessible but unobtrusive location.
  3. Obtain Engineer's written acceptance prior to installation in paved areas, roadways, or walkways.
  4. Use boxes and covers suitable to support anticipated weights.
- F. Install Drain/breather fittings in NEMA 250 Type 4 and Type 4X enclosures.

### **3.7 IDENTIFICATION DEVICES**

- A. Raceway Tags:
1. Identify origin and destination.
  2. For exposed raceways, install tags at each terminus, near midpoint, and at minimum intervals of every 50 feet, whether in ceiling space or surface mounted.
  3. Install tags at each terminus for concealed raceways.
  4. Provide nylon strap for attachment.
- B. Warning Tape: Install approximately 12 inches above underground or concrete-encased raceways. Align parallel to, and within 12 inches of, centerline of run.
- C. Buried Raceway Marker:
1. Install at grade to indicate direction of underground raceway.
  2. Install at bends and at intervals not exceeding 100 feet in straight runs.
  3. Embed and secure to top of concrete base, sized 14 inches long, 6 inches wide, and 8 inches deep; top set flush with finished grade.

### **3.8 PROTECTION OF INSTALLED WORK**

- A. Protect products from effects of moisture, corrosion, and physical damage during construction.

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- B. Provide and maintain manufactured watertight and dust-tight seals over conduit openings during construction.
- C. Touch up painted conduit threads after assembly to cover nicks or scars.
- D. Touch up coating damage to PVC-coated conduit with patching compound approved by manufacturer. Compound shall be kept refrigerated according to manufacturers' instructions until time of use.

**END OF SECTION**

**SECTION 26 08 00**

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**PART 1 - GENERAL**

**1.1 REFERENCES**

- A. The following is a list of standards which may be referenced in this section:
1. ASTM International (ASTM):
    - a. D877, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
    - b. D923, Standard Practice for Sampling Electrical Insulating Liquids.
    - c. D924, Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids.
    - d. D971, Standard Test Method for Interfacial Tension of Oil Against Water by the Ring Method.
    - e. D974, Standard Test Method for Acid and Base Number by Color-Indicator Titration.
    - f. D1298, Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
    - g. D1500, Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale).
    - h. D1524, Standard Test Method for Visual Examination of Used Electrical Insulating Oils of Petroleum Origin in the Field.
    - i. D1533, Standard Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration.
    - j. D1816, Standard Test Method for Dielectric Breakdown Voltage of Insulating Oils of Petroleum Origin Using VDE Electrodes.
  2. Institute of Electrical and Electronics Engineers (IEEE):
    - a. 43, Recommended Practice for Testing Insulating Resistance of Rotating Machinery.
    - b. 48, Standard Test Procedures and Requirements for Alternating-Current Cable Terminators Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5kV through 500kV.
    - c. 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

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- d. 95, Recommended Practice for Insulation Testing of AC Electric Machinery (2300V and Above) with High Direct Voltage.
  - e. 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V.
  - f. 400, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems.
  - g. 450, Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications.
  - h. C2, National Electrical Safety Code.
  - i. C37.20.1, Standard for Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear.
  - j. C37.20.2, Standard for Metal-Clad Switchgear.
  - k. C37.20.3, Standard for Metal-Enclosed Interrupter Switchgear.
  - l. C37.23, Standard for Metal-Enclosed Bus.
  - m. C62.33, Standard Test Specifications for Varistor Surge-Protective Devices.
3. Insulated Cable Engineers Association (ICEA):
- a. S-93-639, 5-46 kV Shielded Power Cables for Use in the Transmission and Distribution of Electric Energy.
  - b. S-94-649, Concentric Neutral Cables Rated 5 through 46 kV.
  - c. S-97-682, Standard for Utility Shielded Power Cables Rated 5 through 46 kV.
4. National Electrical Manufacturers Association (NEMA):
- a. AB 4, Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications.
  - b. PB 2, Deadfront Distribution Switchboards.
  - c. WC 74, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.
5. InterNational Electrical Testing Association (NETA): ATS, Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
6. National Fire Protection Association (NFPA):
- a. 70, National Electrical Code (NEC).
  - b. 70B, Recommended Practice for Electrical Equipment Maintenance.
  - c. 70E, Standard for Electrical Safety in the Workplace.

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- d. 101, Life Safety Code.
- 7. National Institute for Certification in Engineering Technologies (NICET).
- 8. Occupational Safety and Health Administration (OSHA): CFR 29, Part 1910, Occupational Safety and Health Standards.

## 1.2 SUBMITTALS

### A. Informational Submittals:

- 1. Submit 30 days prior to performing inspections or tests:
  - a. Schedule for performing inspection and tests.
  - b. List of references to be used for each test.
  - c. Sample copy of equipment and materials inspection form(s).
  - d. Sample copy of individual device test form.
  - e. Sample copy of individual system test form.
- 2. Submit test or inspection reports and certificates for each electrical item tested within 30 days after completion of test:
- 3. Operation and Maintenance Data:
  - a. After test or inspection reports and certificates have been reviewed by Engineer and returned, insert a copy of each in Operation and Maintenance Manual.
- 4. Programmable Settings: At completion of Performance Demonstration Test, submit final hardcopy printout and electronic files on compact disc of as-left setpoints, programs, and device configuration files for:
  - a. Electrical communications modules.

## 1.3 QUALITY ASSURANCE

### A. Testing Firm Qualifications:

- 1. Corporately and financially independent 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 NICET or NETA and having 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 noncertified 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. In compliance with OSHA CFR 29, Part 1910.7 criteria for accreditation of testing laboratories or a full member company of NETA.
- B. Test equipment shall have an operating accuracy equal to or greater than requirements established by NETA ATS.
- C. Test instrument calibration shall be in accordance with NETA ATS.

#### **1.4 SEQUENCING AND SCHEDULING**

- A. Perform inspection and electrical tests after equipment listed herein has been installed.
- B. Perform tests with apparatus de-energized whenever feasible.
- C. Inspection and electrical tests on energized equipment shall be:
1. Scheduled with Engineer prior to de-energization.
  2. Minimized to avoid extended period of interruption to the operating plant equipment.
- D. Notify Engineer at least 24 hours prior to performing tests on energized electrical equipment.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION**

##### **3.1 GENERAL**

- A. Tests and inspections shall establish:
1. Electrical equipment is operational within industry and manufacturer's tolerances and standards.
  2. Installation operates properly.
  3. Equipment is suitable for energization.
  4. Installation conforms to requirements of Contract Documents and NFPA 70, NFPA 70E, NFPA 101, and IEEE C2.
- B. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer's recommendations.
- C. Adjust mechanisms and moving parts of equipment for free mechanical movement.
- D. Adjust and set electromechanical electronic relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

- E. Verify nameplate data for conformance to Contract Documents and approved Submittals.
- F. Realign equipment not properly aligned and correct unlevelness.
- G. Properly anchor electrical equipment found to be inadequately anchored.
- H. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench/screw driver to manufacturer's recommendations, or as otherwise specified in NETA ATS.
- I. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.
- J. Provide proper lubrication of applicable moving parts.
- K. Inform Engineer of working clearances not in accordance with NFPA 70.
- L. 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.
- M. Electrical Enclosures:
  - 1. Remove foreign material and moisture from enclosure interior.
  - 2. Vacuum and wipe clean enclosure interior.
  - 3. Remove corrosion found on metal surfaces.
  - 4. Repair or replace, as determined by Engineer door and panel sections having dented surfaces.
  - 5. Repair or replace, as determined by Engineer poor fitting doors and panel sections.
  - 6. Repair or replace improperly operating latching, locking, or interlocking devices.
  - 7. Replace missing or damaged hardware.
  - 8. Finish:
    - a. Provide matching paint and touch up scratches and mars.
    - b. If required because of extensive damage, as determined by Engineer, refinish entire assembly.
- N. Replace fuses and circuit breakers that do not conform to size and type required by the Contract Documents or approved Submittals.
- O. Replace transformer insulating oil not in compliance with ASTM D923.

### **3.2 CHECKOUT AND STARTUP**

- A. Voltage Field Test:



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1. Check voltage at point of termination of power company supply system to Project when installation is essentially complete and is in operation.
2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.
3. Record supply voltage (all three phases simultaneously on same graph) for 24 hours during normal working day.
  - a. Submit Voltage Field Test Report within 5 days of test.
4. Unbalance Corrections:
  - a. Make written request to power company to correct condition if balance (as defined by NEMA) exceeds 1 percent, or if voltage varies throughout the day and from loaded to unloaded condition more than plus or minus 4 percent of nominal.
    - b. Obtain written certification from responsible power company official that voltage variations and unbalance are within their normal standards if corrections are not made.

### **3.3 LOW VOLTAGE CABLES, 600 VOLTS MAXIMUM**

- A. Visual and Mechanical Inspection:
  1. Shielded Instrumentation Cables For:
    - a. Proper shield grounding.
    - b. Proper terminations.
    - c. Proper circuit identification.

**END OF SECTION**

**SECTION 40 76 00**  
**PROCESS GAS ANALYTICAL MEASUREMENT**

**PART 1 GENERAL**

1.01 RELATED SECTIONS

- A. Related Specification Sections include but are not limited to:
1. Section 26 05 02 - Basic Electrical Requirements.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Gas Association (AGA):
    - a. Gas Measurement Committee Report #3.
  2. American Iron and Steel Institute (AISI).
  3. American National Standards Institute (ANSI).
  4. American Society of Mechanical Engineers (ASME):
    - a. B16.5, Pipe Flanges and Flanged Fittings.
    - b. B31.1, Power Piping.
    - c. PTC 19.3, Instruments and Apparatus, Part 3 Temperature Measurement.
    - d. PTC 19.5, Application of Fluid Meters, Part 2.
    - e. Section II, Part A SA-182, Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
    - f. Section II, Part A SA-479, Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
  5. ASTM International (ASTM):
    - a. A106, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
    - b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
    - c. A182, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
    - d. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
    - e. A276, Standard Specification for Stainless Steel Bars and Shapes.
    - f. A479, Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
    - g. B16, Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.
    - h. B75, Standard Specification for Seamless Copper Tube.

- i. B124, Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes.
  - j. B283, Standard Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed).
  - k. B453, Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Rod, Bar, and Shapes.
6. The International Society of Automation (ISA):
- a. MC96.1, Temperature Measurement Thermocouples.
7. National Electrical Manufacturers Association (NEMA):
- a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

### 1.3 SUBMITTALS

#### A. Action Submittals:

- 1. Product Data: Products listed in Part 2.

## **PART 2 PRODUCTS**

### 2.1 COMBUSTIBLE AND TOXIC GAS DETECTORS:

#### A. Acceptable manufacturers:

- 1. Diffusion type sensors:
  - a. MSA Instruments.
  - b. Or equal.

#### B. Control unit:

- 1. Front mounted indication.
  - a. Minimum three-digit display of gas concentration associated with each sensor.
  - b. Alarm status indicators for each gas sensing channel:
    - 1) Trouble.
    - 2) High gas level detected.
    - 3) High gas level detected.
- 2. Alarm relay outputs:
  - a. "System trouble"(Fail) contact to indicate trouble in the event any of the following conditions are true:
    - 1) System power loss.
    - 2) Signal loss from any sensor.
    - 3) Signal out of appropriate range.
    - 4) Control module malfunction or removal.
  - b. Each output contact shall be Form C, DPDT, rated for 3 amps resistive at 120 VAC.
  - c. Output signals: 4-20 mA signal representing gas concentration for each gas sensor.
  - d. Temperature range: 32 to 140 DEG F.
  - e. Relative humidity range: 0-95% non-condensing.

C. Sensor and transmitter design and fabrication:

1. Sensor mounting type shall be as indicated on schedule: Either diffusion mounted (point type) or sample draw mounted.
2. Combustible gas sensor shall be catalytic bead type with demonstrated resistance to poisoning by silicones and hydrogen sulfide gases.
3. Sensor: utilize infrared absorption technique, impervious to gas poisoning
4. Toxic gas sensor shall be the electrochemical type and shall not require the periodic addition of reagents.
5. Interconnect wiring from sensor to transmitter (if not integral) or control unit shall be 3-wire shielded cable.
6. Sensing element shall have minimum useful life of one year.
7. Transmitter output: 4-20 mA signal proportional to measured gas level.
  - a. Capable of driving 600 ohm load at 24 VDC supply voltage.
8. Accuracy:
  - a. Combustible gas detection:
    - 1) +3% LEL to 50% full scale.
    - 2) +5% LEL, 50 to 100% full scale.
  - b. Toxic gas detection:
    - 1) +10% full scale or 2 PPM, whichever is greater.
  - c. Oxygen gas detection:
    - 1) + 1/-1% Vol O<sub>2</sub>.
9. Environmental:
  - a. Ambient operating temperature: -40 to 158 DEGF.
  - b. Relative humidity: 0-95% non-condensing.
10. Housing: In accordance with the area classification shown on Drawings.
11. Provide nonintrusive means of calibration.
12. Local displays:
  - a. 3-1/2 digit LCD or LED display of measured gas level.
  - b. Fault LED.
13. Standalone sensors and transmitters (without central control unit):
  - a. Provide relay contacts rated at 1/2 amps at 120 VAC for each of the following conditions:
    - 1) High gas level (warning level).
    - 2) High gas level (alarm level).
    - 3) Sensor fault condition.
14. Relay contacts shall be normally energized (normally closed); contacts shall open in the event of a warning, alarm or trouble condition.
15. Minimum detector response time when exposed to 100% LEL gas concentration:
  - a. 10 seconds to 50% LEL.
  - b. 30 seconds to 90% LEL.
16. Store calibration data in nonvolatile memory or back up with battery.

D. Provide one calibration kit for each type of gas monitored.

1. Calibration kits shall be furnished complete with all tubing, regulators, fittings, communication devices, and accessories required to calibrate sensors.

2. Calibration kit shall utilize nonintrusive means of calibrating sensors/transmitters.
- E. Provide two full cylinders of each type of calibration check gas.
1. Cylinder size: 17 liters.
- F. Provide the same quantity of zero air cylinders as the total required number of calibration check gas cylinders (of all types).
- a. Non-intrusive Calibration Capability. All sensor/transmitters can be calibrated without opening any enclosures via through glass push buttons, Bluetooth connection, or HART communications.
    - 1) The sensor/transmitter will not be affected by low level ambient light either natural or manmade.
    - 2) The display of the sensor/transmitter will instruct the user when to apply zero and span gas. The sensor/transmitter will automatically adjust its internal settings to the proper calibration values without further intervention by the user. Upon completion of a successful calibration, the sensor transmitter will exit the calibration mode. Date stamp of last successful calibration will be retained in the sensor/transmitter internal memory, with capability to be displayed on the LED display.
    - 3) In the event of an unsuccessful calibration for any reason, the sensor/transmitter display must show an unsuccessful calibration and revert to its previous calibration setting.
    - 4) Use of flashlight type devices, magnets or clamp-on devices to achieve calibration is not acceptable. The acceptable method uses a transmitter that employs through glass push buttons, Bluetooth connection, or HART Communications.

## 2.2 ACCESSORIES

- A. Furnish all mounting brackets, hardware and appurtenances required for mounting primary elements and transmitters.
1. Materials, unless otherwise specified, shall be as follows:
    - a. Bolts, nuts, washers, expansion anchors: 316 stainless steel.
    - b. Mounting brackets: 316 stainless steel.
    - c. Mounting plates, angles: 316 stainless steel.
    - d. Instrument pipe stands: 316 stainless steel.
- B. Cable lengths between sensors and transmitters shall be continuous (without splices) and as required to accommodate locations as shown on Drawings.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.

B. Instrument Mounting:

1. Mount all instruments where they will be accessible from fixed ladders, platforms, or grade.
2. Mount all local indicating instruments with face forward toward the normal operating area, within reading distance, and in the line of sight.
3. Mount instruments level, plumb, and support rigidly.
4. Mount to provide:
  - a. Protection from heat, shock, and vibrations.
  - b. Accessibility for maintenance.
  - c. Freedom from interference with piping, conduit and equipment.

C. Threaded Connection Seals:

1. Use Tite-Seal or acceptable alternate.
2. Use of lead base pipe dope or Teflon tape is not acceptable.
3. Do not apply Tite-Seal to tubing threads of compression fittings.

3.2 SCHEDULE

A. Schedule:

TAG NO	AREA	LOCATION	GAS	MOUNT TYPE	RANGE
01-AE/AIT-615A	01 PQPS	SCREEN ROOM	Methane	D	0-9000 PPM
01-AE/AIT-615B	01 PQPS	SCREEN ROOM	Hydrogen Sulfide	D	0-1000 ppm
01-AE/AIT-615C	01 PQPS	SCREEN ROOM	OXYGEN	D	0-25%
01-AE/AIT-616A	01 PQPS	PUMP ROOM	Methane	D	0-9000 PPM
01-AE/AIT-616B	01 PQPS	PUMP ROOM	Hydrogen Sulfide	D	0-1000 ppm
01-AE/AIT-616C	01 PQPS	PUMP ROOM	OXYGEN	D	0-25%

MOUNT TYPE: D – diffusion (point) type, IR – infrared, SP – single point sample draw.

**END OF SECTION**



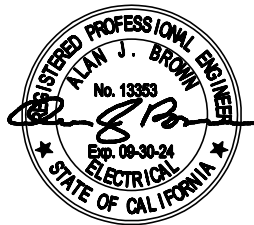
## **CITY OF SAN DIEGO**

# **PENASQUITOS SEWER PUMP STATION**

## **VFD REPLACEMENT PROJECT**

**WBS B22032**

# **VOLUME 1 SPECIFICATIONS**



**August 2024**

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**SECTION 01 14 00**  
**WORK RESTRICTIONS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 USE OF PREMISES**

- A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated. Coordinate site access with the City of San Diego.
  - 1. Limits: Confine constructions operations to the areas indicated.
  - 2. Occupancy: Allow for full occupancy by the City of San Diego on site.
  - 3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Use of Existing Building: Maintain existing building in a weather-tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

**1.3 OCCUPANCY REQUIREMENTS**

- A. Full City of San Diego Occupancy: The City will occupy site and existing building during the entire construction period. Cooperate with the City of San Diego during construction operations to minimize conflicts and facilitate usage. Perform the Work so as not to interfere with normal building usage and operations.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

- A. Notification
  - 1. Unless otherwise indicated by the Engineer, you shall provide a minimum of 14 days notice in writing to the Engineer before planned demolition, removal, installation or other work to be performed at the plant. Do not start work without permission of the Engineer.

**END OF SECTION**

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**SECTION 01 31 00**  
**PROJECT MANAGEMENT AND COORDINATION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Conservation.
  - 3. Coordination Drawings.
  - 4. Administrative and supervisory personnel.
  - 5. Project meetings.
- B. Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 2. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

**1.3 COORDINATION**

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation and to not interfere with other projects.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for City of San Diego and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule and 3-Week Lookahead
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Pre-installation conferences.
  7. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

#### **1.4 SUBMITTALS**

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
  3. Refer to Division 26 Sections for specific Coordination Drawing requirements for electrical installations.
- B. Staff Names: Within 5 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. If some or all of these facilities are not used on the Project, distribute the list to appropriate personnel.

## **1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL**

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
  1. Include special personnel required for coordination of operations with other contractors.

## **1.6 PROJECT MEETINGS**

- A. General: The Contractor shall participate in project meetings at the Project Site, unless otherwise indicated by the Engineer. The Engineer may at its discretion request attendance by representatives of the Contractor's suppliers, manufacturers, and other subcontractors. Project meetings include but are not limited to Preinstallation Conferences, Progress Meetings, and Coordination Meetings.
  1. The Engineer shall preside over meetings and prepare and distribute agenda and minutes.
- B. Pre-installation Conferences: A pre-installation conference will be conducted at a mutually agreed time and place before each construction activity that requires coordination with other construction.
  1. The contractor's Project Manager, its superintendent, and its subcontractors including representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations, shall attend the meeting.
  2. The contractor shall be prepared to furnish and discuss progress of construction activities and preparations for the particular activity under consideration, including but not limited to items listed below.
    - a. Contract Documents.
    - b. Options.
    - c. Field Decisions and Change Orders.
    - d. Purchases.
    - e. Deliveries.
    - f. Submittals.
    - g. Possible conflicts.
    - h. Compatibility problems.
    - i. Cost Loaded Construction Schedule.
    - j. Weather limitations.
    - k. Manufacturer's written recommendations.
    - l. Warranty requirements.
    - m. Compatibility of materials.

- n. Space and access limitations.
  - o. Regulations of authorities having jurisdiction.
  - p. Testing and inspecting requirements.
  - q. Required performance results.
  - r. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements.
  4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate necessary actions to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Progress Meetings: Unless otherwise indicated, the Engineer will schedule and hold regular on-site progress meetings at least weekly and at other times as required by the progress of the work. The Contractor, Engineer, and all subcontractors active on the site or involved with future activities shall attend each progress meeting. The Engineer, may, at its discretion, request attendance by representatives of the Contractor's suppliers, manufacturers, and other subcontractors as well as representatives of the City or stakeholders.
1. The Engineer shall preside at the meetings and will arrange for keeping and distributing the minutes. The purpose of the meetings will be to review the progress of the work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the Contractor is required to present any issues which may impact their work, with a plan to resolve these issues expeditiously.
  2. The agenda will include but will not be limited to the below items. The Contractor shall be prepared to discuss all items.
    - a. Transcript or minutes of previous meeting.
    - b. The Contractor's Construction Schedule and planned work progress for the next work period.
    - c. Review present and future needs of each entity present, including the following:
      - 1) Progress since the last meeting.
      - 2) Shop Drawings, Requests for Informations, and Substitution Requests review.
      - 3) Problems, conflicts, disputed issues, potential claims, and observations.
      - 4) Field Orders and Change Orders
      - 5) Interface requirements.
      - 6) Sequence of operations.
      - 7) Status of submittals.
      - 8) Deliveries, including off-site fabrications and delivery schedules. Corrective measures required.

- 9) Off-site fabrication
- 10) Access
- 11) Site Utilization and Work Hours
- 12) Safety
- 13) Progress cleaning.
- 14) Quality and work standards.
- 15) Documentation of information for payment requests.
- 16) Other issues and business as required

D. Coordination Meetings: The Contractor shall participate in coordination meetings as requested by the Engineer with the City, subcontractor, supplier, stakeholders, and other entity concerned with current progress. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and installation conferences, but may be in conjunction with those meetings. The Contractor shall be prepared to present the detailed work plan for construction, including but not limited to planning, coordination, performance of future activities and action items, design changes, utility conflicts, operational activities, construction problems/claims or disputes.



**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

**SECTION 01 33 00**  
**SUBMITTAL PROCEDURES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
  - 2. Division 1 Section "Quality Requirements" for submitting test and inspection reports.
  - 3. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.
  - 4. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

**1.3 DEFINITIONS**

- A. Action Submittals: Written and graphic information that requires Engineer's responsive action.
- B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

**1.4 SUBMITTAL PROCEDURES**

- A. General: Electronic CAD Drawings of the Contract Drawings will not be provided by Engineer for Contractor's use in preparing submittals.
  - 1. See the Whitebook, Section 5-13 for Electronic Communication Requirements.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Engineer.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Unique identifier, including revision number.
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Other necessary identification.
- CI. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- CII. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. When required utilize Engineering & Capital Project's Product Submittal Form (<https://www.sandiego.gov/sites/default/files/legacy/publicworks/pdf/edocref/product-submittal-form.pdf>). Engineer will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Provide locations on form for the following information:
  - a. Submittal Number
  - b. Project name.
  - c. Date.
  - d. Destination (To:).
  - e. Source (From:).
  - f. Names of Contractor, subcontractor, manufacturer, and supplier.
  - g. Category and type of submittal.
  - h. Submittal purpose and description.
  - i. References
  - j. Submittal and transmittal distribution record.
  - k. Remarks.
  - l. Signature of transmitter.

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

H. Use for Construction: Use only final submittals with mark indicating action taken by Engineer in connection with construction.

## **PART 2 - PRODUCTS**

### **2.1 ACTION SUBMITTALS**

- A. General: Prepare and submit Action Submittals required by other Specification Sections and Contract Documents.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

- a. Manufacturer's written recommendations.
- b. Manufacturer's product specifications.
- c. Manufacturer's installation instructions.
- d. Standard color charts.
- e. Manufacturer's catalog cuts.
- f. Wiring diagrams showing factory-installed wiring.
- g. Printed performance curves.
- h. Operational range diagrams.
- i. Mill reports.
- j. Standard product operating and maintenance manuals.
- k. Compliance with recognized trade association standards.
- l. Compliance with recognized testing agency standards.
- m. Application of testing agency labels and seals.
- n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Include the following information, as applicable:

- a. Dimensions.
- b. Identification of products.
- c. Fabrication and installation drawings.
- d. Roughing-in and setting diagrams.
- e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
- f. Shopwork manufacturing instructions.
- g. Templates and patterns.
- h. Schedules.
- i. Design calculations.
- j. Compliance with specified standards.
- k. Notation of coordination requirements.
- l. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8½ by 11 inches but no larger than 30 by 42 inches.

- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product.
  - 2. Number and name of room or space.
  - 3. Location within room or space.
- F. Delegated-Design Submittal: Comply with requirements in Division 1 Section "Quality Requirements."
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.

## **2.2 INFORMATIONAL SUBMITTALS**

- A. General: Prepare and submit Information Submittals required by other Specification Sections and Contract Documents.
- B. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Operation and Maintenance Data."
- C. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
  - i. Preparation of substrates.
  - ii. Required substrate tolerances.
  - iii. Sequence of installation or erection.
  - iv. Required installation tolerances.
  - v. Required adjustments.
  - vi. Recommendations for cleaning and protection.
- D. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

## **PART 3 - EXECUTION**

### **3.1 CONTRACTOR'S REVIEW**

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- C. Resubmit submittals as directed until approved by the Engineer.

### **3.2 ENGINEER'S ACTION**

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Submittals: Engineer will review each submittal and indicate one of the following review actions:
  - a. ACCEPTABLE
  - b. FURNISH AS NOTED
  - c. REVISE AND RESUBMIT
  - d. REJECTED
- C. Engineer will forward each submittal to appropriate party.

**END OF SECTION**



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**SECTION 01 40 00**  
**QUALITY REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by Engineer, City of San Diego or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.

**1.3 REFERENCED STANDARDS**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN SOCIETY FOR TESTING AND MATERIALS**

ASTM E 548-94

Guide for General Criteria Used for Evaluating  
Laboratory Competence

## 1.4 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

## 1.5 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

## 1.6 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.

3. Identification of applicable standards.
  4. Identification of test and inspection methods.
  5. Number of tests and inspections required.
  6. Time schedule or time span for tests and inspections.
  7. Entity responsible for performing tests and inspections.
  8. Requirements for obtaining samples.
  9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
  2. Project title and number.
  3. Name, address, and telephone number of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Ambient conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and re-inspecting.
- E. Permits, Licenses, and Certificates: For City's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to

inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
    - d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

## 1.8 QUALITY CONTROL

- A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
  1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
  2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.

5. Do not perform any duties of Contractor.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field-curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule 30 days prior to performing inspections or tests.
1. Distribution: Distribute schedule to the City of San Diego, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION**

### **3.1 REPAIR AND PROTECTION**

PQPS Gas Sensor Replacement and PQPS VFD Replacement

01 40 00 - 6

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
  - 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION**



**SECTION 01 70 00**  
**EXECUTION REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

- 1. Construction layout.
- 2. Field engineering and surveying.
- 3. General installation of products.
- 4. Coordination of County-installed products.
- 5. Progress cleaning.
- 6. Starting and adjusting.
- 7. Protection of installed construction.
- 8. Correction of the Work.

- B. Related Sections include the following:

- 1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
- 2. Division 1 Section "Submittal Procedures" for submitting surveys.
- 3. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
- 4. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of City of San Diego-accepted deviations from indicated lines and levels, and final cleaning.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work,

investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    - a. Description of the Work.
    - b. List of detrimental conditions, including substrates.
    - c. List of unacceptable installation tolerances.
    - d. Recommended corrections.
  2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### **3.2 PREPARATION**

- A. Existing Utility Information: Furnish information to the City of San Diego that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by the City of San Diego unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Engineer not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Engineer's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by

field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### **3.3 CONSTRUCTION LAYOUT**

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.

### **3.4 INSTALLATION**

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 8 feet (2.4 m) in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
  - 2. Allow for building movement, including thermal expansion and contraction.

- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
  - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### **3.6 STARTING AND ADJUSTING**

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

### **3.7 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### **3.8 CORRECTION OF THE WORK**

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION**

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**SECTION 01 73 20**  
**SELECTIVE DEMOLITION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Demolition and removal of selected site elements.
  - 2. Repair procedures for selective demolition operations.
- B. Related Sections include the following:
  - 1. Division 1 Section "Work Restrictions" for restrictions on use of the premises.
  - 2. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
  - 3. Division 26 Sections for demolishing, cutting, patching, or relocating electrical items.

**1.3 REFERENCED STANDARDS**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN NATIONAL STANDARDS INSTITUTE**

ANSI A10.6 (1990) Safety Requirements for Construction and Demolition

**NATIONAL FIRE PROTECTION ASSOCIATION**

NFPA 241-96 Safeguarding Construction, Alteration, and Demolition Operations

**RESILIENT FLOOR COVERING INSTITUTE**

RFCI-WP-88 (Revised 1990) Recommended Work Practices for the Removal of Resilient Floor Coverings (with Addendum; Undated)



## 1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to the City of San Diego.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

## 1.5 MATERIALS

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain City of San Diego's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to City of San Diego that may be encountered during selective demolition remain City of San Diego's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to City of San Diego.

## 1.6 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineers, and other information specified.
- B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure City of San Diego on-site operations are uninterrupted.
  - 2. Interruption of utility services.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.

- 5. Locations of temporary partitions and means of egress.
- 6. Coordination of City of San Diego's continuing occupancy of existing building.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

## 1.7 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

## 1.8 PROJECT CONDITIONS

- A. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
  - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

- B. City of San Diego assumes no responsibility for condition of areas to be selectively demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by City of San Diego as far as practical.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and the City of San Diego.
- D. Storage or sale of removed items or materials on-site will not be permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
  - 1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original Installer or fabricator, engage another recognized experienced and specialized firm.
    - a. Processed concrete finishes.
    - b. Stonework and stone masonry.
    - c. Ornamental metal.
    - d. Matched-veneer woodwork.
    - e. Preformed metal panels.
    - f. Roofing.
    - g. Firestopping.
    - h. Window wall system.
    - i. Stucco and ornamental plaster.
    - j. Terrazzo.
    - k. Finished wood flooring.
    - l. Fluid-applied flooring.
    - m. Aggregate wall coating.
    - n. Wall covering.
    - o. Swimming pool finishes.
    - p. HVAC enclosures, cabinets, or covers.

## **PART 2 - PRODUCTS**

### **2.1 REPAIR MATERIALS**

- A. Use repair materials identical to existing materials.
  - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Engineer.
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### **3.2 UTILITY SERVICES**

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by the City of San Diego and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the City of San Diego and to authorities having jurisdiction.
  - 1. Provide at least 72 hours' notice to the City of San Diego if shutdown of service is required during changeover.

- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
  - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- D. Utility Requirements: Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.3 PREPARATION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
- C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from City of San Diego and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
  - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  - 3. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- E. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- F. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

### **3.4 POLLUTION CONTROLS**

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
  2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

### **3.5 SELECTIVE DEMOLITION**

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  5. Maintain adequate ventilation when using cutting torches.
  6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  9. Dispose of demolished items and materials promptly.
  10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items: Comply with the following:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to City of San Diego.
  4. Transport items to City of San Diego's storage area designated by City of San Diego.
  5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items: Comply with the following:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- F. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- G. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- H. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- I. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- J. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

### **3.6 PATCHING AND REPAIRS**

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.



1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
  3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- F. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

### **3.7 DISPOSAL OF DEMOLISHED MATERIALS**

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off City of San Diego's property and legally dispose of them.

**END OF SECTION**

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**SECTION 01 73 29**  
**CUTTING AND PATCHING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
  - 2. Division 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
    - a. Requirements in this Section apply to electrical installations. Refer to Division 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

**1.3 DEFINITIONS**

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

**1.4 SUBMITTALS**

- A. Cutting and Patching Proposal: Submit a proposal describing procedures before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Construction Manager's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

## 1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  1. Primary operational systems and equipment.
  2. Air or smoke barriers.
  3. Fire-protection systems.
  4. Control systems.
  5. Communication systems.
  6. Conveying systems.
  7. Electrical wiring systems.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  1. Water, moisture, or vapor barriers.
  2. Membranes and flashings.
  3. Exterior curtain-wall construction.
  4. Equipment supports.
  5. Piping, ductwork, vessels, and equipment.
  6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
  - a. Processed concrete finishes.
  - b. Stonework and stone masonry.
  - c. Ornamental metal.
  - d. Matched-veneer woodwork.
  - e. Preformed metal panels.
  - f. Roofing.
  - g. Firestopping.
  - h. Window wall system.
  - i. Stucco and ornamental plaster.
  - j. Terrazzo.
  - k. Finished wood flooring.
  - l. Fluid-applied flooring.
  - m. Aggregate wall coating.
  - n. Wall covering.
  - o. Swimming pool finishes.
  - p. HVAC enclosures, cabinets, or covers.

## **1.6 WARRANTY**

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

### **3.3 PERFORMANCE**

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.

- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.

**END OF SECTION**

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**SECTION 01 77 00**  
**CLOSEOUT PROCEDURES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Operation and maintenance manuals.
  - 3. Instruction of the City of San Diego personnel.
  - 4. Final cleaning.
- B. Related Sections include the following:
  - 1. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
  - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Division 1 Section "Demonstration and Training" for requirements for instruction of the City of San Diego personnel.
  - 4. Division 26 Sections for specific closeout and special cleaning requirements for products of those Sections.

**1.3 OPERATION AND MAINTENANCE MANUALS**

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
  - 1. Operation Data:
    - a. Emergency instructions and procedures.
    - b. System, subsystem, and equipment descriptions, including operating standards.
    - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.

- d. Description of controls and sequence of operations.
- e. Piping diagrams.

2. Maintenance Data:

- a. Manufacturer's information, including list of spare parts.
  - b. Name, address, and telephone number of Installer or supplier.
  - c. Maintenance procedures.
  - d. Maintenance and service schedules for preventive and routine maintenance.
  - e. Maintenance record forms.
  - f. Sources of spare parts and maintenance materials.
  - g. Copies of maintenance service agreements.
  - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## **PART 3 - EXECUTION**

### **3.1 DEMONSTRATION AND TRAINING**

- A. Instruction: Instruct the City of San Diego personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- 1. Provide instructors experienced in operation and maintenance procedures.
  - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
  - 3. Schedule training with the City of San Diego, through Engineer, with at least seven days' advance notice.
  - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.

## 3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.

- I. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - n. Replace parts subject to unusual operating conditions.
    - o. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on City of San Diego's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

**END OF SECTION**

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**SECTION 01 78 23**  
**OPERATION AND MAINTENANCE DATA**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation manuals for systems, subsystems, and equipment.
  - 2. Maintenance manuals for the care and maintenance of systems and equipment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Division 26 Sections for specific operation and maintenance manual requirements for products in those Sections.

**1.3 OPERATION MANUALS**

- A. Provide an organized electronic PDF and bound paper operations manual with table of contents that contains the following information:
  - 1. System, subsystem, and equipment descriptions.
  - 2. Performance and design criteria if Contractor is delegated design responsibility.
  - 3. Operating standards.
  - 4. Operating procedures.
  - 5. Operating logs.
  - 6. Wiring diagrams.
  - 7. Control diagrams.
  - 8. Piped system diagrams.
  - 9. Precautions against improper use.
  - 10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

#### **1.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL**

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

**END OF SECTION**



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**SECTION 01 82 00**  
**DEMONSTRATION AND TRAINING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for instructing the City of San Diego personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Management and Coordination" for requirements for pre-instruction conferences.

**1.3 SUBMITTALS**

- A. Instruction Program: Submit Electronic PDF and paper copy outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Provide learning objective and outline for each training module. Include training to meet specific needs of Owner's personnel, and include training sessions, classroom and field, for managers, engineers, operators and maintenance personnel.
  - 1. At completion of training, submit Electronic PDF and one copy of the complete training manual for City of San Diego's use.
  - 2. Trainee sign-in sheets for each training session. Submit to Owner's training coordinator with copy to Engineer.
  - 3. Provide video recording of training sessions. Owner reserves the right to reuse videotapes of training sessions.

**1.4 COORDINATION**

- A. Coordinate instruction schedule with the City of San Diego. Adjust schedule as required to minimize disrupting the City of San Diego operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved operation and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Engineer.

## 1.5 INSTRUCTION PROGRAM

A. Develop a training program that includes instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

- a. System, subsystem, and equipment descriptions.
- b. Performance and design criteria if Contractor is delegated design responsibility.
- c. Operating standards.
- d. Regulatory requirements.
- e. Equipment function.
- f. Operating characteristics.
- g. Limiting conditions.
- h. Performance curves.

2. Documentation: Review the following items in detail:

- a. Operations manuals.
- b. Maintenance manuals.
- c. Project Record Documents.
- d. Identification systems.
- e. Warranties and bonds.
- f. Maintenance service agreements and similar continuing commitments.

3. Operations: Include the following, as applicable:

- a. Startup procedures.
- b. Equipment or system break-in procedures.
- c. Routine and normal operating instructions.
- d. Regulation and control procedures.
- e. Control sequences.
- f. Safety procedures.
- g. Instructions on stopping.
- h. Normal shutdown instructions.
- i. Operating procedures for emergencies.
- j. Operating procedures for system, subsystem, or equipment failure.
- k. Seasonal and weekend operating instructions.
- l. Required sequences for electric or electronic systems.
- m. Special operating instructions and procedures.

4. Adjustments: Include the following:

- a. Alignments.
- b. Checking adjustments.
- c. Noise and vibration adjustments.
- d. Economy and efficiency adjustments.

5. Troubleshooting: Include the following:

- a. Diagnostic instructions.

- b. Test and inspection procedures.

6. Maintenance: Include the following:

- a. Inspection procedures.
- b. Types of cleaning agents to be used and methods of cleaning.
- c. List of cleaning agents and methods of cleaning detrimental to product.
- d. Procedures for routine cleaning
- e. Procedures for preventive maintenance.
- f. Procedures for routine maintenance.
- g. Instruction on use of special tools.

7. Repairs: Include the following:

- a. Diagnosis instructions.
- b. Repair instructions.
- c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- d. Instructions for identifying parts and components.
- e. Review of spare parts needed for operation and maintenance.

## 1.6 PREPARATION

- A. Assemble educational materials, including documentation and instructional aids as appropriate to assist with the training modules. Provide text, tables, graphs and illustrations as required. Assemble training modules into a combined handout for trainees. Provide Electronic PDFs and not less than 15 paper copies of the handouts for each training session. Other appropriate training aids include:
  - 1. Audio-visual aids, such as videos, Microsoft PowerPoint presentations, posters, drawings, diagrams, catalog sheets, or other items.
  - 2. Equipment cutaways and samples, such as spare parts and damaged equipment.
  - 3. Tools, such as repair tools, customized tools, and measuring and calibrating instruments.
- B. Set up instructional equipment at instruction location.
  - 1. Training provider shall provide audio-visual equipment required for training session.

## **1.7 INSTRUCTION**

- A. Engage qualified instructor(s) to instruct the City of San Diego personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
- C. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

**END OF SECTION**

**SECTION 26 00 10**  
**SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

**1.2 REFERENCES**

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. 8P8C: An 8-position 8-contact modular jack.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AFCI: Arc-fault circuit interrupter.
5. AIC: Ampere interrupting capacity.
6. AL, Al, or ALUM: Aluminum.
7. ASD: Adjustable-speed drive.
8. ATS: Automatic transfer switch.
9. AWG: American wire gauge; see ASTM B258.
10. BAS: Building automation system.
11. BIL: Basic impulse insulation level.
12. BIM: Building information modeling.
13. CAD: Computer-aided design or drafting.
14. CATV: Community antenna television.
15. CB: Circuit breaker.
16. cd: Candela, the SI fundamental unit of luminous intensity.
17. CO/ALR: Copper-aluminum, revised.
18. COPS: Critical operations power system.
19. CU or Cu: Copper.
20. CU-AL or AL-CU: Copper-aluminum.
21. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
22. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.

23. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
24. dBm: Decibel absolute power with respect to 1 mW.
25. DC or dc: Direct current.
26. DCOA: Designated critical operations area.
27. DDC: Direct digital control (HVAC).
28. EGC: Equipment grounding conductor.
29. ELV: Extra-low voltage.
30. EMF: Electromotive force.
31. EMI: Electromagnetic interference.
32. EPM: Electrical preventive maintenance.
33. EPS: Emergency power supply.
34. EPSS: Emergency power supply system.
35. ESS: Energy storage system.
36. EV: Electric vehicle.
37. EVPE: Electric vehicle power export equipment.
38. EVSE: Electric vehicle supply equipment.
39. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
40. FLC: Full-load current.
41. ft: Foot.
42. ft-cd: Foot-candle, the antiquated U.S. Standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" after the SI unit candela (cd) replaced the international candle; see "fc,"
43. GEC: Grounding electrode conductor.
44. GFCI: Ground-fault circuit interrupter.
45. GFPE: Ground-fault protection of equipment.
46. GND: Ground.
47. HACR: Heating, air conditioning, and refrigeration.
48. HDPE: High-density polyethylene.
49. HID: High-intensity discharge.
50. HP or hp: Horsepower.
51. HVAC: Heating, ventilating, and air conditioning.
52. Hz: Hertz.
53. IBT: Intersystem bonding termination.

54. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
55. IP: Ingress protection rating (enclosures); Internet protocol (communications).
56. IR: Infrared.
57. IS: Intrinsically safe.
58. IT&R: Inspecting, testing, and repair.
59. ITE: Information technology equipment.
60. kAIC: Kiloampere interrupting capacity.
61. kcmil or MCM: One thousand circular mils.
62. kV: Kilovolt.
63. kVA: Kilovolt-ampere.
64. kVAr or kVAR: Kilovolt-ampere reactive.
65. kW: Kilowatt.
66. kWh: Kilowatt-hour.
67. LAN: Local area network.
68. lb: Pound (weight).
69. lbf: Pound (force).
70. LCD: Liquid-crystal display.
71. LCDI: Leakage-current detector-interrupter.
72. LED: Light-emitting diode.
73. Li-ion: Lithium-ion.
74. lm: Lumen, the SI derived unit of luminous flux.
75. LNG: Liquefied natural gas.
76. LP-Gas: Liquefied petroleum gas.
77. LRC: Locked-rotor current.
78. LV: Low voltage.
79. lx: Lux, the SI derived unit of illuminance equal to one lumen per square meter.
80. m: Meter.
81. MCC: Motor-control center.
82. MDC: Modular data center.
83. MG set: Motor-generator set.
84. MIDI: Musical instrument digital interface.
85. MLO: Main lugs only.
86. MV: Medium voltage.
87. MVA: Megavolt-ampere.
88. mW: Milliwatt.



89. MW: Megawatt.
90. MWh: Megawatt-hour.
91. NC: Normally closed.
92. Ni-Cd: Nickel-cadmium.
93. Ni-MH: Nickel-metal hydride.
94. NIU: Network interface unit.
95. NO: Normally open.
96. NPT: National (American) standard pipe taper.
97. OCPD: Overcurrent protective device.
98. ONT: Optical network terminal.
99. PC: Personal computer.
100. PCS: Power conversion system.
101. PCU: Power-conditioning unit.
102. PF or pf: Power factor.
103. PHEV: Plug-in hybrid electric vehicle.
104. PLC: Programmable logic controller.
105. PLFA: Power-limited fire alarm.
106. PoE: Power over Ethernet.
107. PV: Photovoltaic.
108. PVC: Polyvinyl chloride.
109. pW: Picowatt.
110. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
111. RMS or rms: Root-mean-square.
112. RPM or rpm: Revolutions per minute.
113. SCADA: Supervisory control and data acquisition.
114. SCR: Silicon-controlled rectifier.
115. SPD: Surge protective device.
116. sq.: Square.
117. SWD: Switching duty.
118. TCP/IP: Transmission control protocol/Internet protocol.
119. TEFC: Totally enclosed fan-cooled.
120. TR: Tamper resistant.
121. TVSS: Transient voltage surge suppressor.
122. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
123. UL CCN: UL Category Control Number.

124. UPS: Uninterruptible power supply.
125. USB: Universal serial bus.
126. UV: Ultraviolet.
127. V: Volt, unit of electromotive force.
128. V(ac): Volt, alternating current.
129. V(dc): Volt, direct current.
130. VA: Volt-ampere, unit of complex electrical power.
131. VAR: Volt-ampere reactive, unit of reactive electrical power.
132. VFC: Variable-frequency controller.
133. VOM: Volt-ohm-multimeter.
134. VPN: Virtual private network.
135. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
136. W: Watt, unit of real electrical power.
137. Wh: Watt-hour, unit of electrical energy usage.
138. WPT: Wireless power transfer.
139. WPTE: Wireless power transfer equipment.
140. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. EMT-A: Aluminum electrical metallic tubing.
3. EMT-S: Steel electrical metallic tubing.
4. EMT-SS: Stainless steel electrical metallic tubing.
5. ENT: Electrical nonmetallic tubing.
6. EPEC: Electrical HDPE underground conduit (thin wall).
7. EPEC-A: Type A electrical HDPE underground conduit.
8. EPEC-B: Type B electrical HDPE underground conduit.
9. ERMC: Electrical rigid metal conduit.
10. ERMC-A: Aluminum electrical rigid metal conduit.
11. ERMC-S: Steel electrical rigid metal conduit.
12. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
13. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
14. ERMC-SS: Stainless steel electrical rigid metal conduit.
15. FMC: Flexible metal conduit.
16. FMC-A: Aluminum flexible metal conduit.

17. FMC-S: Steel flexible metal conduit.
18. FMT: Steel flexible metallic tubing.
19. FNMC: Flexible nonmetallic conduit. See "LFNC."
20. HDPE: HDPE underground conduit (thick wall).
21. HDPE-40: Schedule 40 HDPE underground conduit.
22. HDPE-80: Schedule 80 HDPE underground conduit.
23. IMC: Steel electrical intermediate metal conduit.
24. LFMC: Liquidtight flexible metal conduit.
25. LFMC-A: Aluminum liquidtight flexible metal conduit.
26. LFMC-S: Steel liquidtight flexible metal conduit.
27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
28. LFNC: Liquidtight flexible nonmetallic conduit.
29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
32. PVC: Rigid PVC conduit.
33. PVC-40: Schedule 40 rigid PVC conduit.
34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERM-C-S-G.
38. RMC: See ERM-C.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.

3. CATVP: Coaxial plenum cable.
4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.
11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.
17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.
27. ITC: Instrumentation tray cable.
28. ITC-ER: Instrumentation tray cable, exposed run.
29. MC: Metal-clad cable.
30. MC-HL: Metal-clad cable, hazardous location.
31. MI: Mineral-insulated, metal-sheathed cable.
32. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.
33. MV: Medium-voltage cable.
34. NM: Nonmetallic sheathed cable.
35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
37. NPLF: Non-power-limited fire-alarm circuit cable.

38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
40. NUCC: Nonmetallic underground conduit with conductors.
41. OFC: Conductive optical fiber general-purpose cable.
42. OFCG: Conductive optical fiber general-purpose cable.
43. OFCP: Conductive optical fiber plenum cable.
44. OFCR: Conductive optical fiber riser cable.
45. OFN: Nonconductive optical fiber general-purpose cable.
46. OFNG: Nonconductive optical fiber general-purpose cable.
47. OFNP: Nonconductive optical fiber plenum cable.
48. OFNR: Nonconductive optical fiber riser cable.
49. P: Marine shipboard cable.
50. PLTC: Power-limited tray cable.
51. PLTC-ER: Power-limited tray cable, exposed run.
52. PV: Photovoltaic cable.
53. RHH: (high heat) Thermoset rubber, heat-resistant cable.
54. RHW: Thermoset rubber, moisture-resistant cable.
55. SA: Silicone rubber cable.
56. SE: Service-entrance cable.
57. SER: Service-entrance cable, round.
58. SEU: Service-entrance cable, flat.
59. SIS: Thermoset cable for switchboard and switchgear wiring.
60. TBS: Thermoplastic cable with outer braid.
61. TC: Tray cable.
62. TC-ER: Tray cable, exposed run.
63. TC-ER-HL: Tray cable, exposed run, hazardous location.
64. THW: Thermoplastic, heat- and moisture-resistant cable.
65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
66. THHW: Thermoplastic, heat- and moisture-resistant cable.
67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
68. TW: Thermoplastic, moisture-resistant cable.
69. UF: Underground feeder and branch-circuit cable.
70. USE: Underground service-entrance cable.
71. XHH: Cross-linked polyethylene, heat-resistant cable.
72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

#### D. Abbreviations and Acronyms for Electrical Flexible Cord Types:

1. SEO: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
2. SEOW: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
3. SEOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
4. SEOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
5. SJEO: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
6. SJEOW: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
7. SJEOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
8. SJEOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
9. SJO: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp locations.
10. SJOW: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
11. SJOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp locations.
12. SJOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
13. SJTO: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
14. SJTOW: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
15. SJTOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.

16. SJTOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
17. SO: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp locations.
18. SOW: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
19. SOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp locations.
20. SOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
21. STO: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
22. STOW: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.
23. STOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
24. STOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.

E. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted-pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
  - a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.
2. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
3. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
4. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.

5. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
6. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
7. Designated Seismic System: A system component that requires design in accordance with Ch. 13 of ASCE/SEI 7 and for which the Component Importance Factor is greater than 1.0.
8. Direct Buried: Installed underground without encasement in concrete or other protective material.
9. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
  - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
  - b. Concrete Box: A box intended for use in poured concrete.
  - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
  - e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
  - f. Device Box: A box with provisions for mounting a wiring device directly to the box.
  - g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
  - h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
  - i. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
  - j. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
  - k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.



- l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
  - m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
  - n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  - o. Raised-Floor Box: A floor box intended for use in raised floors.
  - p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
  - q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
  - r. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
  - s. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
  - t. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
10. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
11. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.
12. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
- a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
13. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-

benefit, productivity, sustainability, functionality, and operational considerations.

14. Jacket: A continuous nonmetallic outer covering for conductors or cables.
15. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
16. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
17. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
18. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
19. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
20. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
21. Sheath: A continuous metallic covering for conductors or cables.
22. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
23. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
  - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
  - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
  - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
  - e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
  - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.

24. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

### **1.3 COORDINATION**

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
  - 1. Notify Owner no fewer than seven days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Owner's written permission.
  - 3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
    - a. Exercising generators.
    - b. Emergency lighting.
    - c. Elevators.
    - d. Fire-alarm systems.
- B. Arrange to provide temporary electrical power in accordance with requirements specified in Division 01.

### **1.4 PREINSTALLATION MEETINGS**

- A. Electrical Preconstruction Conference: Schedule conference with Engineer and Owner, not later than 10 days after notice to proceed. Agenda topics include, but are not limited to, the following:
  - 1. Electrical installation schedule.
  - 2. Status of power system studies.
  - 3. Utility work coordination and class of service requests.
  - 4. Commissioning activities.

### **1.5 SEQUENCING**

- A. Conduct and submit results of power system studies before submitting Product Data and Shop Drawings for electrical equipment.

### **1.6 ACTION SUBMITTALS**

- A. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
  2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Coordination Drawings for Large Equipment Indoor Installations:
1. Location plan, drawn to scale, showing heavy equipment or truck access paths to loading dock or other freight access into building. Indicate available width and height of doors or openings.
  2. Floor plan for entry floor and floor where equipment is located, drawn to scale, showing heavy equipment access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
    - a. Dimensioned concrete bases, outlines of equipment, conduit entries, and grounding equipment locations.
    - b. If freight elevator must be used, indicate width and height of door and depth of car. Indicate if large equipment must be tipped to use elevator.
    - c. Dimensioned working clearances and dedicated areas below and around electrical equipment where obstructions and tripping hazards are prohibited.

## 1.7 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Engineer including, but not limited to, milestone dates for the following activities:
1. Submission of power system studies.
  2. Submission of specified coordination drawings.
  3. Submission of action submittals specified in Division 26.
  4. Orders placed for major electrical equipment.
  5. Arrival of major electrical equipment on-site.
  6. Preinstallation meetings specified in Division 26.
  7. Utility service outages.
  8. Utility service inspection and activation.
  9. Mockup reviews.
  10. Closing of walls and ceilings containing electrical Work.
  11. System startup, testing, and commissioning activities for major electrical equipment.
  12. System startup, testing, and commissioning activities for emergency lighting.
  13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).

14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
  15. Requests for special inspections.
  16. Requests for inspections by authorities having jurisdiction.
- B. Seismic-Load Performance Certificates: Provide special certification for designated seismic systems as indicated in Paragraph 13.2.2 "Special Certification Requirements for Designated Seismic Systems" of ASCE for all designated seismic-load systems identified on Drawings or in the Specifications.

1. Include the following information:

- a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- d. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- e. Provide equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction ASCE/SEI 7.
- f. Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in ASCE/SEI 7.
- g. Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by qualified structural professional engineer.

C. Qualification Statements:

1. For qualified regional manufacturer.
2. For structural professional engineer.
3. For electrical professional engineer.
4. For lighting professional engineer.
5. For EPM specialist.
6. For welder.
7. For ERMC-S-PVC raceway Installer.
8. For medium-voltage cable Installer.
9. For medium-voltage duct Installer.

10. For medium-voltage equipment Installer.
11. For electrical power monitoring Installer.
12. For switchboard Installer.
13. For EVSE Installer.
14. For generator set Installer.
15. For lightning protection system Installer.
16. For theatrical lighting Installer.
17. For exterior athletic lighting Installer.
18. For power quality specialist.
19. For low-voltage electrical testing agency and on-site electrical testing supervisor.
20. For power-limited electrical testing agency and on-site power-limited testing supervisor.
21. For structural testing and inspecting agency.
22. For outdoor pole testing and inspecting agency.
23. For luminaire photometric testing laboratory.
24. For lighting testing and inspecting agency.

## **1.8 CLOSEOUT SUBMITTALS**

### **A. Facility EPM Program Binders:**

1. Complete Set: On approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.

### **B. Operation and Maintenance Data:**

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each VFD.
2. Include the following information:
  - a. Manufacturer's operating specifications.
  - b. User's guides for software and hardware.
  - c. Schedule of maintenance material items recommended to be stored at Project site.
  - d. Detailed instructions covering operation under both normal and abnormal conditions.
  - e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
  - f. List of load-current and overload-relay heaters with related motor nameplate data.

- g. List of lamp types and photoelectric relays used on Project, with ANSI and manufacturers' codes.
  - h. Manufacturer's instructions for setting field-adjustable components.
  - i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
  - j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
  - k. Exterior pole inspection and repair procedures.
- C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation in Facility EPM Program Binders, including the following:
- 1. Software operating and upgrade manuals.
  - 2. Names, versions, and website addresses for locations of installed software.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.
  - 5. Testing and adjusting of panic and emergency power features.
  - 6. For lighting controls, include the following:
    - a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
    - b. Operation of adjustable zone controls.
- D. Software:
- 1. Program Software Backup: Provide username and password for approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
  - 2. Provide to Owner upgrades and unrestricted licenses for installed and backup software, including operating systems and programming tools required for operation and maintenance.

## 1.9 QUALIFICATIONS

- A. Structural Professional Engineer: Professional engineer possessing active qualifications specified in Section 01 40 00 "Quality Requirements," with expertise in structural engineering, including seismic- and wind-load modeling and analysis.
- B. Electrical Professional Engineer: Professional engineer possessing active qualifications specified in Section 01 40 00 "Quality Requirements," with expertise in electrical engineering, including electrical power system modeling and analysis of electrical safety in accordance with NFPA 70E.
- C. Lighting Professional Engineer: Professional engineer possessing active qualifications in accordance with Section 01 40 00 "Quality Requirements" and the following:
  - 1. Expertise in electrical engineering, lighting design, and structural requirements for exterior poles and standards.

2. Lighting Certified (LC) Professional by the National Council on Qualifications for the Lighting Professions (NCQLP).
- D. EPM Specialist: Recognized experts possessing the following qualifications in accordance with Section 01 40 00 "Quality Requirements" and NFPA 70B:
1. Technical Competence: Person should, by education, training, and experience, be well-rounded in all aspects of electrical maintenance.
  2. Administrative and Supervisory Skills: Person should be skilled in planning and development of long-range objectives to achieve specific results and should be able to command respect and solicit cooperation of persons involved in EPM Program development.
- E. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
1. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.
- F. Structural Testing and Inspecting Agency: Entity possessing active qualifications specified in Section 01 40 00 "Quality Requirements" with documented training and experience with testing structural concrete, seismic controls, and wind-load controls.

## **PART 2 - PRODUCTS**

### **2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT**

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.
  2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
  3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

### **2.2 FACILITY ELECTRICAL PREVENTIVE MAINTENANCE (EPM) PROGRAM BINDERS**

- A. Description: Set of binders containing operation and maintenance data for facility's electrical equipment that was compiled during analysis of installed electrical Work for Facility EPM Program development.



B. Applicable Standards:

1. Regulatory Requirements: Comply with recommendations in NFPA 70B.
2. General Characteristics:

a. Volume 1 - Introduction:

- 1) Summarize how Facility EPM Program Analysis was performed, how data were collected, and how volumes are organized.
- 2) Describe Facility EPM Program and provide recommended policies and procedures for implementing the program and keeping it current.
- 3) Provide place for Owner to identify contact information for employees responsible for implementing and maintaining Facility EPM Program.

b. Volume 2 - Facility Safety, Hazards Awareness, and Emergency Procedures:

- 1) Include training requirements for employees and contractors.
- 2) Include list of known facility hazards impacting IT&R activities.
- 3) Include approval and permitting procedures for IT&R activities.
- 4) Include incident emergency response procedures.
- 5) Include emergency shutdown procedures.
- 6) Include electrical disaster recovery procedures.

c. Volume 3 - Facility Diagrams and Schedules:

- 1) Include single-line diagrams.
- 2) Include grounding and bonding diagrams.
- 3) Include essential wiring diagrams.
- 4) Include system automation diagrams (SCADA, BMS, lighting, HVAC, etc.).
- 5) Include records of switchgear, switchboard, and panelboard schedules.
- 6) Include time-current curves for overcurrent protective devices.
- 7) Include list of load-current and overload-relay heaters with related motor nameplate data.

d. Volume 4 - Inventory of Facility Equipment Using Electrical Power:

- 1) Include simplified floor plans showing equipment locations.
  - 2) Identify critical equipment (electrical or otherwise).
  - 3) Include identifying designations and nameplate data.
  - 4) Include warranty and maintenance contract information.
- e. Volume 5 - Inventory of Facility Tools, Supplies, and Personnel Protective Equipment:
- 1) Include schedules of maintenance material items recommended to be stored at facility.
  - 2) Include list of lamp types and photoelectric relays used in facility with ANSI and manufacturers' codes.
  - 3) Include calibration and servicing data for each item.
- f. Volume 6- Inspection, Testing, and Repair (IT&R) Plan:
- 1) Include tables showing frequency of activities for each item.
  - 2) Include annual schedule with activities mapped to specific days of the year.
  - 3) Include exterior pole inspection and repair procedures.
- g. Volume 7 - Spare Parts List:
- 1) Include list of all parts required to perform IT&R procedures.
  - 2) Identify quantities of which parts are recommended to be stored on-site.
  - 3) Include source contact information and budget cost for each item.
- h. Volume 8 - Construction Project Closeout Record Documentation:
- 1) Include records of power system studies and photometric studies.
  - 2) Include records of risk assessment studies.
  - 3) Include records of electrical system startup and commissioning activities.
  - 4) Include records of baseline inspections and tests.
  - 5) Include records of baseline infrared photographs with normal light photographs showing the location, direction, angle, and conditions necessary for reproducing each infrared photograph.
  - 6) Include records of baseline settings for adjustable equipment and devices.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

#### A. Verification of Conditions:

1. Contractor shall verify existing conditions prior to beginning work.

### **3.2 PREPARATION**

#### A. Protection of In-Place Conditions:

1. Feeders to and from existing VFDs shall remain in place for re-use. Contractor to verify quality of conduit and cabling prior to re-using.

### **3.3 DEVELOPMENT OF FACILITY EPM PROGRAM**

#### A. Facility EPM Program must be developed by qualified EPM specialist.

#### B. Conduct Facility EPM Program analysis in accordance with NFPA 70B recommendations.

##### 1. Renovation Projects:

- a. Facility diagrams must include connected existing equipment for entire facility where known. Areas of uncertainty should be clearly indicated.
- b. Obtain copies of existing operation and maintenance data and existing Facility EPM Program information from Owner.
- c. Facility EPM Program analysis should identify existing equipment that does not have available operation and maintenance data and should explain the Owner's risks because this equipment is not included in Facility EPM Program.
- d. Data for existing equipment outside scope of Project may be inserted in Facility EPM Program Binders without analysis.
- e. Data for existing equipment impacted by scope of Project should be analyzed and documented similar to Project's new equipment data as much as possible.

#### C. Compile operation and maintenance data from Facility EPM Program analysis and submit updated Facility EPM Program Binders.

### **3.4 INSTALLATION OF ELECTRICAL WORK**

#### A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Engineer for resolution of conflicting requirements.

### **3.5 FIELD QUALITY CONTROL**

#### A. Administrant for Low-Voltage Electrical Tests and Inspections:

1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.

B. Administrant for Structural Tests and Inspections:

1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.

### 3.6 CLOSEOUT ACTIVITIES

A. Provide video recordings of demonstrations to Owner.

B. Training: With assistance from factory-authorized service representatives, train Owner's maintenance personnel on the following topics:

1. How to implement updated Facility EPM Program.
2. How to operate normal and emergency electrical systems, including justifications for, and limitations of, protective device settings recommended in study report specified in Section 26 05 73.16 "Coordination Studies."
3. Electrical power safety fundamentals refresher including arc-flash hazard safety features of electrical power distribution equipment in facility, interpreting arc-flash warning labels, selecting appropriate personal protective equipment, and understanding significance of findings documented in study report specified in Section 26 05 73.19 "Arc-Flash Hazard Analysis."
4. How to adjust, operate, and maintain equipment specified in Section 26 29 23 "Variable-Frequency Motor Controllers."

**END OF SECTION**

## SECTION 26 00 11

### FACILITY PERFORMANCE REQUIREMENTS FOR ELECTRICAL

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Field conditions and other facility performance requirements applicable to Work specified in Division 26.

##### 1.2 FIELD CONDITIONS

A. Seismic Hazard Design Loads:

1. Unless otherwise indicated on Contract Documents, specified Work must withstand seismic hazard design loads determined in accordance with requirements specified in this Section, adjusted for installed elevation above or below grade.
  - a. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to specified seismic hazard design loads and unit must be fully operational after seismic event."
2. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in ASCE/SEI 7-16 >. Where "ASCE/SEI 7" is used throughout this Section, it must be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.
  - a. Data indicated below to be determined by Delegated Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
  - b. Coordinate seismic design calculations with wind-load calculations for equipment mounted outdoors.
  - c. Building Occupancy Category: Refer to drawings.
  - d. Building Risk Category: Refer to drawings.
  - e. Building Site Classification: Refer to drawings.
3. Calculation Factors, ASCE/SEI 7-16, Ch. 13 - Seismic Design Requirements for Nonstructural Components: All section, paragraph, equation, and table numbers refer to ASCE/SEI 7-16 unless otherwise indicated.
  - a. Horizontal Seismic Design Force  $F_p$ : Value must be calculated by Delegated Design Contractor using Equation 13.3-1. Factors below must be obtained for this calculation:

- 1) Spectral Acceleration ( $S_{DS}$ ): Refer to structural calculations. Value applies to all components on Project.
  - 2) Component Amplification Factor ( $a_p$ ): See Drawing Schedule for each component.
  - 3) Component Importance Factor ( $I_p$ ): See Drawing Schedule for each component.
  - 4) Component Operating Weight ( $W_p$ ): For each component. Obtain by Delegated Design Contractor from each component submittal.
  - 5) Component Response Modification Factor ( $R_p$ ): See Drawing Schedule for each component.
  - 6) Height in Structure of Point of Attachment of Component for Base ( $z$ ): Determine from Project Drawings for each component by Delegated Design Contractor. For items at or below the base, "z" must be taken as zero.
  - 7) Average Roof Height of Structure for Base ( $h$ ): Determine from Project Drawings by Delegated Design Contractor.
- b. Vertical Seismic Design Force: Calculated by Delegated Design Contractor using method explained in ASCE/SEI 7-16, Paragraph 13.3.1.2.
- c. Seismic Relative Displacement ( $D_{pl}$ ): Calculated by Delegated Design Contractor using methods explained in ASCE/SEI 7-16, Paragraph 13.3.2. Factors below must be obtained for this calculation:
- 1) Relative Seismic Displacement that Each Component Must Be Designed to Accommodate ( $D_p$ ): Calculated by Delegated Design Contractor in accordance with ASCE/SEI 7-16, Paragraph 13.3.2.
  - 2) Structure Importance Factor ( $I_e$ ): Refer to structural drawings. Value applies to all components on Project.
  - 3) Deflection at Building Level x of Structure A ( $\delta_{xA}$ ): See Drawing Schedule for each component.
  - 4) Deflection at Building Level y of Structure A ( $\delta_{yA}$ ): See Drawing Schedule for each component.
  - 5) Deflection at Building Level y of Structure B ( $\delta_{yB}$ ): See Drawing Schedule for each component.
  - 6) Height of Level x to Which Upper Connection Point Is Attached ( $h_x$ ): Determine for each component by Delegated Design Contractor from Project Drawings and manufacturer's data.
  - 7) Height of Level y to Which Upper Connection Point Is Attached ( $h_y$ ): Determine for each component by Delegated Design Contractor from Project Drawings and manufacturer's data.

- 8) Allowable Story Drift for Structure A ( $\Delta_{aA}$ ): See Drawing Schedule for each component.
  - 9) Allowable Story Drift for Structure B ( $\Delta_{aB}$ ): See Drawing Schedule for each component.
  - 10) Story Height Used in the Definition of the Allowable Drift  $\Delta_a$  ( $h_{sx}$ ): See Drawings Schedules for each component.
- d. Component Fundamental Period ( $T_p$ ): Calculated by Delegated Design Contractor using methods explained in ASCE/SEI 7-16, Paragraph 13.3.3. Factors below must be obtained for this calculation:
- 1) Component Operating Weight ( $W_p$ ): Determined by Contractor from Project Drawings and manufacturer's data.
  - 2) Gravitational Acceleration ( $g$ ): 32.17 ft./s<sup>2</sup> (9.81 m/s<sup>2</sup>)
  - 3) Combined Stiffness of the Component, Supports, and Attachments ( $K_p$ ): Determined by delegated design seismic engineer.
- B. Temperature Variation: Allow for thermal movements from the following differential temperatures:
1. Ambient Temperature Differential: 120 deg F (67 deg C) <
  2. Material Surface Temperature Differential: 180 deg F (100 deg C)
- C. Ground Water:
1. Assume ground-water level is at grade level unless a lower water table is noted on Drawings.
  2. Assume ground-water level is 36 inch (900 mm) below ground surface unless a higher water table is indicated on Drawings.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

**SECTION 26 05 19**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Metal-clad cable, Type MC, rated 600 V or less.
  - 3. Connectors, splices, and terminations rated 600 V and less.

**1.3 DEFINITIONS**

- A. RoHS: Restriction of Hazardous Substances.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

**1.6 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Member company of NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

**PART 2 - PRODUCTS**

**2.1 COPPER BUILDING WIRE**

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:



1. Alpha Wire Company.
  2. Okonite Company (The).
  3. Service Wire Co.
  4. Southwire Company.
- C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. RoHS compliant.
  3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.
  2. Type XHHW-2: Comply with UL 44.

## 2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Alpha Wire Company.
  2. American Bare Conductor.
  3. Okonite Company (The).
  4. Southwire Company.
- C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. Comply with UL 1569.
  3. RoHS compliant.
  4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
1. Single circuit and multi circuit with color-coded conductors.
- E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- F. Ground Conductor: Insulated.
- G. Conductor Insulation:
1. Type TFN/THHN/THWN-2: Comply with UL 83.
  2. Type XHHW-2: Comply with UL 44.

- H. Armor: Steel, interlocked.
- I. Jacket: PVC applied over armor.

## **2.3 CONNECTORS AND SPLICES**

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. 3M Electrical Products.
  - 2. Hubbell Incorporated, Power Systems.
  - 3. Ideal Industries, Inc.
  - 4. Service Wire Co.
  - 5. TE Connectivity Ltd.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Submersible Splices shall be UL listed cable joints utilizing flexible, flame retardant and water resistant resin and are compatible with EPR, neoprene, Hypalon, PVC, and nitrile sheaths.
- E. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: One hole with standard barrels.
  - 3. Termination: Compression.

## **PART 3 - EXECUTION**

### **3.1 CONDUCTOR MATERIAL APPLICATIONS**

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### **3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits in Wet Well: Type XHHW-2, multiwire, suitable for submersible .

### **3.3 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

### **3.4 CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

### **3.5 IDENTIFICATION**

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

### 3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
  - 2. Perform each of the following visual and electrical tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - b. Test bolted connections for high resistance using one of the following:
      - 1) A low-resistance ohmmeter.
      - 2) Calibrated torque wrench.
    - c. Inspect compression-applied connectors for correct cable match and indentation.
    - d. Inspect for correct identification.
    - e. Inspect cable jacket and condition.
    - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
    - g. Continuity test on each conductor and cable.
    - h. Uniform resistance of parallel conductors.
- C. Cables will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

**END OF SECTION**

**SECTION 26 05 23**  
**CONTROL-VOLTAGE ELECTRICAL POWER CABLES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Category 6A balanced twisted pair cable.
2. Balanced twisted pair cable hardware.
3. Control cable.
4. Control-circuit conductors.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Source quality-control reports.
- B. Field quality-control reports.

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

**2.2 CATEGORY 6A BALANCED TWISTED PAIR CABLE**

- A. Description: Four-pair, balanced-twisted pair cable with internal spline, certified to meet transmission characteristics of Category 6A cable at frequencies up to 250 MHz.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. 3M.
  2. Belden.
  3. Berk-Tek Leviton; a Nexans/Leviton alliance.
  4. CommScope, Inc.
  5. Mohawk; a division of Belden Networking, Inc.
  6. Superior Essex Inc.

- 7. SYSTIMAX Solutions; a CommScope Inc. brand.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100 ohm, No. 23 AWG solid copper.
- E. Shielding/Screening: Shielded twisted pairs (FTP).
- F. Cable Rating: Riser.
- G. Jacket: Blue thermoplastic.

### **2.3 BALANCED TWISTED PAIR CABLE HARDWARE**

- A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Belden.
  - 2. Berk-Tek Leviton; a Nexans/Leviton alliance.
  - 3. CommScope, Inc.
  - 4. General Cable; Prysmian Group North America.
  - 5. Genesis Cable Products; Honeywell International, Inc.
- C. General Requirements for Balanced Twisted Pair Cable Hardware:
  - 1. Comply with the performance requirements of Category 6A.
  - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
  - 3. Cables must be terminated with connecting hardware of same category or higher.
- D. Source Limitations: Obtain balanced twisted pair cable hardware from same manufacturer as balanced twisted pair cable, from single source.
  - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Cords: Factory-made, four-pair cables in 48 inch (1200 mm) lengths; terminated with an eight-position modular plug at each end.
  - 1. Patch cords must have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords must have latch guards to protect against snagging.
- F. Plugs and Plug Assemblies:
  - 1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
  - 2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
  - 3. Marked to indicate transmission performance.

G. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

## 2.4 CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

## 2.5 CONTROL-CIRCUIT CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Encore Wire Corporation.
2. General Cable; Prysmian Group North America.
3. Service Wire Co.
4. Southwire Company.

B. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

C. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

E. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

1. Smoke control signaling and control circuits.

## 2.6 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test twisted pair cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Test cables on receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

### **3.2 INSTALLATION OF RACEWAYS AND BOXES**

- A. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
  1. Outlet boxes for cables must be no smaller than 4 inch (102 mm) square by 2-1/8 inch (53 mm) deep with extension ring sized to bring edge of ring to within 1/8 inch (3.1 mm) of the finished wall surface.
  2. Flexible metal conduit must not be used.
- B. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
  1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
  2. Secure conduits to backboard if entering the room from overhead.
  3. Extend conduits 3 inch (75 mm) above finished floor.
  4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- E. Backboards: Install backboards with 96 inch (2440 mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

### **3.3 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  1. Comply with TIA-568-C Series of standards.
  2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
  3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
  5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
  6. Secure and support cables at intervals not exceeding 30 inch (760 mm) and not more than 6 inch (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.



8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
10. Support: Do not allow cables to lie on removable ceiling tiles.
11. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
12. Provide strain relief.
13. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
14. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Install termination hardware as required by equipment manufacturer.
3. Do not untwist balanced twisted pair cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways.
2. Use insulated spade lugs for wire and cable connection to screw terminals.
3. Comply with requirements specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment must be as follows:
  - a. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inch (600 mm).
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment must be as follows:
  - a. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inch (305 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures must be as follows:
  - a. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inch (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inch (1200 mm).

### **3.4 CONTROL-CIRCUIT CONDUCTORS**

#### **A. Minimum Conductor Sizes:**

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

### **3.5 GROUNDING**

- #### **A. For control-voltage wiring and cabling, comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."**

### **3.6 IDENTIFICATION**

- #### **A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."**

### **3.7 FIELD QUALITY CONTROL**

#### **A. Tests and Inspections:**

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
  - a. Test instruments must meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

- #### **B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.**

- #### **C. End-to-end cabling will be considered defective if it does not pass tests and inspections.**

- #### **D. Prepare test and inspection reports.**

**END OF SECTION**

**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes grounding and bonding systems and equipment.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

**1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
  - 1. Include the following:
    - a. Plans showing as-built, dimensioned locations of system.
    - b. Instructions for periodic testing and inspection of grounding features at test wells based on NETA MTS.
      - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      - 2) Include recommended testing intervals.

**1.6 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Certified by NETA.

## **PART 2 - PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### **2.2 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Burndy; Hubbell Incorporated, Construction and Energy.
  - 2. Fushi Copperweld Inc.
  - 3. Galvan Industries, Inc.; Electrical Products Division, LLC.

### **2.3 CONDUCTORS**

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B3.
  - 2. Stranded Conductors: ASTM B8.
  - 3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

### **2.4 CONNECTORS**

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of Aconductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Conduit Hubs: Mechanical type, terminal with threaded hub.
- G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- H. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- I. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- J. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- K. Straps: Solid copper, copper lugs. Rated for 600 A.
- L. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- M. Water Pipe Clamps:
  - 1. Mechanical type, two pieces with stainless-steel bolts.
    - a. Material: Die-cast zinc alloy.
    - b. Listed for direct burial.
  - 2. U-bolt type with malleable-iron clamp and copper ground connector.

## **2.5 GROUNDING ELECTRODES**

- A. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

## **PART 3 - EXECUTION**

### **3.1 APPLICATIONS**

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Grounding Conductors: Green-colored insulation with continuous yellow stripe.
- C. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

### **3.2 EQUIPMENT GROUNDING**

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Receptacle circuits.
  - 3. Single-phase motor and appliance branch circuits.
  - 4. Three-phase motor and appliance branch circuits.
  - 5. Flexible raceway runs.
  - 6. Armored and metal-clad cable runs.

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- C. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
- G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

**END OF SECTION**



**SECTION 26 05 29**  
**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Steel slotted support systems.
  - 2. Conduit and cable support devices.
  - 3. Structural steel for fabricated supports and restraints.
  - 4. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
  - 5. Fabricated metal equipment support assemblies.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Slotted support systems, hardware, and accessories.
    - b. Clamps.
    - c. Hangers.
  - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.
  - 1. Hangers. Include product data for components.
  - 2. Slotted support systems.
  - 3. Equipment supports.
  - 4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For hangers and supports for electrical systems.
  - 1. Include design calculations and details of hangers.
  - 2. Include design calculations for seismic restraints.

**1.4 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces."

### **2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Stainless steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. ERICO International Corporation.
    - c. GS Metals Corp.
    - d. Thomas & Betts Corporation; A Member of the ABB Group.
    - e. Unistrut; Part of Atkore International.
    - f. Or Approved Equal.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 5. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
  - 6. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- 1) Hilti, Inc.
- 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
- 3) MKT Fastening, LLC.
- 4) Or Approved Equal.

- 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel 316, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) B-line, an Eaton business.
- 2) Empire Tool and Manufacturing Co., Inc.
- 3) Hilti, Inc.
- 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
- 5) Or Approved Equal.

- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
- 6. Toggle Bolts: Stainless-steel 316 springhead type.
- 7. Hanger Rods: Threaded stainless steel 316.

## **2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION**

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA 1.
  - 2. NECA 101
- B. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

### **3.2 SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
  - 5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  - 6. To Light Steel: Sheet metal screws.
  - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### **3.3 INSTALLATION OF FABRICATED METAL SUPPORTS**

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

### **3.4 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete.

- C. Anchor equipment to concrete base as follows:
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### **3.5 PAINTING**

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

**END OF SECTION**

**SECTION 26 05 33**  
**RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Metal conduits and fittings.
  - 2. Boxes, enclosures, and cabinets.

**1.3 DEFINITIONS**

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.
- C. EMT: Electrical Metal Tubing

**1.4 ACTION SUBMITTALS**

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

**PART 2 - PRODUCTS**

**2.1 METAL CONDUITS AND FITTINGS**

- A. Metal Conduit:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Allied Tube & Conduit; a part of Atkore International.
    - c. Electri-Flex Company.
    - d. O-Z/Gedney; a brand of Emerson Industrial Automation.
    - e. Western Tube and Conduit Corporation.
    - f. Or Approved Equal.
  - 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. GRC: Comply with ANSI C80.1 and UL 6.

4. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
    - a. Comply with NEMA RN 1.
    - b. Coating Thickness: 0.040 inch (1 mm), minimum.
  5. EMT: Comply with ANSI C80.3 and UL 797.
  6. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
1. Comply with NEMA FB 1 and UL 514B.
  2. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
  3. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: compression.
  4. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
  5. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- C. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Adalet.
  2. Appleton - EGS; Emerson Electric Co., Automation Solutions.
  3. Eaton (Crouse-Hinds).
  4. Erickson Electrical Equipment Company.
  5. Hubbell Incorporated.
  6. Kraloy Fittings.
  7. Milbank Manufacturing Co.
  8. Or Approved Equal.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

- H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- I. Cabinets:
  - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.
  - 6. Provide factory applied or field applied painting of entire equipment with 2-coat marine grade epoxy.

## **PART 3 - EXECUTION**

### **3.1 RACEWAY APPLICATION**

- A. Indoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT.
  - 2. Exposed and Subject to Severe Physical Damage: GRC.
  - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  - 5. Damp or Wet Locations, in Wetwell/Vault, Hazardous Environments: PVC coated GRC.
  - 6. Boxes and Enclosures: NEMA 250, Type 1, except use Explosion proof in wet well locations.
- B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
  - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20 and CEC.
- D. Do not install any aluminum conduits, boxes, or fittings.



## 3.2 INSTALLATION

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof.
- E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- F. Complete raceway installation before starting conductor installation.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- L. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.
  - 5. Change from ENT to GRC before rising above floor. Utilize GRC elbow for transition.
- M. Stub-Ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
  - O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
  - P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
  - Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
  - R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
  - S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
  - T. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
  - U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
  - V. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
  - W. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
    1. Where an underground service raceway enters a building or structure.
    2. Where otherwise required by NFPA 70.
  - X. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
  - Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
    1. Use LFMC in damp or wet locations subject to severe physical damage.

- Z. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- AA. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- BB. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- CC. Locate boxes so that cover or plate will not span different building finishes.
- DD. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- EE. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

### **3.3 PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**

**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
  - 2. Labels.
  - 3. Bands and tubes.
  - 4. Tapes and stencils.
  - 5. Tags.
  - 6. Signs.
  - 7. Cable ties.
  - 8. Fasteners for labels and signs.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with ANSI Z535.4 for safety signs and labels.
- D. Comply with NFPA 70E and Section 26 05 73.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

**2.2 COLOR AND LEGEND REQUIREMENTS**

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.

2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  3. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  4. Color for Neutral: White.
  5. Color for Equipment Grounds: Green.
- C. Equipment Identification Labels:
1. Black letters on a white field.

## 2.3 LABELS

- A. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, polyester flexible label with acrylic pressure-sensitive adhesive.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Brother International Corporation.
    - c. Ideal Industries, Inc.
    - d. Marking Services, Inc.
    - e. Panduit Corp.
  2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

## 2.4 BANDS AND TUBES

- A. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.

## 2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

### C. Underground-Line Warning Tape:

1. Tape:
  - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  - d. Tape shall be detectable without excavation.
2. Color and Printing:
  - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
  - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
  - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

## 2.6 TAGS

- A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch (0.58 mm) thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

## 2.7 SIGNS

- A. Baked-Enamel Signs:
  1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
  2. 1/4-inch (6.4-mm) grommets in corners for mounting.
  3. Nominal Size: 7 by 10 inches (180 by 250 mm).

## 2.8 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  1. Minimum Width: 3/16 inch (5 mm).
  2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
  3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  4. Color: Black, except where used for color-coding.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

## 3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- H. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.
- I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- J. Accessible Fittings for Raceways: Identify the covers of each junction and pull box with voltage and circuit.
- K. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- L. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- M. Nonmetallic Preprinted Tags:
  - 1. Place in a location with high visibility and accessibility.
  - 2. Secure using general-purpose cable ties.
- N. Baked-Enamel Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

- O. Laminated Acrylic or Melamine Plastic Signs:
  1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.
  
- P. Cable Ties: General purpose, for attaching tags, except as listed below:
  1. Outdoors: UV-stabilized nylon.
  2. In Spaces Handling Environmental Air: Plenum rated.

### 3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
  
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
  
- C. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
  
- D. Arc Flash Warning Labeling: Self-adhesive labels.
  
- E. Equipment Identification Labels:
  1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
  2. Outdoor Equipment: Laminated acrylic or melamine sign.
  3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of an engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Switchboards.
    - e. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - f. Emergency system boxes and enclosures.
    - g. Motor-control centers.
    - h. Enclosed switches.
    - i. Variable-speed controllers.
    - j. Push-button stations.
    - k. Power-transfer equipment.
    - l. Contactors.
    - m. Battery-inverter units.
    - n. Battery racks.
    - o. Power-generating units.
    - p. Monitoring and control equipment.

**END OF SECTION**



**SECTION 26 05 73.13**  
**SHORT-CIRCUIT STUDIES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

**1.3 DEFINITIONS**

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

**1.4 ACTION SUBMITTALS**

- A. Product Data:
  - 1. For computer software program to be used for studies.

2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
  - a. Short-circuit study input data, including completed computer program input data sheets.
  - b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
    - 1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
    - 2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data:
  1. For Power Systems Analysis Software Developer.
  2. For Power System Analysis Specialist.
  3. For Field Adjusting Agency.
- B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data:
  1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
  2. The following are from the Short-Circuit Study Report:
    - a. Final one-line diagram.
    - b. Final Short-Circuit Study Report.
    - c. Short-circuit study data files.
    - d. Power system data.

## **1.7 QUALITY ASSURANCE**

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
  1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.
  2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

- D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- E. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.
- F. Field Adjusting Agency Qualifications:
  - 1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
  - 2. A member company of NETA.
  - 3. Acceptable to authorities having jurisdiction.

## **PART 2 - PRODUCTS**

### **2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Operation Technology, Inc.
  - 2. Power Analytics, Corporation.
  - 3. SKM Systems Analysis, Inc.
- B. Comply with IEEE 399 and IEEE 551.
  - 1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

### **2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS**

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
  - 1. Protective device designations and ampere ratings.
  - 2. Conductor types, sizes, and lengths.
  - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
  - 4. Motor and generator designations and kVA ratings.
  - 5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
  - 6. Derating factors and environmental conditions.
  - 7. Any revisions to electrical equipment required by the study.

- D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.
- E. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
  2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
  3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
  4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
  5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
- F. Short-Circuit Study Input Data:
1. One-line diagram of system being studied.
  2. Power sources available.
  3. Manufacturer, model, and interrupting rating of protective devices.
  4. Conductors.
  5. Transformer data.
- G. Short-Circuit Study Output Reports:
1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    - a. Voltage.
    - b. Calculated fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. Equivalent impedance.
  2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    - a. Voltage.
    - b. Calculated symmetrical fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. Calculated asymmetrical fault currents:
      - 1) Based on fault-point X/R ratio.
      - 2) Based on calculated symmetrical value multiplied by 1.6.
      - 3) Based on calculated symmetrical value multiplied by 2.7.
  3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    - a. Voltage.
    - b. Calculated symmetrical fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. No AC Decrement (NACD) ratio.
    - e. Equivalent impedance.

- f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
- g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

## **PART 3 - EXECUTION**

### **3.1 POWER SYSTEM DATA**

- A. Obtain all data necessary for conduct of the study.
  - 1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Engineer's attention.
  - 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
  - 3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.
  
- B. Gather and tabulate the required input data to support the short-circuit study. Record data on a Record Document copy of one-line diagram in accordance with the Whitebook Section 3-7.3 "Red Lines and Record Documents". Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:
  - 1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  - 2. Obtain electrical power utility impedance at the service.
  - 3. Power sources and ties.
  - 4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
  - 5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
  - 6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
  - 7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
  - 8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
  - 9. Motor horsepower and NEMA MG 1 code letter designation.
  - 10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
  - 11. Derating factors.

### 3.2 SHORT-CIRCUIT STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.
- E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:
  - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
  - 2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.
- H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
  - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- I. Include in the report identification of any protective device applied outside its capacity.

**END OF SECTION**

**SECTION 26 05 73.16**  
**COORDINATION STUDIES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
  - 1. Study results shall be used to determine coordination of series-rated devices.

**1.3 DEFINITIONS**

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

## 1.4 ACTION SUBMITTALS

### A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
  - a. Coordination-study input data, including completed computer program input data sheets.
  - b. Study and equipment evaluation reports.
3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.
  - a. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

## 1.5 INFORMATIONAL SUBMITTALS

### A. Qualification Data:

1. For Power System Analysis Software Developer.
2. For Power Systems Analysis Specialist.
3. For Field Adjusting Agency.

- ### B. Product Certificates:
- For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

## 1.6 CLOSEOUT SUBMITTALS

- ### A. Operation and Maintenance Data:
- For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. The following are from the Coordination Study Report:
  - a. Final one-line diagram.
  - b. Final protective device coordination study.
  - c. Coordination study data files.
  - d. List of all protective device settings.
  - e. Time-current coordination curves.
  - f. Power system data.

## 1.7 QUALITY ASSURANCE

- ### A.
- Studies shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- ### B.
- Software algorithms shall comply with requirements of standards and guides specified in this Section.
- ### C.
- Manual calculations are unacceptable.
- ### D. Power System Analysis Software Qualifications:



1. Computer program shall be designed to perform coordination studies or have a function, component, or add-on module designed to perform coordination studies.
  2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- E. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- F. Field Adjusting Agency Qualifications:
1. Employer of a NETA ETT-Certified Technician Level III responsible for all field adjusting of the Work.
  2. A member company of NETA.
  3. Acceptable to authorities having jurisdiction.

## **PART 2 - PRODUCTS**

### **2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Operation Technology, Inc.
  2. Power Analytics, Corporation.
- B. Comply with IEEE 242 and IEEE 399.
- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
1. Optional Features:
    - a. Arcing faults.
    - b. Simultaneous faults.
    - c. Explicit negative sequence.
    - d. Mutual coupling in zero sequence.

### **2.2 COORDINATION STUDY REPORT CONTENTS**

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

- C. One-line diagram of modeled power system, showing the following:
1. Protective device designations and ampere ratings.
  2. Conductor types, sizes, and lengths.
  3. Transformer kilovolt ampere (kVA) and voltage ratings.
  4. Motor and generator designations and kVA ratings.
  5. Switchgear, switchboard, motor-control center, and panelboard designations.
  6. Any revisions to electrical equipment required by the study.
  7. Study Input Data: As described in "Power System Data" Article.
    - a. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 73.13 "Short-Circuit Studies."
- D. Protective Device Coordination Study:
1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
    - a. Phase and Ground Relays:
      - 1) Device tag.
      - 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
      - 3) Recommendations on improved relaying systems, if applicable.
    - b. Circuit Breakers:
      - 1) Adjustable pickups and time delays (long time, short time, and ground).
      - 2) Adjustable time-current characteristic.
      - 3) Adjustable instantaneous pickup.
      - 4) Recommendations on improved trip systems, if applicable.
    - c. Fuses: Show current rating, voltage, and class.
- E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
  2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
  3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
  4. Plot the following listed characteristic curves, as applicable:
    - a. Power utility's overcurrent protective device.
    - b. Medium-voltage equipment overcurrent relays.
    - c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    - d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.

- e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
  - f. Cables and conductors damage curves.
  - g. Ground-fault protective devices.
  - h. Motor-starting characteristics and motor damage points.
  - i. Generator short-circuit decrement curve and generator damage point.
  - j. The largest feeder circuit breaker in each motor-control center and panelboard.
5. Maintain selectivity for tripping currents caused by overloads.
  6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
  7. Provide adequate time margins between device characteristics such that selective operation is achieved.
  8. Comments and recommendations for system improvements.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.
  1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

### **3.2 POWER SYSTEM DATA**

- A. Obtain all data necessary for conduct of the overcurrent protective device study.
  1. Verify completeness of data supplied in one-line diagram on Drawings. Call any discrepancies to Engineer's attention.
  2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
  3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.
- B. Gather and tabulate all required input data to support the coordination study. List below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:
  1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution

system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
17. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:
  - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
  - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
  - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
  - d. Generator thermal-damage curve.
  - e. Ratings, types, and settings of utility company's overcurrent protective devices.
  - f. Special overcurrent protective device settings or types stipulated by utility company.
  - g. Time-current-characteristic curves of devices indicated to be coordinated.
  - h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
  - i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
  - j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
  - k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of

downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

### 3.3 COORDINATION STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
- B. Comply with IEEE 399 for general study procedures.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.
- E. Begin analysis at the service, extending down to system overcurrent protective devices as follows:
  - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
  - 2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Transformer Primary Overcurrent Protective Devices:
  - 1. Device shall not operate in response to the following:
    - a. Inrush current when first energized.
    - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
    - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
  - 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- H. Motor Protection:
  - 1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
  - 2. Select protection for motors served at voltages more than 600 V according to IEEE 620.
- I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- J. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.

- K. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.
- L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
  - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- M. Protective Device Evaluation:
  - 1. Evaluate equipment and protective devices and compare to short-circuit ratings.
  - 2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
  - 3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.
  - 4. Include in the report identification of any protective device applied outside its capacity.

### **3.4 LOAD-FLOW AND VOLTAGE-DROP STUDY**

- A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
  - 1. Determine load flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
  - 2. Determine load flow and voltage drop based on 80 percent of the design capacity of load buses.
  - 3. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

### **3.5 MOTOR-STARTING STUDY**

- A. Perform a motor-starting study to analyze the transient effect of system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of motor starting on the power system stability.

### **3.6 FIELD ADJUSTING**

- A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

### **3.7 DEMONSTRATION**

- A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in the following:
  1. Acquaint personnel in fundamentals of operating the power system in normal and emergency modes.
  2. Hand-out and explain the coordination study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.
  3. For Owner's maintenance staff certified as NETA ETT-Certified Technicians Level III or NICET Electrical Power Testing Level III Technicians, teach how to adjust, operate, and maintain overcurrent protective device settings.

**END OF SECTION**

**SECTION 26 05 73.19**  
**ARC-FLASH HAZARD ANALYSIS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

**1.3 DEFINITIONS**

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

**1.4 ACTION SUBMITTALS**

- A. Product Data: For computer software program to be used for studies.



- B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:
  - 1. Arc-flash study input data, including completed computer program input data sheets.
  - 2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
  - 3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
  - 1. For Power Systems Analysis Software Developer.
  - 2. For Power System Analysis Specialist.
  - 3. For Field Adjusting Agency.
- B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
  - 1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
  - 2. Operation and Maintenance Procedures: In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

## 1.7 QUALITY ASSURANCE

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
- D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
  - 1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
  - 2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

- E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.
- G. Field Adjusting Agency Qualifications:
  - 1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
  - 2. A member company of NETA.
  - 3. Acceptable to authorities having jurisdiction.

## **PART 2 - PRODUCTS**

### **2.1 COMPUTER SOFTWARE DEVELOPERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. EasyPower, LLC (formerly ESA Inc.).
  - 2. Power Analytics, Corporation.
  - 3. SKM Systems Analysis, Inc.
- B. Comply with IEEE 1584 and NFPA 70E.
- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

### **2.2 ARC-FLASH STUDY REPORT CONTENT**

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
  - 1. Protective device designations and ampere ratings.
  - 2. Conductor types, sizes, and lengths.
  - 3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
  - 4. Motor and generator designations and kVA ratings.
  - 5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.

- E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 73.13 "Short-Circuit Studies."
- F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 26 05 73.16 "Coordination Studies."
- G. Arc-Flash Study Output Reports:
  - 1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:
    - a. Voltage.
    - b. Calculated symmetrical fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. No AC Decrement (NACD) ratio.
    - e. Equivalent impedance.
    - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- H. Incident Energy and Flash Protection Boundary Calculations:
  - 1. Arcing fault magnitude.
  - 2. Protective device clearing time.
  - 3. Duration of arc.
  - 4. Arc-flash boundary.
  - 5. Restricted approach boundary.
  - 6. Limited approach boundary.
  - 7. Working distance.
  - 8. Incident energy.
  - 9. Hazard risk category.
  - 10. Recommendations for arc-flash energy reduction.
- I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

### **2.3 ARC-FLASH WARNING LABELS**

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.
- B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
  - 1. Location designation.
  - 2. Nominal voltage.
  - 3. Protection boundaries.
    - a. Arc-flash boundary.
    - b. Restricted approach boundary.
    - c. Limited approach boundary.

4. Arc flash PPE category.
  5. Required minimum arc rating of PPE in Cal/cm squared.
  6. Available incident energy.
  7. Working distance.
  8. Engineering report number, revision number, and issue date.
- C. Labels shall be machine printed, with no field-applied markings.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

### **3.2 ARC-FLASH HAZARD ANALYSIS**

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.
1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 73.13 "Short-Circuit Studies."
  2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 26 05 73.16 "Coordination Studies."
- C. Calculate maximum and minimum contributions of fault-current size.
1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
  2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
  3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.
  4. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.
- D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.
- F. Calculate the limited, restricted, and prohibited approach boundaries for each location.
- G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the

sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
  2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).
- H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:
1. When the circuit breaker is in a separate enclosure.
  2. When the line terminals of the circuit breaker are separate from the work location.
- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

### **3.3 POWER SYSTEM DATA**

- A. Obtain all data necessary for conduct of the arc-flash hazard analysis.
1. Verify completeness of data supplied on one-line diagram on Drawings. Call discrepancies to Engineer's attention.
  2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
  3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:
1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  2. Obtain electrical power utility impedance or available short circuit current at the service.
  3. Power sources and ties.
  4. Short-circuit current at each system bus (three phase and line to ground).
  5. Full-load current of all loads.
  6. Voltage level at each bus.
  7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.

8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage conductor sizes, lengths, conductor material, conductor construction and metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).

### **3.4 LABELING**

- A. Apply one arc-flash label on the front cover of each section of the equipment for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.
- B. Each piece of equipment listed below shall have an arc-flash label applied to it:
  1. Low voltage transformers. Exclude transformers with high voltage side 240 V or less and less than 125 kVA.
  2. Panelboard and safety switch over 250 V.
  3. Applicable panelboard and safety switch under 250 V.
  4. Control panel.
  5. Pedestal.
- C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.
  1. Indicate arc-flash energy.
  2. Indicate protection level required.

### **3.5 APPLICATION OF WARNING LABELS**

- A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

### **3.6 DEMONSTRATION**

- A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

**END OF SECTION**

**SECTION 26 08 00**  
**COMMISSIONING OF ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Electrical equipment connected to Normal electrical systems, including the following:
  - a. Motor-control centers.
  - b. Transformers.
  - c. Grounding systems.
2. Electrical equipment connected to Essential electrical systems that provide an alternative source of power in the absence of power from the Normal electrical system, including the following:
  - a. Motor-control centers.
  - b. Lighting protection systems.
  - c. Grounding systems.
  - d. Generators.
3. Controls and instrumentation, including the following:
  - a. Equipment monitoring systems.
  - b. Energy monitoring and control systems.
  - c. Electrical metering and metering system.
  - d. Demand response systems.
4. Systems testing and verification, including Normal and Essential electrical systems.

B. Related Requirements:

1. Section 26 00 10 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

**1.2 DEFINITIONS**

- A. BoD: Basis-of-Design Document.
- B. Cx: Commissioning.
- C. CxA: Commissioning Authority.
- D. OPR: Owner's Project Requirements.

- E. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they mean "as-built" systems, assemblies, subsystems, equipment, and components.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Construction Checklists by CxA: Draft construction checklists will be created by CxA for Contractor review.

### 1.4 QUALITY ASSURANCE

- A. Testing Equipment and Instrumentation Quality and Calibration: For test equipment and instrumentation required to perform electrical Cx work, perform the following:

1. Submit test equipment and instrumentation list. For each equipment or instrument, identify the following:

- a. Equipment/instrument identification number.
- b. Planned Cx application or use.
- c. Manufacturer, make, model, and serial number.
- d. Calibration history, including certificates from agencies that calibrate the equipment and instrumentation.

2. Test equipment and instrumentation must meet the following criteria:

- a. Capable of testing and measuring performance within the specified acceptance criteria.
- b. Be calibrated at manufacturer's recommended intervals with current calibration tags permanently affixed to the instrument being used.
- c. Be maintained in good repair and operating condition throughout duration of use on Project.
- d. Be recalibrated/repared if dropped or damaged in any way since last calibrated.

- B. Proprietary Test Instrumentation and Tools:

1. Equipment Manufacturer's Proprietary Instrumentation and Tools: For installed equipment included in the Cx process, test instrumentation and tools manufactured or prescribed by equipment manufacturer to service, calibrate, adjust, repair, or otherwise work on its equipment or required as a condition of equipment warranty, perform the following:

- a. Submit proprietary instrumentation and tools list. For each instrument or tool, identify the following:

- 1) Instrument or tool identification number.
- 2) Equipment schedule designation of equipment for which the instrument or tool is required.
- 3) Manufacturer, make, model, and serial number.



- 4) Calibration history, including certificates from agencies that calibrate the instrument or tool, where appropriate.
- b. Include a separate list of proprietary test instrumentation and tools in operation and maintenance manuals.
- c. Electrical proprietary test instrumentation and tools become property of Owner at the time of Substantial Completion.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION**

### **3.1 CONSTRUCTION CHECKLISTS**

- A. Prepare detailed construction checklists for electrical systems, subsystems, equipment, and components. Complete and submit construction checklists.

### **3.2 CONSTRUCTION CHECKLIST REVIEW**

- A. Review and provide written comments on draft construction checklists. CxA will create required draft construction checklists and provide them to Contractor.
- B. Return draft Construction Checklist review comments within 10 days of receipt.
- C. When review comments have been resolved, CxA will provide final construction checklists, marked "Approved for Use, (date)."
- D. Use only construction checklists, marked "Approved for Use, (date)."

### **3.3 GENERAL TESTING REQUIREMENTS**

- A. Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and that they are operating according to the Contract Documents and approved Shop Drawings and submittals.
- B. Certify that electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents and approved Shop Drawings and submittals, and that pretest set points have been recorded.
- C. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (for example, normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- D. Measure capacities and effectiveness of systems, assemblies, subsystems, equipment, and components, including operational and control functions to verify compliance with acceptance criteria.
- E. Test systems, assemblies, subsystems, equipment, and components operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and response according to acceptance criteria.

- F. Construction Checklists: Prepare and submit detailed construction checklists for electrical systems, subsystems, equipment, and components.
  - 1. Contributors to development of construction checklists must include, but are not limited to, the following:
    - a. Electrical systems and equipment installers.
    - b. Electrical instrumentation and controls installers.
- G. Perform tests using design conditions, whenever possible.
  - 1. Simulated conditions may, with approval of Engineer, be imposed using an artificial load when it is impractical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by CxA, and document simulated conditions and methods of simulation. After tests, return configurations and settings to normal operating conditions.
  - 2. Cx test procedures may direct that set points be altered when simulating conditions is impractical.
  - 3. Cx test procedures may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are impractical.
- H. If tests cannot be completed because of a deficiency outside the scope of the electrical system, document the deficiency and report it to Owner. After deficiencies are resolved, reschedule tests.
- I. If seasonal testing is specified, complete appropriate initial performance tests and documentation and schedule seasonal tests.
- J. Coordinate schedule with, and perform Cx activities at the direction of the CxA.
- K. Comply with Construction Checklist requirements, including material verification, installation checks, startup, and performance tests requirements specified in Sections specifying electrical systems and equipment.
- L. Provide qualified testing and inspecting agency personnel in accordance with Section 26 00 10 "Supplemental Requirements for Electrical," instrumentation, tools, and equipment to complete and document the following:
  - 1. Performance tests.
  - 2. Demonstration of a sample of performance tests.
  - 3. Cx tests.
  - 4. Cx test demonstrations.

### 3.4 Cx TESTS FOR ELECTRICAL SYSTEMS

- A. Verification of Normal Electrical System Operation:

1. Prerequisites: Acceptance of results for construction checklists for Division 26 electrical components associated with Normal electrical system.
2. Equipment and Systems to Be Tested: Division 26 electrical equipment.
3. Test Purpose: Verify operation of Normal electrical system.
4. Test Conditions: Energize components of Normal electrical system, one at a time.
5. Acceptance Criteria: Proper operation of Normal electrical system over a 48-hour period.

B. Verification of Essential Electrical System Operation:

1. Prerequisites:
  - a. Acceptance of results for construction checklists for Division 26 electrical components associated with Essential electrical system.
  - b. Completion of "Verification of Normal Electrical System Operation" tests.
2. Equipment and Systems to Be Tested: Division 26 electrical equipment.
3. Test Purpose: Verify operation of Essential electrical system.
4. Test Conditions:
  - a. Energize components of Normal electrical system.
  - b. Simulate a failure of Normal electrical system.
5. Acceptance Criteria: Transfer of power from Normal to Essential electrical system within OPR.

C. Verification of Control and Instrumentation:

1. Prerequisites: Acceptance of results for construction checklists.

D. Test Purpose: Verify operation of control and monitoring systems for Normal and Essential electrical systems.

E. Test Conditions:

1. Energize components of Normal electrical system.
2. Test operation of equipment.
3. When work is performed on the existing facilities, the commissioning agent/contractor is responsible for redlining any changes to the existing loop drawings based on the work to be performed/completed in the field. Redlines shall consist of actual field conditions upon completion of work. Technical assistance will be provided by Facilities engineer as needed. The commissioning agent/contractor can obtain current electronic copies of the loop drawing from the Owner as part of the contract documents. Once the

work is completed, final loop drawing redlines shall be forwarded to the Owner and design engineer.

F. Acceptance Criteria: Operation of equipment according to OPR.

**END OF SECTION**

## SECTION 26 29 23.23

### VARIABLE FREQUENCY MOTOR CONTROLLERS - PROCESS

Square D Altivar™ Process 630,660,680 and Drive Systems by Schneider Electric

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for adjustable or variable frequency motor controllers (also identified as VFDs, AFDs, Variable Frequency Drives, or Adjustable Frequency Drives) as required for the complete performance of the Work, as shown on the Drawings, as specified herein, and as specified elsewhere for the assemblies or systems comprised of the components specified herein.
- B. Related Sections include, but shall not be limited to, the following:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - 2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections, apply to this Section.
  - 3. Refer to the specification sections for the VFD driven equipment for additional requirements. The system supplier of the motor driven equipment shall be responsible for furnishing the Variable Frequency Drive where specified or shown.

##### **1.2 REFERENCES**

- A. General, Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.
  - 1. American Society of Civil Engineers (ASCE)
    - a. ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures."
  - 2. Canadian Standards Association (CSA)
    - a. C22.2 No. 274, "Adjustable Speed Drives"
    - b. C22.1, "Canadian Electrical Code, Part I (CEC)"
  - 3. Institute of Electrical and Electronics Engineers (IEEE)
    - a. IEEE 519, "IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems"
  - 4. International Code Council (ICC):
    - a. ICC IBC, "International Building Code"
    - b. ICC UBC, "Uniform Building Code"
    - c. AC156, "Acceptance criteria for Seismic Certification by Shake Table Testing of Nonstructural Components"
  - 5. International Electrotechnical Commission (IEC)

- a. IEC 61000, “Electromagnetic Compatibility”
  - b. IEC 61800-5-1, “Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy”
  - c. IEC 60068 Part 2-3, “Basic Environmental Testing Procedures Part 2: Tests – Test Ca: Damp Heat”
  - d. IEC 60146-1-1, “Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements”
  - e. IEC 60664-1, “Insulation Coordination for Equipment Within Low-Voltage Systems”
  - f. IEC 60447, “Basic and safety principles for man-machine interface, marking and identification - Actuating principles”
  - g. IEC 61439-1, “Low-Voltage Switchgear and Control gear Assemblies - Part 1: General Rules”
  - h. IEC 60364-1, “Low-Voltage Electrical Installations - Part 1: Fundamental Principles, Assessment of General Characteristics, Definitions”
  - i. IEC 60204-1, “Safety of machinery - Electrical equipment of machines - Part 1: General requirements”
  - j. IEC 106, “Guide for Specifying Environmental Conditions for Equipment Performance Rating”
  - k. IEC 529, “Degrees of protection provided by enclosure”
  - l. IEC 1000, “Electromagnetic Compatibility”
  - m. IEC 1800, “Adjustable speed Electrical power drive systems”
  - n. IEC 60721-3-3, “Classification of Environmental Conditions”
  - o. IEC 60255-8, “Overload Relays”
  - p. IEC 60801-2,-3,-4,-5, “Immunity Tests”
  - q. IEC 60947-2, “Low-voltage switchgear and control gear - Part 2: Circuit-breakers”
6. International Organization for Standardization (ISO):
- a. ISO 9001, “Quality Management Systems – Requirements “
  - b. ISO 14001, “Environmental management systems -- Requirements with guidance for use”
7. National Electrical Manufacture Association (NEMA)
- a. NEMA 250, “Enclosures for Electrical Equipment”
  - b. NEMA ICS Part 4, “Overload Relays”
  - c. NEMA ICS7, “Industrial Control and Systems Adjustable Speed Drives”
  - d. NEMA ICS 7.1, “Safety Standards for Construction and Guide for Selection Installation and Operation of Adjustable Speed Drives”
8. National Fire Protection Association
- a. NFPA 70, “National Electrical Code (NEC)”
  - b. NFPA 79, “Electrical Standard for Industrial Machinery”
  - c. NFPA 5000, “Building Construction and Safety Code”
9. Occupational Health and Safety Administration (OHSA)
- a. OSHA 1910.95, “AC Drive Controller Acoustical Noise”
10. Semiconductor Equipment and Materials International (SEMI)
- a. SEMI F47, “Industry Standard for Voltage Sag Immunity”
11. Underwriters Laboratories, Inc. (UL):

- a. UL 50, "Enclosures for Electrical Equipment"
- b. UL 98, "Disconnect Switches"
- c. UL 507, "Electric Fans"
- d. UL 508, "Industrial Control Equipment"
- e. UL 508A, "Standard for Industrial Control Panels"
- f. UL 991, "Safety Tests for Safety Related Controls Employing Solid State Devices"
- g. UL 508C, UL 61800-5-1, "UL Standard for Safety Power Conversion Equipment"

### 1.3 DEFINITIONS

- A. General, Definitions: Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.
  - 1. LV: Low voltage
  - 2. VFD: Variable frequency drive
  - 3. VSI: Voltage source inverter
  - 4. AFE: Active front end
  - 5. DFE: Diode front end
  - 6. MTBF: Mean time between failure
  - 7. MTTR: Mean time to repair
  - 8. NPC: Neutral point clamped
  - 9. IGBT: Insulated gate bipolar transistor
  - 10. PWM: Pulse width modulation

### 1.4 SUBMITTALS

- A. General: Submittals shall be in accordance with the requirements of Section 01 33 00 Submittal Procedures and Section 26 00 10 Supplemental Requirements for Electrical, in addition to those specified herein.
  - 1. Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.
  - 2. Deviations from the Contract Documents shall be indicated within the submittal. Each deviation shall reference the corresponding drawing or specification number, show the Contract Document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.
  - 3. Submit required product data and shop drawings specific to each product and accessory proposed. In addition, include the following information:
    - a. Manufacturer, supplier, and proposal specific contact information.
    - b. Manufacturer's catalog data indicating model numbers, equipment specifications and construction features including all furnished options, and accessories.
    - c. VFD assembly rated input KVA and output KVA, percent efficiency, operating characteristics, and electrical characteristics.
    - d. Maximum Btu heat release data and ambient cooling requirements.
    - e. Enclosure type, NEMA rating, material and finishes.

- f. Certification of UL conformity
  - g. Equipment assembly. Indicate dimensions, shipping section dimensions, weights, foundation requirements, required clearances, location and size of each field connection, and mounting and installation instructions.
  - h. Include elementary and interconnection diagrams for power, signal, control, and communications wiring. Diagrams shall provide the minimum detail as shown for drawings in the appendix of NFPA 79. All field terminals shall be identified and updated later within the O&M data to include actual field connection information. Drawings shall not be typical, but be provided for each VFD furnished.
  - i. Electronic 2D dimensional drawing and 3D model CAD files for standard units shall be provided upon request if not available from the manufacturer's website.
- B. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout on which, the following items are shown and coordinated with each other, using input from installers of the items involved:
- 1. Required working clearances and required area above and around VFDs.
  - 2. Show VFD layout and relationships between electrical components and adjacent structural and mechanical elements.
  - 3. Show support locations, type of support, and weight on each support.
  - 4. Indicate field measurements.
- C. Harmonic Analysis Report: Provide project-specific calculations and manufacturer's statement of compliance with IEEE 519, latest revision. Owner shall supply detailed electrical power system characteristics to support harmonic calculations.
- D. Operation & Maintenance (O&M) manuals shall be provided in accordance with the minimum requirements specified in Section 01 78 23 Operation and Maintenance Data, Section 26 00 10 Supplemental Requirements for Electrical and additional requirements specified herein.
- 1. Submit required Operations & Maintenance data specific to each product and accessory proposed. In addition, include the following information:
    - a. Manufacturer, supplier, support, and repair center specific contact information.
    - b. Manufacturer's standard operation and maintenance data assembled for each size and type of equipment furnished.
    - c. All construction, installation, schematic, and wiring diagrams updated to an as-installed and commissioned state.
    - d. All configured settings/parameters for adjustable components updated to an as-installed and commissioned stated if different from the factory default. Electronic copies of configuration files shall be provided, on media acceptable to the Owner (e.g. CD, USB stick, etc.), where these configurations can be saved as an electronic file for future upload into replaced or repaired components.
    - e. List of furnished and recommended spare parts.
    - f. Statement of standard Warranty. Statement of extended warranty options and costs.
  - 2. O&M manuals shall be submitted prior to arrival of equipment on site.



## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service.
  - 1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.
  - 2. The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.
  - 3. The VFD manufacturer shall have the Environment Certification ISO 14001 for EcoDesign.
- B. Installer Qualifications: Installer shall be a firm that shall have successful installation experience with projects utilizing equipment similar in type and scope to that required for this Project.
- C. All work performed, and all materials used shall be in accordance with the National Electrical Code and with applicable local regulations and ordinances. Equipment assemblies, materials, and equipment shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.
- B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.
- C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.
- D. To be in accordance with 2021 Greenbook and Whitebook.

## 1.7 WARRANTY

- A. General: Refer to Section 01 77 00 - Closeout Procedures.
- B. The manufacturer shall warrant products against defects in material and workmanship for 60 months from the date of commissioning provided that the following requirements are met:
  - 1. Schneider Electric performs startup, functional testing, commissioning and first parameter adjusting of equipment.
  - 2. The new gear is registered by Schneider Electric representative.
  - 3. Extended warranty, ASP Ultra Contract, offered by Schneider Electric is purchased upon registration of gear.

- C. During the warranty period, the manufacturer shall repair or replace defective products.
- D. This warranty shall be in addition to any provided by the Contractor. The warranty shall exclude normal wear and tear under normal usage and any damage caused by abuse, modification, or improper maintenance by entities other than the manufacturer or its approved representative.
- E. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

## **1.8 SPECIAL TOOLS AND SPARE PARTS**

- A. The Contractor shall provide a recommended spare parts list with the following information provided as a minimum:
  - 1. Contact information for the closest parts stocking location to the Owner.
  - 2. Critical spare parts shall be identified as those parts being associated with long lead times and/or those being critical to the unit's operation.
  - 3. Maintenance spares shall be identified as being those parts required to regularly perform scheduled maintenance on the VFD equipment. These spares shall include, but shall not be limited to, consumable spares that are required to be exchanged during scheduled maintenance periods.
- B. A replacement VFD shall be provided for 1-100 HP 575V, 1-125 HP 460V, and 1-60 HP 230V, in lieu of replacement components. Spare parts shall be provided for each type and size of VFD furnished greater than 125 HP 460V, and 60 HP 230V. Provide the minimum spare parts recommended by the manufacturer. At a minimum the following shall be provided:
  - 1. Power and control fuses
  - 2. Non-LED type indicating lights
  - 3. Rectifier power semiconductors
  - 4. Inverter power semiconductors
  - 5. One of each type of printed circuit board and gate firing board
  - 6. Other field replaceable components
- C. Any manufacturer specific special tool, not normally found in an electrician's toolbox, required to remove and install recommended or furnished spare parts shall be furnished. At a minimum the following shall be provided:
  - 1. PC-based configuration software tool.
  - 2. Electronic configuration files, in a media format acceptable by the Owner (e.g. CD, USB stick, etc.), updated to an as-installed and commissioned state.
- D. Spare parts shall be properly marked and packaged for long term storage. Printed circuit boards shall be provided in separate anti-static containers.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D Altivar Process Variable Speed Drive by Schneider Electric.

- B. Acceptable Products: VFDs specified herein shall be the product of a single manufacturer. Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. Provide the following specified product and manufacturer without exception, unless approved as a substitute by addendum to the Contract Documents prior to the bid date:
- C. 1. Square D Altivar Process Variable Speed Drive by Schneider Electric
- D. The VFD manufacturer shall provide for repair and service of the drive components with worldwide support. The VFD manufacturer shall provide remote diagnostic services in conjunction with the VFD's user interface to provide QR code, or equivalent, linked access to worldwide web based enhanced diagnostics, documentation, and customer service.

## 2.2 GENERAL REQUIREMENTS

- A. The VFDs shall be built to comply with the UL standard and shall be marked in accordance with to UL 508, UL508C or UL 61800-5-1.
- B. Without limiting the generality of other requirements of this Section, all work specified herein shall conform to or exceed the applicable requirements of the following standards; provided, that wherever the provisions of listed publications conflict with the requirements specified herein, the more stringent requirements shall apply:
  1. ANSI/NFPA 70: National Electrical Code
  2. EN61800-5: Electronic equipment for use in power installation
  3. CSA C22.2 No. 274 – Adjustable Speed Drives
  4. IEC 60068 Part 2-3: Basic Environmental Testing Procedures Part 2: Tests – Test Ca: Damp Heat
  5. IEC 60146-1-1: Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements
  6. IEC 60664-1: Insulation Coordination for Equipment Within Low-Voltage Systems
  7. IEC 60447: Basic and safety principles for man-machine interface, marking and identification - Actuating principles
  8. IEC 61439-1: Low-Voltage Switchgear and Controlgear Assemblies - Part 1: General Rules
  9. IEC 60364-1: Low-Voltage Electrical Installations - Part 1: Fundamental Principles, Assessment of General Characteristics, Definitions
  10. IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
  11. IEC 106: Guide for Specifying Environmental Conditions for Equipment Performance Rating
  12. IEC 529: Degrees of protection provided by enclosure
  13. IEC 1000: Electromagnetic Compatibility
  14. IEC 1800: Adjustable speed Electrical power drive systems
  15. IEC 60721-3-3: Classification of Environmental Conditions
  16. IEC 60255-8: Overload Relays
  17. IEC 60801-2,-3,-4,-5: Immunity Tests
  18. NEMA ICS Part 4: Overload Relays
  19. NEMA ICS7: Industrial Control and Systems Variable Speed Drives
  20. UL 508C, UL 61800-5-1: UL Standard for Safety Power Conversion Equipment

- C. Variable Frequency Drives (VFDs) shall provide for the starting and speed control of standard NEMA, design AC inverter duty asynchronous motors and synchronous motors with permanent magnets by the adjustment of output voltage and frequency. The VFD shall be a digitally controlled drive, using Pulse Width Modulation (PWM).
- D. Unless otherwise specified or shown within the Contract Documents, the Contractor shall be responsible for matching the VFD to the load (variable or constant torque) as well as the speed and current of the actual motor being controlled. This sizing shall match the KVA and inrush characteristics of the motors provided.
- E. The VFD manufacturer shall design the device with more than 70% of recyclability rate. The VFD shall be compliant with the "Green" Premium label (REACH, RoHS-2, EOL, and PEP). The VFD Manufacturer shall design the device according to the IEC 62635 guidelines to reduce the carbon footprint. The materials used in the VFD shall be recyclable, non-toxic and flame retardant. The VFD manufacturer shall provide the carbon footprint of the devices.
- F. The VFD shall have a main fuse block, at a height coordinated with VFD manufacturer upon procurement, so that existing incoming feeders can be re-used.
- G. Environmental Requirements
  - 1. The VFD shall be rated to withstand the following environmental conditions while able to give a 100% output current continuously. Where derating is necessary to meet on site environmental conditions, the manufacturer shall submit the VFDs derated performance. The derating factor shall be specified so that neither the lifetime of the VFD nor the unit's performance, overload capability included, nor the reliability of the VFD shall suffer.
    - a. Storage Temperature: -40°C to 70°C,
    - b. Operating Temperature for UL Type 1 VFDs: -15°C to 50°C without derating, up to 60°C with derating of power stage (UL Type 1)
    - c. Operating Temperature for enclosed VFDs: -10°C to 40°C without derating, down to -10°C with enclosure heater, up to 55°C with derating of power stage
    - d. Relative Humidity: ≤95% relative humidity without condensation per IEC 60068-2-3
    - e. Operating Altitude: ≤1000m without derating, up to 4800m with derating.
    - f. Corrosion Protection Level: Class 3C3 according to IEC 60721-3-3 for cooling air and chemical gases
    - g. Biological Protection Level: Class 3B1 according IEC 60721-3-3
    - h. Dust Protection Level: Class 3S3 according to IEC 60721-3-3
    - i. Vibration and Shock Protection Level: Class 3M3 according to IEC 60721-3-3
  - 2. The seismic rating of the enclosed VFD shall meet the site-specific requirements of the installed location as determined by CBC and local governing codes.
    - a. Seismic code compliance testing shall be in accordance with ICC ES AC156 Shake-Table Test Acceptance Criteria protocol with an importance factor of at least 1.5.
    - b. All anchorage, lateral bracing, and mounting guidelines shall be specified with drive instruction documentation and/or markings. The VFD shall exhibit a seismic qualification label stating compliance.

- c. A certificate of compliance shall be provided to the seismic provisions of the CBC.
- 3. The VFDs shall have an integral enclosure that shall protect from ingress of dirt and water in accordance with UL Type 1. The user interface terminal shall be rated UL Type 12, mounted on front face of enclosure, and accessible for programming and controls with the main door closed.
- 4. VFD enclosures shall be front cabinet accessible and constructed in conformance with IEC 60439-1. Conduit entry shall be bottom entry as standard to allow for top mounted cooling components. The VFD enclosure shall have a forced air and heat sink cooling system that does not require liquid or air condition cooling components for ambient temperatures within the drives stated ambient temperature operating range.

## 2.3 PERFORMANCE REQUIREMENTS

- A. The VFD shall be rated for the nominal input voltage specified or shown on the drawings. The VFD shall have a three-phase input voltage tolerance within the following range of the corresponding nominal input voltage:
  - 1. 200V -15% 240V +10%
  - 2. 380V -15% 480V +10%
  - 3. 500 to 690V -15% / +10%
- B. The VFD shall meet the following minimum operating requirements:
  - 1. Rated Frequency: 50 Hz -5% to 60 Hz + 5%
  - 2. Displacement Power Factor:  $\geq 0.97$
  - 3. Efficiency:
    - a.  $>98\%$  at nominal load for VFD (IP 21 / UL Type 1)
    - b.  $>97.5\%$  at nominal load for enclosed VFD systems.
    - c.  $>96\%$  at nominal load for low harmonic VFD (IP 21 / UL Type 1)
    - d.  $>95.5\%$  at nominal load for low harmonic enclosed VFD systems.
  - 4. Overload Capability: Heavy Duty at 150% nominal current for 1 min
  - 5. Harmonics Mitigation:  $<48\%$  THDi according to IEC/EN 61000-3-12 at 80-100% load
  - 6. Surge immunity according to IEC/EN 61000-4-5 Level 3
  - 7. The VFD shall be compliant with SEMI F47: degraded running operation during undervoltage conditions.
    - a. 50% undervoltage for up to 200 ms
    - b. 30% undervoltage for up to 500 ms
    - c. 20% undervoltage for up to 1 s
- C. The VFD shall provide a speed range in the motor quadrant 1:100 in sensor less vector control and in the generator quadrant 1:50 in sensor less vector control.
- D. The VFD shall provide an over torque capability better than 150% of the rated motor torque for heavy duty applications during 60s, every 10 minutes.
- E. The VFD shall provide a speed accuracy  $\pm 10\%$  of the nominal slip of the motor in sensor less vector control.
- F. The VFD shall provide a torque control accuracy  $\pm 15\%$  in sensor less vector control for AC motors.

## 2.4 APPLICATION REQUIREMENTS

- A. The VFD shall be able to control motors using the following motor control types in accordance with the applications needs and energy savings: Volts per hertz VC Standard, Volts per hertz VC 5pts, Volts per hertz VC Quad., Volts per hertz VC Energy Sav.
- B. The VFD shall provide Real Time Clock management with battery backup.
- C. The VFD shall be capable of automatic tuning of motor parameters through measurement of the motor without rotation, and without the need to disconnect the load from the motor.
- D. The VFD shall provide functionality adjustable within the drive parameters to reduce voltage surges on motor cables.
- E. The Contractor shall provide AC chokes and filters to fit installation and motor requirements per the following guidelines:
  - 1. Voltage reflection suppression for motors compliant to IEC60034-25 or NEMA MG1 Part 31
    - a. Unshielded motor cable length up to 500 feet (150 meters) shall be managed with the VFD functionality
    - b. Unshielded motor cable length up to 1000 feet (300 meters) an AC choke shall be required
    - c. Unshielded motor cable length up to 1640 feet (500 meters) a dV/dt filter shall be required
    - d. Unshielded motor cable length up to 3280 feet (1000 meters) a Sinus filter shall be required
  - 2. Voltage reflection suppression with motors not compliant to IEC60034-25 or NEMA MG1 Part 31
    - a. Unshielded motor cable length up to 50 meters a dV/dt filter shall be required
    - b. Unshielded motor cable length up to 1000 meters a Sinus filter shall be required
- F. Protection
  - 1. The VFD shall be UL 508 or UL61800-5-1 listed for use on distribution systems.
  - 2. The VFD shall have coordinated short circuit rating designed to UL 508C or UL 61800-5-1 and NEMA ICS 7.1 Short Circuit Rating: 65 kAIC
  - 3. Micro-short voltage sag immunity per SEMI F47.
  - 4. Upon power-up the VFD shall automatically test for valid operation of memory, option module, loss of analogue reference input, loss of communication, DC to DC power supply, control power and the pre-charge circuit.
  - 5. The VFD shall be protected against short circuits, between output phases and ground and the logic and analogue outputs.
  - 6. The VFD shall have a selectable ride through function that shall allow the logic to maintain control for a minimum of one second without tripping.
  - 7. The deceleration mode of the VFD shall be programmable for normal and trip conditions. The stop modes shall include freewheel stop, fast stop.
  - 8. Upon loss of the analog process follower reference signal, the VFD shall trip and/or operate at a user-defined speed set by a software programmed speed settings or last speed.

9. The VFD shall integrate a protection against IGBT and heat sink over temperature.
10. The VFD shall have solid state thermal protection that is UL Listed and meets UL 508C as a Class 10 overload protection and meets IEC 60947-2.
11. The VFD shall have a motor thermal memory retention function per UL requirements.
12. The VFD shall be able to protect the motor when temperature probes are connected.
13. The VFD shall be able to limit the motor surge (  $I dv/dt$  ) at twice the DC bus voltage
14. The VFD shall provide IGBT protection
  - a. IGBT overcurrent protection
  - b. IGBT checkup sequence
  - c. IGBT checkup sequence before PWM enable sequence
  - d. IGBT over-heat protection
15. The VFD shall provide VFD Current protection
  - a. Phase short circuit protection
  - b. Ground protection
  - c. Over-current protection
16. The VFD shall provide VFD Voltage error protection
  - a. Mains over-voltage protection
  - b. Mains under-voltage protection
  - c. DC Bus over-voltage protection
  - d. DC Bus pre-charge protection
17. The VFD shall provide VFD Thermal protection
  - a. VFD over-temperature protection
  - b. FAN management
  - c. Switching Frequency management
18. The VFD shall provide internal error detection.
19. The VFD shall provide Motor protection functions
  - a. Motor output phase detection
  - b. Motor surge voltage
  - c. Motor over load detection
  - d. Motor stall protection
20. The VFD shall provide Application protection functions
  - a. Catch on fly function
  - b. Mains input phase lost protection
  - c. Motor over-speed input protection
  - d. Current limitation
  - e. Power limitation
  - f. Reverse inhibition
  - g. Under-load protection
  - h. Over-load protection
  - i. External error management
  - j. Loss of follower signal
  - k. Thermal Sensor management
  - l. PID Feedback
  - m. Customer defined input

## 2.5 CONTROL AND INTERFACE REQUIREMENTS

### A. Indicators

1. The VFD shall display a signal by LED near the connection point of the device when a hazardous voltage is present.
2. The VFD shall have 3 LEDs for local diagnostics.
3. The VFD shall have 3 dual color LEDs for embedded communication status.
4. The VFD shall have 4 dual color LEDs for optional communication status

### B. User Interface

1. A detachable UL Type 12/IP65 rated bi-color backlit graphical user interface terminal with keypad and capacitive wheel shall be provided for monitoring, annunciation, and configuration. The graphical display shall change to a red backlit color when an alarm occurs. The door mounting for the user interface shall be done with a 22 mm hole.
2. A "Simply Start" menu for fast and easy commissioning shall be provided and parameter setting shall be easily accessible and user friendly with plain text messaging and actual setting range.
3. The keypad shall be capable of providing password protection.
4. The user interface shall be capable of saving and downloading configurations of the VFDs, as well as porting them to other VFDs.
5. The user interface shall offer a Mini-USB port for mass storage or PC device connection.
6. The mechanical mounting for the user interface on the cabinet shall be done with a 22 mm hole.
7. The VFD shall have self-diagnostic capabilities to display alarms, errors, and warnings as they occur and be able to store at least 15 last messages into the memory. These shall be accessible by PC maintenance tools or web server with flash record for data logging expertise
8. The user interface shall be identical throughout the power range to avoid confusion amongst the users and need for training in several different units.
9. The displayed messages shall be in plain text English.

### C. Control Interface:

1. VFD shall interface with automation systems to monitor, control, display, and record data for use in processing reports. VFD settings shall be retained within VFD's nonvolatile memory.
2. The speed command and reference may come from different control sources:
  - a. I/O terminals
  - b. Communication network
  - c. Web server
  - d. Remote graphic display terminal
3. A minimum of the following standard inputs / outputs shall be provided to interface with control systems and instrumentation:
  - a. Analog Inputs: 5 programmable 0(4)-20 mA or 0-10 vdc
    - 1) 2 analog inputs shall also be programmable for temperature sensors (PTC, PT100, PT1000, KTY84)
  - b. Analog Outputs: 2 programmable 0(4)-20 mA or 0-10 vdc



- c. Discrete Inputs: 12 programmable isolated logic inputs as either sink or source
  - 1) 2 discrete inputs shall also be programmable as 0-30 kHz pulse inputs
  - 2) 2 discrete inputs shall be dedicated Safe Torque Off safety function in accordance with IEC/EN 61508-1 SIL3
- d. Discrete Outputs: 6 programmable relay contacts and 1 open collector output
  - 1) 1 discrete output shall be dedicated to product watchdog logic
- 4. Programmable analog inputs shall be able to be assigned the following parameters:
  - a. Speed reference
  - b. Summing reference
  - c. Subtracting reference
  - d. Multiplying reference
  - e. Torque reference
  - f. Torque limitation
  - g. PID feedback
  - h. Manual PID reference
  - i. PID speed reference
  - j. Forced local reference
- 5. Programmable analog outputs shall be able to be assigned the following parameters:
  - a. Motor current
  - b. Motor frequency
  - c. Motor torque (signed or unsigned)
  - d. Motor power
  - e. Motor voltage
  - f. Output frequency (signed or unsigned)
  - g. PID error
  - h. PID feedback
  - i. PID output
  - j. PID reference
  - k. Ramp output
  - l. Signed ramp
  - m. Drive thermal state
  - n. Motor thermal state
  - o. Pressure sensor
  - p. Flow sensor
- 6. Programmable discrete inputs shall be able to be assigned the following parameters:
  - a. Run
  - b. Forward
  - c. Reverse
  - d. Jog
  - e. Preset speeds
  - f. Reference switching
  - g. Ramp switching

- h. Error reset
  - i. Error inhibition
  - j. Product reset
  - k. PID regulation mode (auto)
  - l. PID speed regulation mode (manual)
  - m. PID integral reset
  - n. Preset PID reference
  - o. Sleep/wake-up
  - p. Activate sleep mode by flow detection
  - q. Analogue torque limitation activation
  - r. Torque reference sign
  - s. Command switching
  - t. Parameter sets selection
  - u. Fast stop
  - v. DC injection
  - w. Freewheel stop
  - x. + speed
  - y. - speed
  - z. External error
  - aa. Pre Fluxing
  - bb. Forced local control
  - cc. Current limitation activation
  - dd. Output contactor feedback
  - ee. Reference memorization
  - ff. Auto-tuning
  - gg. Forced operation
  - hh. Under load detection
  - ii. Overload detection
  - jj. Limiting low speed operating time
  - kk. Switching frequency, noise reduction
  - ll. Drive lock assignment
  - mm. Outlet pressure switch select
  - nn. Pipe fill
  - oo. External anti jam trigger
  - pp. Dry running no flow switch select
  - qq. Pump low flow no flow switch select
7. Programmable discrete outputs shall be able to be assigned the following parameters:
- a. Ready
  - b. Drive running
  - c. Frequency reference attained
  - d. Current attained
  - e. High speed attained
  - f. Drive error
  - g. Frequency threshold attained
  - h. Torque sign
  - i. Motor thermal state attained
  - j. Drive thermal state attained
  - k. Torque or current limitation attained
  - l. Output contactor command
  - m. Input contactor command

- n. Current present
- o. Power removed
- p. Alarm Groups
- q. Alarms: load slipping, 4-20mA loss, brake control, external error, PTC, PID error, PID feedback, IGBT temperature, under voltage, torque control, drive temperature, braking resistor, fan counter, fan feedback, customer warning, power threshold, electrical power drift
- r. Active configuration
- s. Active parameter set
- t. Active channel
- u. DC bus charged
- v. DC bus charging
- w. Water Command: jockey pump, priming pump
- x. Water running: anti-jam, pipe fill, priming pump, jockey pump
- y. Water warning: dry running, flow, inlet pressure, outlet pressure, pump cycling, anti-jam, outlet pressure switch,

#### 8. Safety Inputs

- a. The VFD shall provide 2 inputs dedicated to Safe Torque Off (STO) safety function, which prohibits unintended equipment operation, in accordance with IEC/EN 61508-1 SIL3.
- b. The VFD shall be compliant with EN13849 (PL e).
- c. The VFD shall be compliant with safety of machinery EN 954-1
- d. The VFD manufacturer shall provide the certified schematics and the list of devices in order to comply with IEC/EN 60204-1 stopping category 0 and 1.
- e. The VFD shall integrate the safety contacts in compliance with EN-81 13.2.2.3

#### D. Communications

1. The VFD shall provide at a minimum 1 Modbus and 1 Ethernet Modbus TCP communications ports. In addition, the following communications options shall be provided as necessary for communications. Refer to communication requirements specified elsewhere within the Contract Documents on sheet I003.
  - a. Modbus TCP, RJ45 dual port for daisy chain
  - b.
2. VFD Ethernet ports shall be IPv6 compliant, allow for web server access and provide network management via SNMP and clock synchronization.
3. The VFD shall provide an embedded web server for enhanced diagnostic, mini usb, parameter access, and energy management. There shall be the capability to create a user-defined custom dashboard for viewing drive and process status through tables, charts, and graphical views. It shall be possible to export data in standard table format using the webserver, for information around energy consumption as well as error and warning history.
4. The VFD shall be compliant with the Cyber Security Management ISA Secure /Achilles.
5. The VFD shall be capable of providing Wi-Fi connectivity via option for wireless diagnostic, configuration, and parameter access.

6. VFD communications modules shall be capable of being remotely powered by a separate external 24 VDC to allow for continued communications when the drive power supply is off.
7. The VFD shall provide integration connectivity via
  - a. DHCP protocol for Fast Device Replacement
  - b. DTM library in compliance with standard FDT technology

#### E. Configuration

1. The VFD shall be capable of accepting independent command and speed reference signals from:
  - a. Terminals
  - b. Modbus port
  - c. Ethernet port
  - d. Communication option card
  - e. Keypad display.
2. The VFD shall provide a Speed set-point function capable of:
  - a. Maximum output frequency function
  - b. Low and high speed scaling and limitation function
  - c. Jump frequency
  - d. Speed summing references function
  - e. Preset-speed references function
  - f. Jog function
  - g. Up-Down speed references
3. The VFD shall provide a Stop function capable of:
  - a. Deceleration ramp on power loss
  - b. Freewheel stop
  - c. Stop by DC injection at motor stop detection
  - d. Stop by DC injection by Logic Input
  - e. Stop on deceleration ramp adaptation
4. The VFD shall have an acceleration/deceleration, time adjustable ramp function capable of:
  - a. Ramp type: linear ramp, S shape ramp, with U or customized profile.
  - b. Ramp Deceleration adaptation
  - c. Ramp switching
5. Application programming dedicated to pumps
  - a. The VFD shall provide Pump Control & Monitoring Functions
    - 1) Centrifugal pump characteristics and configurations
    - 2) Pump monitoring function to define data relevant for pump (acceleration, low speed, high speed, etc.)
    - 3) Application Units function to define units used in applications
    - 4) Pump Cyclic Start Protection to protect the pump against too many restarts in a dedicated time period.
    - 5) Multi-pump functions.
  - b. The VFD shall provide Pump Protection Functions
    - 1) Anti-Jam function to remove automatically clogging substances from the pump impellers.

- 2) Pipe Cleaning function to start pump regularly to avoid sedimentation in pump impeller
  - 3) Cavitation Pump Protection
  - 4) Inlet protection to avoid system dry running.
- c. The VFD shall provide Application control functions
- 1) Stop and Go function to reduce consumption when VFD is in standby mode.
  - 2) Pulse input in order to connect a flow meter.
  - 3) Process control (PID) function to maintain a process at a given pressure or flow reference.
  - 4) Flow limitation function to allow limiting the consumption of water.
  - 5) Friction loss compensation function to compensate pressure losses in pipes due to friction.
  - 6) Pipe Fill function to manage a smooth control during pipe filling and to lessen the effects of water hammer.
  - 7) Sleep wake-up function to manage periods of the application when process demand is low and when it is not needed.
  - 8) Low demand function to define periods of the application when process demand is low to save energy.
  - 9) Jockey pump control function to start / jockey pump, during sleep period, to maintain emergency service pressure or demand such as low water.
  - 10) Sensor management to define how it will be used to drive inputs to manage pressure sensor or flow sensor
- d. The VFD shall provide Application protection functions
- 1) High flow protection function to detect pipe burst or detect running outside normal working area
  - 2) Outlet pressure protection function to fix minimum and maximum pressure.
- e. The VFD shall provide Pump curve input to help optimize pump performance.
- 1) Input and storage of the pump characteristics including 5 points of the pump curve.
  - 2) A best efficiency point (BEP) function to run in optimum conditions and detect deviation from this point.

#### F. Diagnostics and Configuration

1. The VFD Supplier shall have Windows based PC software for configuring and diagnosing the VFD. It shall be possible to set and modify parameters, control the drive, read actual values and make trend analysis using the software. The PC-tools may be connected to the VFD by wired or wireless connection.
2. The VFD shall display all faults in plain text and help screens shall be available to guide the user in the troubleshooting. Codes are not acceptable.
3. The VFD shall provide a Real Time Clock management for time stamping of detected errors.
4. The VFD shall display detected errors with QR codes to guide the user in the troubleshooting.
5. The VFDs must provide LED lights to indicate the status of the VFD.

6. The VFD must have the ability to dynamically display I/O status.

**G. Energy Management**

1. The VFD shall provide a data logging function to keep files ready for maintenance or user.
2. The VFD shall provide information related to Energy management through different ways such as: web server, keypad, facet for SCADA, communication networks.
3. The user interface shall be able to display a chart relative to energy efficiency and energy management.
  - a. Report in KW
  - b. Display energy history for instant, weekly, monthly, and yearly.
  - c. Trend base on variation /time
  - d. Power measurement accuracy shall be less than 5 %.
4. The user interface shall be able to display the “efficient” set point for pump based on pump characteristics.
5. The user interface shall be able to display the “efficiency board” including CO2 savings, Savings viewer, and Return of Investment.

**2.6 BYPASS STARTER**

- A. The VFD shall include mechanically or electrically interlocked output and bypass contactors complete with a Class 10/20 thermal overload relay, circuit breaker disconnect, control circuit transformer, and VFD/Off/Bypass selector switch.
- B. When selected, the operator shall have full control of the bypass starter by operation of the VFD/Off/Bypass selector switch.
- C. When selected in the automatic mode of operation, the bypass contactors shall be sequenced as described and/or shown on the Drawings.
- D. The drive output contactor for the bypass shall be sequenced to provide motor isolation during a drive ready state of operation.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of specifications Section 26 00 10, Section 26 08 00 and Drawings.
- B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.
- C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- D. Pre-Installation Conference: Prior to commencing the installation, an onsite pre-installation conference shall review the material selections, installation procedures, and coordination with other trades. Attendees shall include, but shall not be limited to, the Contractor, the Installer, manufacturer’s representatives, and any trade that

requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Engineer

- E. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.
- F. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.
- G. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

### **3.2 FACTORY ACCEPTANCE TESTING**

- A. All VFDs shall be functionally tested at the factory by the manufacturer.
- B. A test report shall be submitted to the Owner and Engineer.
- C. The Owner and the Engineer (at option of either) reserves the right to witness factory tests.

### **3.3 FIELD QUALITY CONTROL**

- A. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory-trained manufacturer's field service representative. This manufacturer's field service technician shall provide all material, equipment, labor and technical supervision to perform inspection, testing and adjustments to ensure equipment is installed, adjusted, and tested in accordance with the manufacturer's recommendations and is ready for operation. The manufacturer's field service technician shall replace damaged or malfunctioning equipment and report to the Engineer any discrepancies or issues with the installation.
- B. The manufacturer's representative shall, upon satisfactory completion of inspection and testing, attach a label to all serviced devices indicating the date serviced and testing company responsible.

### **3.4 FIELD TESTING AND COMMISSIONING**

- A. Operational Readiness Testing
  - 1. The Contractor shall inspect and test furnished equipment and associated systems for conformance to the contract documents, including equipment manufacturer's recommendations, and readiness for operation. The test shall include the following as a minimum:
    - a. Visually inspect for physical damage and proper installation
    - b. Perform tests in accordance with manufacturer's instructions
    - c. Perform tests to ensure compliance with Contract Documents
    - d. Perform tests that equipment is ready for operation
    - e. Touch-up paint all chips and scratches with manufacturer-supplied paint and transfer remaining paint to Owner
  - 2. Contractor shall submit an operational readiness test report documenting all test results, including all assumptions, conditions, allowances and corrections made during the test. The report shall provide a listing of all modifications and adjustments made onsite to include any settings / parameters not identified as factory defaults within the equipment's O&M documentation. The test report

shall include a signed statement from the Contractor, installer(s) and the factory-trained manufacturer's representative(s) certifying that the furnished equipment and associated system have been installed, configured, and tested in accordance with the manufacturer's recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.

**B. Functional Demonstration Testing**

1. Prior to scheduling functional demonstration testing the Contractor shall submit a signed statement from the Contractor, installer(s) and the factory-trained manufacturer's representative(s) certifying that the furnished equipment and associated system have been installed, configured, and tested in accordance with the manufacturer's recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.
2. The Contractor shall completely demonstrate the functionality and performance of the equipment and associated systems in the presence of Owner and Engineer, observing and documenting complete compliance with the Contract Documents.
3. The Contractor shall submit a written report documenting successful completion of functional demonstrating testing including all assumptions, conditions, allowances and corrections made during the test.
4. The Contractor shall verify that each drive set has undergone seven days of continuous use without failure prior to being put in regular operation service.

**3.5 TRAINING**

- A. O&M Training: Onsite training specific to the equipment furnished shall be provided to the Owner's staff by a factory trained manufacturer's representative. Training duration shall be sufficiently adequate to cover the operation and maintenance of the equipment and shall consist of not less than 1 session(s) with 4 hours of onsite classroom and hands-on instruction for a minimum of 4 attendees per session.
1. The instructor shall provide sufficient time and detail in each session to cover the following as a minimum:
    - a. Theory of operation
    - b. Major components of equipment
    - c. Operation of equipment
    - d. Configurations of equipment
    - e. Maintenance, troubleshooting and repair
    - f. Replacement of component level parts
  2. The submitted O&M manuals shall be used for training.

END OF SECTION



**SUPPLEMENTARY SPECIAL PROVISIONS**  
**APPENDICES**

**APPENDIX A**  
**NOTICE OF EXEMPTIONS**

**NOTICE OF EXEMPTION**

(Check one or both)

TO:   X   Recorder/County Clerk  
P.O. Box 1750, MS A-33  
1600 Pacific Hwy, Room 260  
San Diego, CA 92101-2400

FROM: City of San Diego  
Engineering & Capital Projects Department  
525 B Street, Suite 750, MS 908A  
San Diego, CA 92101

       Office of Planning and Research  
1400 Tenth Street, Room 121  
Sacramento, CA 95814

**Project Name:** PQPS Gas Sensor Replacement Project

**WBS No.:** B-22035.02.06

**Project Location-Specific:** The project site is located within the Peñasquitos Sewer Pump Station located at 10150 Cara Way, San Diego, CA 92131 within the Miramar Ranch North Community Planning Area (Council District 5).

**Project Location-City/County:** San Diego/San Diego

**Description of nature and purpose of the Project:** The project will replace two existing gas sensors, controllers, and associated mechanical components designed to detect hazardous gases within the facility. All work will occur within the pump station facility building structure.

**Name of Public Agency Approving Project:** City of San Diego

**Name of Person or Agency Carrying Out Project:** City of San Diego  
Engineering and Capital Projects Department  
Contact: Jerry Jakubauskas, Senior Planner  
Email/Phone: JJakubauskas@sandiego.gov / (619) 533-3755  
525 B Street, Suite 750 (MS 908A), San Diego, CA 92101

Exempt Status: (CHECK ONE)

- Ministerial (Sec. 21080(b)(1); 15268);
- Declared Emergency (Sec. 21080(b)(3); 15269(a));
- Emergency Project (Sec. 21080(b)(4); 15269 (b)(c))
- Categorical Exemption: 15301 (Existing Facilities); and 15302 (Replacement or Reconstruction)
- Statutory Exemptions:

Reasons why project is exempt: The City of San Diego conducted an environmental review which determined that the project meets the categorical exemption criteria set forth in CEQA State Guidelines, Sections 15301 (Existing Facilities) which allows for repair, maintenance, or minor alteration of facilities involving negligible or no expansion of existing or former use including sewerage systems and associated mechanical components; 15302 (Replacement or Reconstruction) which allows for replacement or reconstruction of existing facilities or utility systems involving negligible or no expansion of capacity such as a gas sensors, controllers and associated mechanical equipment; and where the exceptions listed in Section 15300.2 would not apply and where the exceptions listed in Section 15300.2 would not apply.

Lead Agency Contact Person: Jerry Jakubauskas

Telephone: (619) 533-3755

If filed by applicant:

- 1. Attach certified document of exemption finding.
- 2. Has a notice of exemption been filed by the public agency approving the project?  Yes  No

It is hereby certified that the City of San Diego has determined the above activity to be exempt from CEQA

*Carrie Purcell*

Carrie Purcell, Deputy Director

December 16, 2022

Date

Check One:

Signed By Lead Agency

Signed by Applicant

Date Received for Filing with County Clerk or OPR:

**NOTICE OF EXEMPTION**

(Check one or both)

TO:  Recorder/County Clerk  
P.O. Box 1750, MS A-33  
1600 Pacific Hwy, Room 260  
San Diego, CA 92101-2400

FROM: City of San Diego  
Engineering & Capital Projects Department  
525 B Street, Suite 750, MS 908A  
San Diego, CA 92101

Office of Planning and Research  
1400 Tenth Street, Room 121  
Sacramento, CA 95814

**Project Name:** PQPS VFD Replacement

**WBS No.:** B-22032.02.06

**Project Location-Specific:** The project is sited within the Peñasquitos Sewer Pump Station located at 10150 Cara Way, San Diego, CA 92131 within the Miramar Ranch North Community Planning Area (Council District 5).

**Project Location-City/County:** San Diego/San Diego

**Description of nature and purpose of the Project:** The project will replace four existing Toshiba Variable Frequency Drives (VFD) and associated mechanical components. All work will occur within the existing sewer pump station building.

**Name of Public Agency Approving Project:** City of San Diego

**Name of Person or Agency Carrying Out Project:** City of San Diego  
Engineering and Capital Projects Department  
Contact: Jerry Jakubauskas, Senior Planner  
Email/Phone: JJakubauskas@sandiego.gov / (619) 533-3755  
525 B Street, Suite 750 (MS 908A), San Diego, CA 92101

Exempt Status: (CHECK ONE)

- Ministerial (Sec. 21080(b)(1); 15268);
- Declared Emergency (Sec. 21080(b)(3); 15269(a));
- Emergency Project (Sec. 21080(b)(4); 15269 (b)(c))
- Categorical Exemption: 15301 (Existing Facilities) and 15302 (Replacement or Reconstruction)
- Statutory Exemptions:

Reasons why project is exempt: The City of San Diego conducted an environmental review which determined that the project meets the categorical exemption criteria set forth in CEQA State Guidelines, Sections 15301 (Existing Facilities) which allows for repair, maintenance, or minor alteration of facilities involving negligible or no expansion of existing or former use including sewerage systems and associated electrical components; 15302 (Replacement or Reconstruction) which allows for replacement or reconstruction of existing facilities or utility systems involving negligible or no expansion of capacity such as a variable frequency drives; and where the exceptions listed in Section 15300.2 would not apply and where the exceptions listed in Section 15300.2 would not apply.

Lead Agency Contact Person: Jerry Jakubauskas

Telephone: (619) 533-3755

If filed by applicant:

- 1. Attach certified document of exemption finding.
- 2. Has a notice of exemption been filed by the public agency approving the project?  Yes  No

It is hereby certified that the City of San Diego has determined the above activity to be exempt from CEQA.

*Carrie Purcell*

Carrie Purcell, Deputy Director

October 4, 2022

Date

Check One:

Signed By Lead Agency

Signed by Applicant

Date Received for Filing with County Clerk or OPR:

**APPENDIX B**  
**FIRE HYDRANT METER PROGRAM**

<b>CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS</b>	<b>NUMBER DI 55.27</b>	<b>DEPARTMENT Water Department</b>
<b>SUBJECT  FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)</b>	<b>PAGE 1 OF 10</b>	<b>EFFECTIVE DATE  October 15, 2002</b>
	<b>SUPERSEDES DI 55.27</b>	<b>DATED April 21, 2000</b>

1. **PURPOSE**

1.1 To establish a Departmental policy and procedure for issuance, proper usage and charges for fire hydrant meters.

2. **AUTHORITY**

2.1 All authorities and references shall be current versions and revisions.

2.2 San Diego Municipal Code (NC) Chapter VI, Article 7, Sections 67.14 and 67.15

2.3 Code of Federal Regulations, Safe Drinking Water Act of 1986

2.4 California Code of Regulations, Titles 17 and 22

2.5 California State Penal Code, Section 498B.0

2.6 State of California Water Code, Section 110, 500-6, and 520-23

2.7 Water Department Director

**Reference**

2.8 State of California Guidance Manual for Cross Connection Programs

2.9 American Water Works Association Manual M-14, Recommended Practice for Backflow Prevention

2.10 American Water Works Association Standards for Water Meters

2.11 U.S.C. Foundation for Cross Connection Control and Hydraulic Research Manual

3. **DEFINITIONS**

3.1 **Fire Hydrant Meter:** A portable water meter which is connected to a fire hydrant for the purpose of temporary use. (These meters are sometimes referred to as Construction Meters.)



<b>CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS</b>	<b>NUMBER DI 55.27</b>	<b>DEPARTMENT Water Department</b>
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- 3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.
- 3.3 **Backflow Preventor:** A Reduced Pressure Principal Assembly connected to the outlet side of a Fire Hydrant Meter.

4. **POLICY**

- 4.1 The Water Department shall collect a deposit from every customer requiring a fire hydrant meter and appurtenances prior to providing the meter and appurtenances (see Section 7.1 regarding the Fees and Deposit Schedule). The deposit is refundable upon the termination of use and return of equipment and appurtenances in good working condition.
- 4.2 Fire hydrant meters will have a 2 ½" swivel connection between the meter and fire hydrant. The meter shall not be connected to the 4" port on the hydrant. All Fire Hydrant Meters issued shall have a Reduced Pressure Principle Assembly (RP) as part of the installation. Spanner wrenches are the only tool allowed to turn on water at the fire hydrant.
- 4.3 The use of private hydrant meters on City hydrants is prohibited, with exceptions as noted below. All private fire hydrant meters are to be phased out of the City of San Diego. All customers who wish to continue to use their own fire hydrant meters must adhere to the following conditions:
  - a. Meters shall meet all City specifications and American Water Works Association (AWWA) standards.
  - b. Customers currently using private fire hydrant meters in the City of San Diego water system will be allowed to continue using the meter under the following conditions:
    - 1. The customer must submit a current certificate of accuracy and calibration results for private meters and private backflows annually to the City of San Diego, Water Department, Meter Shop.

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2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.
3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).
4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).
5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).
6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.
7. All private fire hydrant meters shall have backflow devices attached when installed.
8. The customer must maintain and repair their own private meters and private backflows.
9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.
10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

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11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any re-installation.
  12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.
  13. The outlet shall have a 2 ½ “National Standards Tested (NST) fire hydrant male coupling.
  14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).
- 4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.
- 4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.
- 4.6 Conditions and Processes for Issuance of a Fire Hydrant Meter**
- Process for Issuance
- a. Fire hydrant meters shall only be used for the following purposes:
    1. Temporary irrigation purposes not to exceed one year.

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2. Construction and maintenance related activities (see Tab 2).
  - b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.
  - c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.
  - d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.
  - e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.
  - f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.
  - g. After the fees have been paid and an account has been created, the

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meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

#### 4.7 Relocation of Existing Fire Hydrant Meters

- a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as “Hotline”), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter’s relocation.
- b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.
- c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

#### 4.8 Disconnection of Fire Hydrant Meter

- a. After ten (10) months a “Notice of Discontinuation of Service” (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.
- b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

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for removal of the meter.

- c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.
- d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.
- e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. **EXCEPTIONS**

- 5.1 Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. **MOBILE METER**

- 6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:

- a) **Vehicle Mounted Meters:** Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

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inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

b) **Floating Meters:** Floating Meters are meters that are not mounted to a vehicle. **(Note: All floating meters shall have an approved backflow assembly attached.)** The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:

- 1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.
- 2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

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7. **FEE AND DEPOSIT SCHEDULES**

7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. These deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. **UNAUTHORIZED USE OF WATER FROM A HYDRANT**

8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.

8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.

8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.

8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.



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- 8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

**Water Department Director**

- Tabs: 1. Fire Hydrant Meter Application  
2. Construction & Maintenance Related Activities With No Return To Sewer  
3. Notice of Discontinuation of Service

#### APPENDIX

**Administering Division:** Customer Support Division

**Subject Index:** Construction Meters  
Fire Hydrant  
Fire Hydrant Meter Program  
Meters, Floating or Vehicle Mounted  
Mobile Meter  
Program, Fire Hydrant Meter

**Distribution:** DI Manual Holders



# Application for Fire Hydrant Meter (EXHIBIT A)

(For Office Use Only)

NS REQ	FAC#
DATE	BY

METER SHOP (619) 527-7449

## Meter Information

Application Date	Requested Install Date:
------------------	-------------------------

Fire Hydrant Location: (Attach Detailed Map//Thomas Bros. Map Location or Construction drawing.) <u>Zip:</u>	T.B.	G.B. (CITY USE)
Specific Use of Water:		
Any Return to Sewer or Storm Drain, if so, explain:		
Estimated Duration of Meter Use:	<input type="checkbox"/>	<input type="checkbox"/> Check Box if Reclaimed Water

## Company Information

Company Name:			
Mailing Address:			
City:	State:	Zip:	Phone: ( )
*Business license#		*Contractor license#	
A Copy of the Contractor's license OR Business License is required at the time of meter issuance.			
Name and Title of Billing Agent: <small>(PERSON IN ACCOUNTS PAYABLE)</small>			Phone: ( )
Site Contact Name and Title:			Phone: ( )
Responsible Party Name:			Title:
Cal ID#			Phone: ( )
Signature:		Date:	
<small>Guarantees Payment of all Charges Resulting from the use of this Meter. Insures that employees of this Organization understand the proper use of Fire Hydrant Meter</small>			

<b>Fire Hydrant Meter Removal Request</b>	Requested Removal Date:
Provide Current Meter Location if Different from Above:	
Signature:	Title: Date:
Phone: ( )	Pager: ( )

<input type="checkbox"/> City Meter	<input type="checkbox"/> Private Meter
Contract Acct #:	Deposit Amount: <b>\$ 936.00</b> Fees Amount: <b>\$ 62.00</b>
Meter Serial #	Meter Size: <b>05</b> Meter Make and Style: <b>6-7</b>
Backflow #	Backflow Size: Backflow Make and Style:
Name:	Signature: Date:

**WATER USES WITHOUT ANTICIPATED CHARGES FOR RETURN TO SEWER**

Auto Detailing  
Backfilling  
Combination Cleaners (Vactors)  
Compaction  
Concrete Cutters  
Construction Trailers  
Cross Connection Testing  
Dust Control  
Flushing Water Mains  
Hydro Blasting  
Hydro Seeing  
Irrigation (for establishing irrigation only; not continuing irrigation)  
Mixing Concrete  
Mobile Car Washing  
Special Events  
Street Sweeping  
Water Tanks  
Water Trucks  
Window Washing

**Note:**

1. If there is any return to sewer or storm drain, then sewer and/or storm drain fees will be charges.

Date

Name of Responsible Party  
Company Name and Address  
Account Number: \_\_\_\_\_

Subject:           Discontinuation of Fire Hydrant Meter Service

Dear Water Department Customer:

The authorization for use of Fire Hydrant Meter # \_\_\_\_\_, located at *(Meter Location Address)* ends in 60 days and will be removed on or after *(Date Authorization Expires)*. Extension requests for an additional 90 days must be submitted in writing for consideration 30 days prior to the discontinuation date. If you require an extension, please contact the Water Department, or mail your request for an extension to:

City of San Diego  
Water Department  
Attention: Meter Services  
2797 Caminito Chollas  
San Diego, CA 92105-5097

Should you have any questions regarding this matter, please call the Fire Hydrant Hotline at (619) \_\_\_\_\_ - \_\_\_\_\_.

Sincerely,

Water Department

**APPENDIX C**

**MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE**

## **MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE**

1. Soil amendment
2. Fiber mulch
3. PVC or PE pipe up to 16 inch diameter
4. Stabilizing emulsion
5. Lime
6. Preformed elastomeric joint seal
7. Plain and fabric reinforced elastomeric bearing pads
8. Steel reinforced elastomeric bearing pads
9. Waterstops (Special Condition)
10. Epoxy coated bar reinforcement
11. Plain and reinforcing steel
12. Structural steel
13. Structural timber and lumber
14. Treated timber and lumber
15. Lumber and timber
16. Aluminum pipe and aluminum pipe arch
17. Corrugated steel pipe and corrugated steel pipe arch
18. Structural metal plate pipe arches and pipe arches
19. Perforated steel pipe
20. Aluminum underdrain pipe
21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
22. Metal target plates
23. Paint (traffic striping)
24. Conductors
25. Painting of electrical equipment
26. Electrical components
27. Engineering fabric
28. Portland Cement
29. PCC admixtures
30. Minor concrete, asphalt
31. Asphalt (oil)
32. Liquid asphalt emulsion
33. Epoxy

**APPENDIX D**  
**SAMPLE CITY INVOICE**



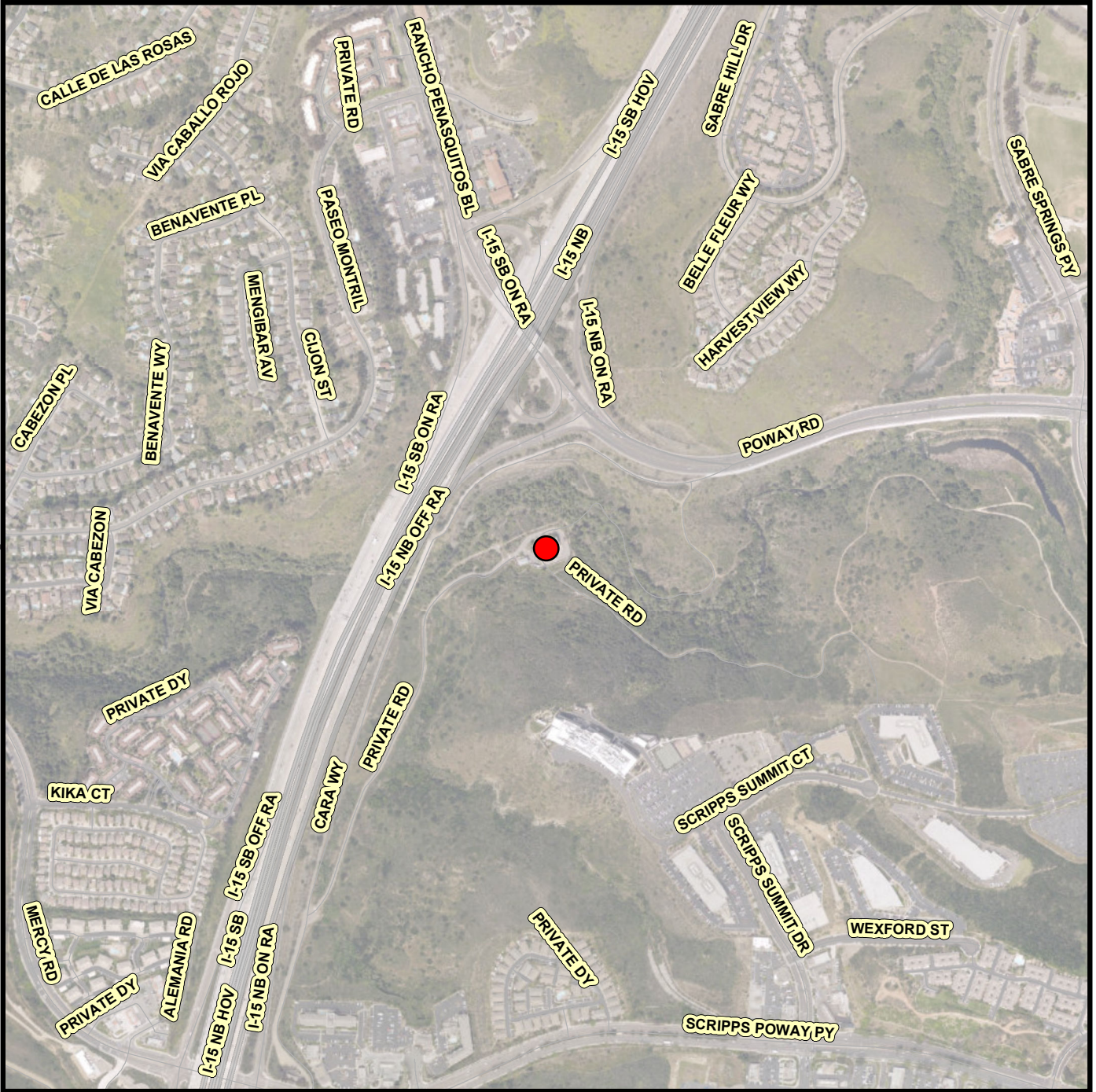
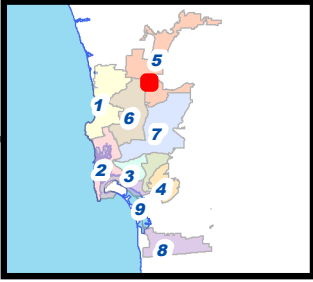


**APPENDIX E**  
**LOCATION MAPS**

# PQPS GAS SENSOR REPLACEMENT

FOR QUESTIONS ABOUT THIS PROJECT Call: 619-533-4207

Email: [engineering@sandiego.gov](mailto:engineering@sandiego.gov)



## Legend

● Project Location



No Scale

Document Path: \\ad\dfs\FWD-Shared\PTTS\PTTS-CIP-Preliminary-Engineering-and-Program-Coordination\PUd PE Active\B22035 PQPS Gas Sensor Replacement Project\02 GIS\CIP Tracking\Location Map\Location Map.mxd

Community Name: Miramar Ranch North

Council District: 5

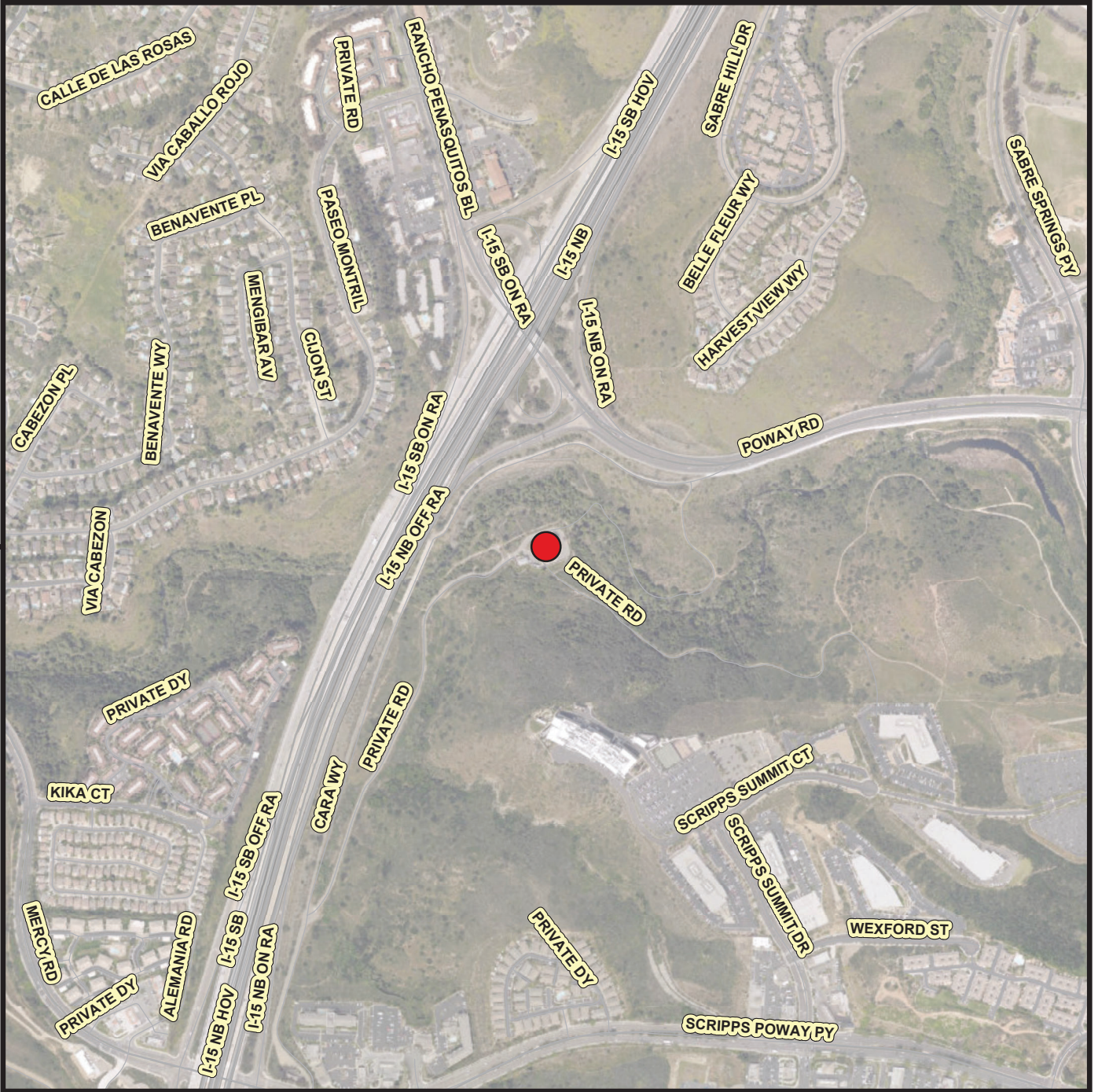
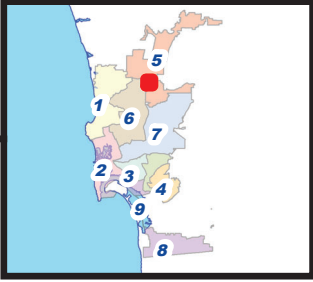
WBS No: B22035

Date: 6/30/2024

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# PQPS VFD REPLACEMENT PROJECT

LOCATION MAP



## Legend

 Project Location



No Scale

**APPENDIX F**  
**SAMPLE OF PUBLIC NOTICE**



## CONSTRUCTION NOTICE

### PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

#### The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
- Streets where trenching takes place will be resurfaced and curb ramps will be upgraded to facilitate access for persons with disabilities where required.
- This work is anticipated to be complete in your community by December 2016.

#### How your neighborhood may be impacted:

- Water service to some properties during construction will be provided by a two-inch highline pipe that will run along the curb. To report a highline leak call 619-515-3525.
- Temporary water service disruptions are planned. If planned disruptions impact your property, you will receive advance notice.
- Parking restrictions will exist because of the presence of construction equipment and materials.
- "No Parking" signs will be displayed 72 hours in advance of the work.
- Cars parked in violation of signs will be TOWED.

#### Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

#### City of San Diego Contractor:

Company Name, XXX-XXX-XXXX



## CONSTRUCTION NOTICE

### PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

#### The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
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- Cars parked in violation of signs will be TOWED.

#### Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

#### City of San Diego Contractor:

Company Name, XXX-XXX-XXXX

To contact the City of San Diego:  Public Works  
619-533-4207 | [engineering@sandiego.gov](mailto:engineering@sandiego.gov) | [sandiego.gov/CIP](http://sandiego.gov/CIP)

To contact the City of San Diego:  Public Works  
619-533-4207 | [engineering@sandiego.gov](mailto:engineering@sandiego.gov) | [sandiego.gov/CIP](http://sandiego.gov/CIP)

## **APPENDIX G**

### **ADVANCED METERING INFRASTRUCTURE (AMI) DEVICE PROTECTION**

## Protecting AMI Devices in Meter Boxes and on Street Lights

The Public Utilities Department (PUD) has begun the installation of the Advanced Metering Infrastructure (AMI) technology as a new tool to enhance water meter reading accuracy and efficiency, customer service and billing, and to be used by individual accounts to better manage the efficient use of water. **All AMI devices shall be protected per Section 402-2, "Protection", of the 2021 Whitebook.**

AMI technology allows water meters to be read electronically rather than through direct visual inspection by PUD field staff. This will assist PUD staff and customers in managing unusual consumption patterns which could indicate leaks or meter tampering on a customer's property.

Three of the main components of an AMI system are the:

- A. Endpoints, see Photo 1:

**Photo 1**



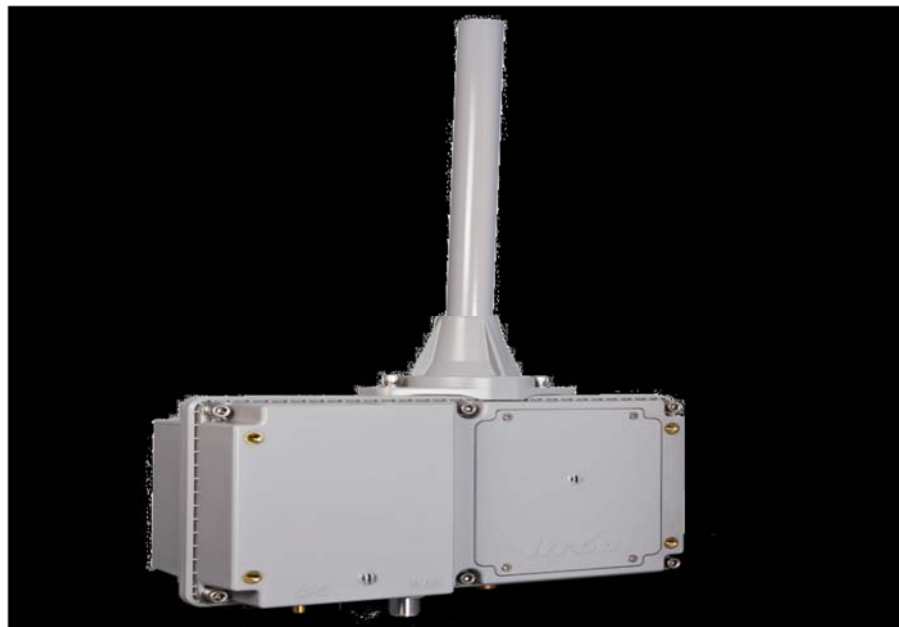
B. AMI Antenna attached to Endpoint (antenna not always required), see Photo 2:



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Network Devices, see Photo 3:

**Photo 3**





AMI endpoints transmit meter information to the AMI system and will soon be on the vast majority of meters in San Diego. These AMI devices provide interval consumption data to the PUD's Customer Support Division. If these devices are damaged or communication is interrupted, this Division will be alerted of the situation. The endpoints are installed in water meter boxes, coffins, and vaults adjacent to the meter. A separate flat round antenna may also be installed through the meter box lid. This antenna is connected to the endpoint via cable. The following proper installation shall be implemented when removing the lid to avoid damaging the antenna, cable, and/or endpoint. Photo 4 below demonstrates a diagram of the connection:

**Photo 4**



The AMI device ERT/Endpoint/Transmitter shall be positioned and installed as discussed in this Appendix. If the ERT/Endpoint/Transmitter is disturbed, it shall be re-installed and returned to its original installation with the end points pointed upwards as shown below in Photo 5.

**The PUD's code compliance staff will issue citations and invoices to you for any damaged AMI devices that are not re-installed as discussed in the Contract Document**

Photo 5 below shows a typical installation of an AMI endpoint on a water meter.

**Photo 5**

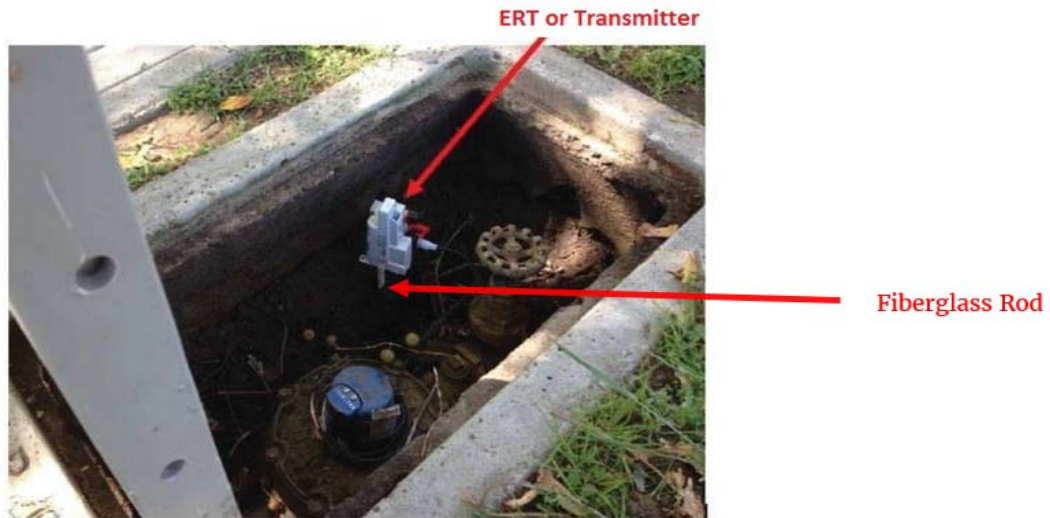


Photo 6 below is an example of disturbance that shall be avoided:

**Photo 6**



**You are responsible when working in and around meter boxes.** If you encounter these endpoints, use proper care and do not disconnect them from the registers on top of the water meter. If the lid has an antenna drilled through, do not change or tamper with the lid and inform the Resident Engineer immediately about the location of that lid. Refer to Photo 7 below:

**Photo 7**



Another component of the AMI system are the Network Devices. The Network Devices are strategically placed units (mainly on street light poles) that collect interval meter reading data from multiple meters for transmission to the Department Control Computer. **If you come across any of these devices on street lights that will be removed or replaced (refer to Photos 8 and 9 below), notify Elvira Santiesteban, Compliance & Metering Manager 619-380-3804 and Kevin Wilson, Senior Water Utility Supervisor 619-857-8257 immediately.**

Photo 8 shows an installed network device on a street light. On the back of each Network Device is a sticker with contact information. See Photo 9. **Call PUD Water Emergency Repairs at 619-515-3525 if your work will impact these street lights.** These are assets that belong to the City of San Diego and you shall be responsible for any costs of disruption of this network.

**Photo 8**



**Network Device**

**Photo 9**



**If you encounter any bad installations, disconnected/broken/buried endpoints, or inadvertently damage any AMI devices or cables, notify the Resident Engineer immediately. The Resident Engineer will then immediately contact Elvira Santiesteban, Compliance & Metering Manager 619-380-3804 and Kevin Wilson, Senior Water Utility Supervisor 619-857-8257.**

## **APPENDIX H**

### **SAMPLE LOOP DRWAINGS**

For the above specified Drawing Set, refer to the following link:

<https://drive.google.com/file/d/1j7i8R4lCiZg9S2naeNiTFe5Cj1QIsPIM/view>

## **APPENDIX I**

### **PQPS VFD REPLACEMENT ISSUES PRJ-1074451 PERMIT PLANS**

For the above specified Permit Plan Set, refer to the following link:

<https://drive.google.com/file/d/1B69naubBvNsQSYV-BjRY5KcBrOo4LfrC/view>

## Appendix J

### **PQPS Gas Sensor Replacement Issued PRJ-1081899 Permit Plans**

For the above specified Permit Plan Set, refer to the following link:

<https://drive.google.com/file/d/1kIa-d46eJ6zkBmQf4GvfLAyTh-6DWI6A/view>

**ATTACHMENT F**

**IN-USE OFF-ROAD DIESEL FUELED FLEET REGULATION (OFF-ROAD REGULATION)  
COMPLIANCE (CARB)**



## ATTACHMENT F

### IN-USE OFF-ROAD DIESEL FUELED FLEET REGULATION (OFF-ROAD REGULATION) COMPLIANCE

The California Air Resources Board (CARB) approved amendments to the Off-Road Regulations which can be found at 13 California Code of Regulations (CCR) sections 2449, 2449.1, and 2449.2. These amendments apply to any person, business, or government agency who owns or operates within California any vehicles with a diesel-fueled or alternative diesel fueled off-road compression-ignition engine with maximum power (max hp) of 25 horsepower (hp) or greater provided that the vehicle cannot be registered and driven safely on-road or was not designed to be driven on-road, even if it has been modified so that it can be driven safely on-road. See 13 CCR section 2449 (b) for the full list of vehicles covered by these Off-Road Regulations.

Beginning **January 1, 2024**, Contractor shall be subject to the requirements below. No Contractor or public works awarding body, as applicable, shall enter into a contract with a fleet for which it does not have a valid Certificate of Reported Compliance for the fleet and its listed subcontractors, if applicable, prior to entering into a new or renewed contract with that fleet. Contractor shall comply with the following requirements:

- (1) For a project involving the use of vehicles subject to the Off-Road Regulation, Contractor must obtain copies of the valid Certificates of Reported Compliance, as described in 13 CCR section 2449(n), for the fleet selected for this Contract and their listed subcontractors, if applicable, prior to entering into a new or renewed contract with that fleet and provide copies of such Certificates of Reported Compliance to the City within 10 days of issuance of the Notice of Intent to Award letter. Contractor shall enter into a contract with a fleet for which it does not have a valid Certificates of Reported Compliance for the fleet and its listed subcontractors. City shall not enter into a contract with Contractor until all current Certificates of Reported Compliance for the fleet to be used on this Project are provided by Contractor.
- (2) The Certificates of Reported Compliance received by Contractor for this Project must be retained by Contractor for three years after the Project's completion. Upon request by CARB, these records must be provided to CARB within five business days of the request. Additionally, upon request by City, these records must be produced to City within five business days of the request.
- (3) For emergency contracts that meet the definition of "emergency operations" as defined in 13 CCR section 2449(c)(18), they are exempt from the requirements in 13 CCR section 2449(i)(1)-(3) and sections (1) and (2) above, but must still retain records verifying vehicles subject to the regulation that are operating on the "emergency operations" project are actually being operated on the project for "emergency operations" only. These records, as described in more detail below in section (B) must be retained by Contractor for three years after completion of the Project and upon request from either CARB or the City, Contractor shall provide those records to the requesting party within five business days. All other emergency contracts that do not meet the definition of "emergency operations" must comply with the requirements above and 13 CCR section 2449(i)(1) – (3).

- A. "Emergency Operations" is defined as:
1. Any activity for a project conducted during emergency, life threatening situations, where a sudden, unexpected occurrence that poses a clear and imminent danger, requiring immediate action to prevent or mitigate the loss or impairment of life, health, property, or an essential public service; or in conjunction with any officially declared disaster or state of emergency, as declared by an authorized health officer, agricultural commissioner, fire protection officer, or other authorized health officer;
  2. Any activity for a project conducted by essential service utilities to provide electricity, natural gas, telephone, water, or sewer during periods of service outages and emergency; or
  3. Operations including repairing or preventing damage to roads, buildings, terrain, and infrastructure as a result of an earthquake, flood, storm, fire, other infrequent act of nature, or terrorism. Routine maintenance or construction to prevent public health risks does not constitute emergency operations under the Off-Road Regulations.
- B. The records retained by Contractor for "emergency operations" projects must include:
1. A description of the emergency;
  2. The address or a description of the specific location of the emergency;
  3. The dates on which the emergency operations were performed; and
  4. An attestation by the fleet that the vehicles are operated on the Project for "emergency operations" only.

Beginning **January 1, 2024**, Contractor is also subject to the requirements described in 13 CCR section 2449(j).

- (1) Between March 1 and June 1 of each year, Contractor must collect new valid Certificates of Reported Compliance for the current compliance year, as defined in 13 CCR section 2449(n), from all fleets that have an ongoing contract with Contractor as of March 1 of that year. Contractors shall not write contracts to evade this requirement.
- (2) Contractor shall only allow fleets with valid Certificates of Reported Compliance on the Contractor's job sites.
- (3) If Contractor discovers that any fleet intending to operate vehicles subject to this regulation for Contractor does not have a valid Certificate of Reported Compliance, as defined in 13 CCR section 2449(n), or if Contractor observes any noncompliant vehicles subject to the regulation on Contractor's job site, then Contractor must report the that to CARB at <https://calepacomplaints.secure.force.com/complaints/Complaint>, or email [dieselcomplaints@arb.ca.gov](mailto:dieselcomplaints@arb.ca.gov), for each fleet without a valid Certificate of Reported Compliance or each noncompliant vehicle,

as applicable, within five business days of such discovery. See 13 CCR 2449(n) for the information required to be disclosed to CARB when reporting non-compliance.

(4) Upon request by CARB, Contractor must immediately disclose to CARB the name and contact information of each responsible party for all vehicles subject to this regulation operating at the job site or for Contractor.

(5) Contractor shall prominently display signage for any project where vehicles subject to this Off-Road Regulation will operate for 8 calendar days or more. The signage must be posted by the eighth calendar day from which the first vehicle operates. The signage will be in lettering larger than size 14-point type and displayed in a conspicuous place where notices to employees are customarily posted at the job site or where there is employee foot traffic. If one of the above locations is also viewable by the public, it should be posted at that location. An exemption to this posting requirement is permitted if the operational time of a project is 7 calendar days or less. The signage must include the following language, verbatim:

(A) Who does the In-Use Off-Road Regulation Apply to?

The In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road Regulation) applies to all self-propelled off-road diesel vehicles 25 horsepower or greater and most two-engine vehicles (except on-road two-engine sweepers) owned or operated in California. This includes vehicles that are rented or leased (rental or leased fleets)."

(B) "In-Use Off-Road Regulation Requirements

Idling Limit: Vehicles cannot idle longer than five minutes. There are exceptions for vehicles that need to idle to perform work.

Labeling: Vehicles must be labeled with a CARB assigned equipment identification number (EIN). The EIN shall be white on a red background, unless the vehicle is part of a captive attainment area fleet, in which case the EIN shall be white on a green background.

The EIN shall be located in clear view on both sides of the outside of the vehicle."

**ATTACHMENT G**  
**CONTRACT AGREEMENT**

**ATTACHMENT G**  
**CONTRACT AGREEMENT**

---

**CONSTRUCTION CONTRACT**

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and Southern Contracting Company, herein called "Contractor" for construction of **PQPS Gas Sensor Replacement and PQPS VFD Replacement**; Bid No. **K-25-2338-DBB-3**; in the total amount of **One Million Five Hundred Sixty Seven Thousand Eight Hundred Dollars (\$1,567,800)**.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

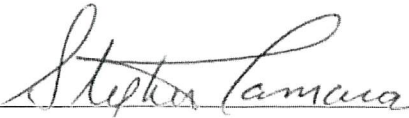
1. The following are incorporated into this contract as though fully set forth herein:
  - (a) The attached Faithful Performance and Payment Bonds.
  - (b) The attached Proposal included in the Bid documents by the Contractor.
  - (c) Reference Standards listed in the Instruction to Bidders and the Supplementary Special Provisions (SSP).
  - (d) That certain documents entitled **PQPS Gas Sensor Replacement and PQPS VFD Replacement**, on file in the office of the Purchasing & Contracting Department as Document No. **B-22035, B-22032**, as well as all matters referenced therein.
2. The Contractor shall perform and be bound by all the terms and conditions of this contract and in strict conformity therewith shall perform and complete in a good and workmanlike manner **PQPS Gas Sensor Replacement and PQPS VFD Replacement**, Bid Number **K-25-2338-DBB-3**, San Diego, California.
3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement and is approved by the City Attorney in accordance with San Diego Charter Section 40.

**CONTRACT AGREEMENT (continued)**

**IN WITNESS WHEREOF**, this Agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Municipal Code §22.3102, authorizing such execution.

**THE CITY OF SAN DIEGO**

**APPROVED AS TO FORM**

By 

Mara W. Elliott, City Attorney  
By 

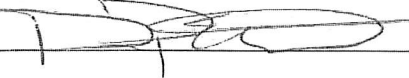
Print Name: Stephen Samara  
Principal Contract Specialist  
Purchasing & Contracting Dept.

Print Name: Bonny Hou  
Deputy City Attorney

Date: 1/14/2025

Date: 1/14/25

**CONTRACTOR**

By 

Print Name: Philip E. Waterman

Title: President

Date: 11/12/2024

City of San Diego License No.: B1974004617

State Contractor's License No.: 222252

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: 1000002172

## **CERTIFICATIONS AND FORMS**

The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certifications, forms and affidavits submitted as part of this bid are true and correct.

## **BIDDER'S GENERAL INFORMATION**

To the City of San Diego:

Pursuant to "Notice Inviting Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.



**NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23  
UNITED STATES CODE 112 AND PUBLIC CONTRACT CODE 7106**

State of California

County of San Diego

The bidder, being first duly sworn, deposes and says that he or she is authorized by the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

## **CONTRACTOR CERTIFICATION**

---

### **DRUG-FREE WORKPLACE**

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 5-1.3, "Drug-Free Workplace", of the project specifications, and that;

This company has in place a drug-free workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of subdivisions a) through c) of the policy as outlined.

## **CONTRACTOR CERTIFICATION**

---

### **AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION**

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the Americans With Disabilities Act (ADA) outlined in the WHITEBOOK, Section 5-1.2, "California Building Code, California Code of Regulations Title 24 and Americans with Disabilities Act". of the project specifications, and that:

This company has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

## **CONTRACTOR CERTIFICATION**

---

### **CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE**

I declare under penalty of perjury that I am authorized to make this certification on behalf of the company submitting this bid/proposal, that as Contractor, I am familiar with the requirements of City of San Diego Municipal Code § 22.3004 regarding Contractor Standards as outlined in the WHITEBOOK, Section 5-1.4, ("Contractor Standards and Pledge of Compliance"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3004.

## **CONTRACTOR CERTIFICATION**

---

### **EQUAL BENEFITS ORDINANCE CERTIFICATION**

I declare under penalty of perjury that I am familiar with the requirements of and in compliance with the City of San Diego Municipal Code § 22.4300 regarding Equal Benefits Ordinance.

## **CONTRACTOR CERTIFICATION**

---

### **EQUAL PAY ORDINANCE CERTIFICATION**

Contractor shall comply with the Equal Pay Ordinance (EPO) codified in the San Diego Municipal Code (SDMC) at section 22.4801 through 22.4809, unless compliance is not required based on an exception listed in SDMC section 22.4804.

Contractor shall require all of its subcontractors to certify compliance with the EPO in their written subcontracts.

Contractor must post a notice informing its employees of their rights under the EPO in the workplace or job site.

By signing this Contract with the City of San Diego, Contractor acknowledges the EPO requirements and pledges ongoing compliance with the requirements of SDMC Division 48, section 22.4801 et seq., throughout the duration of this Contract.

## CONTRACTOR CERTIFICATION

---

### **IN-USE OFF-ROAD DIESEL FUELED FLEET REGULATION (OFF-ROAD REGULATION) COMPLIANCE**

I hereby certify that Contractor is familiar with the requirements 13 CCR 2449, 2449.1, and 2449.2, as well as Attachment F, In-Use Off-Road Diesel Fueled Fleet Regulation (Off-Road Regulation) Compliance (CARB), and that Contractor shall comply with these requirements.

I further certify that each of the Contractor's listed subcontractors is familiar with these requirements and shall also comply.

## **CONTRACTOR CERTIFICATION**

---

### **PRODUCT ENDORSEMENT**

I declare under penalty of perjury that I acknowledge and agree to comply with the provisions of City of San Diego Administrative Regulation 95.65, concerning product endorsement. Any advertisement identifying or referring to the City as the user of a product or service requires the prior written approval of the City.



**AFFIDAVIT OF DISPOSAL**

(To be submitted upon completion of Construction pursuant to the contracts Certificate of Completion)

**WHEREAS**, on the \_\_\_\_\_ DAY OF \_\_\_\_\_, 2\_\_\_\_ the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

**PQPS Gas Sensor Replacement and PQPS VFD Replacement**

(Project Title)

as particularly described in said contract and identified as Bid No. **K-25-2338-DBB-3**; SAP No. (WBS) **B-22035, B-22032**; and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

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

**NOW, THEREFORE**, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

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

and that they have been disposed of according to all applicable laws and regulations.

Dated this \_\_\_\_\_ DAY OF \_\_\_\_\_, \_\_\_\_\_.

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

**ATTEST:**

State of \_\_\_\_\_ County of \_\_\_\_\_

On this \_\_\_\_\_ DAY OF \_\_\_\_\_, 2\_\_\_\_, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared \_\_\_\_\_ known to me to be the \_\_\_\_\_ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

**LIST OF SUBCONTRACTORS**

**\*\*\* PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY \*\*\* TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY\*\*\* SEE INSTRUCTIONS TO BIDDERS, FOR FURTHER INFORMATION**

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions – General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB®	WHERE CERTIFIED®	CHECK IF JOINT VENTURE PARTNERSHIP
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							

- ① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):
- |   |        |  |         |
|---|--------|--|---------|
| Certified Minority Business Enterprise        | MBE    | Certified Woman Business Enterprise            | WBE     |
| Certified Disadvantaged Business Enterprise   | DBE    | Certified Disabled Veteran Business Enterprise | DVBE    |
| Other Business Enterprise                     | OBE    | Certified Emerging Local Business Enterprise   | ELBE    |
| Certified Small Local Business Enterprise     | SLBE   | Small Disadvantaged Business                   | SDB     |
| Woman-Owned Small Business                    | WoSB   | HUBZone Business                               | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB |  |         |
- ② As appropriate, Bidder shall indicate if Subcontractor is certified by:
- |  |        |  |          |
|--|--------|--|----------|
| City of San Diego                                    | CITY   | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission               | CPUC   |  |          |
| State of California's Department of General Services | CADoGS | City of Los Angeles                              | LA       |
| State of California                                  | CA     | U.S. Small Business Administration               | SBA      |

**The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.**

Form AA35 List of Subcontractors

**NAMED EQUIPMENT/MATERIAL SUPPLIER LIST**

**\*\*\* PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY \*\*\* TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY \*\*\* SEE INSTRUCTIONS TO BIDDERS FOR FURTHER INFORMATION**

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB <sup>①</sup>	WHERE CERTIFIED <sup>②</sup>
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						

- ① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):
- |   |        |  |         |
|---|--------|--|---------|
| Certified Minority Business Enterprise        | MBE    | Certified Woman Business Enterprise            | WBE     |
| Certified Disadvantaged Business Enterprise   | DBE    | Certified Disabled Veteran Business Enterprise | DVBE    |
| Other Business Enterprise                     | OBE    | Certified Emerging Local Business Enterprise   | ELBE    |
| Certified Small Local Business Enterprise     | SLBE   | Small Disadvantaged Business                   | SDB     |
| Woman-Owned Small Business                    | WoSB   | HUBZone Business                               | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB |  |         |

- ② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:
- |  |        |  |          |
|--|--------|--|----------|
| City of San Diego                                    | CITY   | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission               | CPUC   |  |          |
| State of California's Department of General Services | CADoGS | City of Los Angeles                              | LA       |
| State of California                                  | CA     | U.S. Small Business Administration               | SBA      |

**The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.**

Form AA40 – Named Equipment/Material Supplier List

## **ELECTRONICALLY SUBMITTED FORMS**

**FAILURE TO FULLY COMPLETE AND SUBMIT ANY OF THE FOLLOWING FORMS WILL DEEM YOUR BID NON-RESPONSIVE.**

**PLANETBIDS WILL NOT ALLOW FOR BID SUBMISSIONS WITHOUT THE ATTACHMENT OF THESE FORMS**

The following forms are to be completed by the bidder and submitted (uploaded) electronically with the bid in PlanetBids.

- A. BID BOND – See Instructions to Bidders, Bidders Guarantee of Good Faith (Bid Security) for further instructions**
- B. CONTRACTOR’S CERTIFICATION OF PENDING ACTIONS**
- C. MANDATORY DISCLOSURE OF BUSINESS INTERESTS FORM**
- D. DEBARMENT AND SUSPENSION CERTIFICATION FOR PRIME CONTRACTOR**
- E. DEBARMENT AND SUSPENSION CERTIFICATION FOR SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS**

**BID BOND**

**See Instructions to Bidders, Bidder Guarantee of Good Faith  
(Bid Security)**

KNOW ALL MEN BY THESE PRESENTS,

That SOUTHERN CONTRACTING COMPANY as Principal, and NATIONWIDE MUTUAL INSURANCE COMPANY as Surety, are held and firmly bound unto The City of San Diego hereinafter called "OWNER," in the sum of **10% OF THE TOTAL BID AMOUNT** for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required under the bidding schedule(s) of the OWNER's Contract Documents entitled

PQPS GAS SENSOR REPLACEMENT AND PQPS VFD REPLACEMENT; K-25-2338-DBB-3

NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time and in the manner required in the "Notice Inviting Bids" enters into a written Agreement on the form of agreement bound with said Contract Documents, furnishes the required certificates of insurance, and furnishes the required Performance Bond and Payment Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this 10TH day of OCTOBER, 2024

SOUTHERN CONTRACTING COMPANY (SEAL)  
(Principal)

NATIONWIDE MUTUAL INSURANCE COMPANY (SEAL)  
(Surety)

By:   
(Signature)  
PHILIP E. WATERMAN, PRESIDENT

By:   
(Signature)  
JOHN G. MALONEY, ATTORNEY-IN-FACT

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

**CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT**

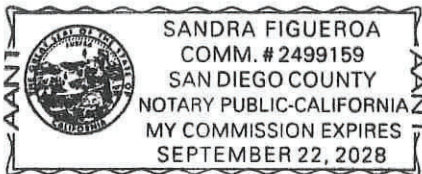
CIVIL CODE § 1189

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 California }  
County of SAN DIEGO }

On 10/10/2024 before me, SANDRA FIGUEROA, NOTARY PUBLIC  
*Date Here Insert Name and Title of the Officer*  
personally appeared JOHN G. MALONEY  
*Name(s) of Signer(s)*

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 of which the person(s) acted, executed the instrument.



Place Notary Seal and/or Stamp Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature [Handwritten Signature]  
*Signature of Notary Public*

**OPTIONAL**

*Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.*

**Description of Attached Document**

Title or Type of Document: \_\_\_\_\_

Document Date: \_\_\_\_\_ Number of Pages: \_\_\_\_\_

Signer(s) Other Than Named Above: \_\_\_\_\_

**Capacity(ies) Claimed by Signer(s)**

Signer's Name: JOHN G. MALONEY

Signer's Name: \_\_\_\_\_

Corporate Officer – Title(s): \_\_\_\_\_

Corporate Officer – Title(s): \_\_\_\_\_

Partner –  Limited  General

Partner –  Limited  General

Individual  Attorney in Fact

Individual  Attorney in Fact

Trustee  Guardian of Conservator

Trustee  Guardian of Conservator

Other: \_\_\_\_\_

Other: \_\_\_\_\_

Signer is Representing: \_\_\_\_\_

Signer is Representing: \_\_\_\_\_

Power of Attorney

KNOW ALL MEN BY THESE PRESENTS THAT:

Nationwide Mutual Insurance Company, an Ohio corporation

hereinafter referred to severally as the "Company" and collectively as "the Companies" does hereby make, constitute and appoint:

HELEN MALONEY; JOHN G MALONEY; MARK D IATAROLA; SANDRA FIGUEROA; TRACY LYNN RODRIGUEZ;

each in their individual capacity, its true and lawful attorney-in-fact, with full power and authority to sign, seal, and execute on its behalf any and all bonds and undertakings, and other obligatory instruments of similar nature, in penalties not exceeding the sum of

UNLIMITED

and to bind the Company thereby, as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Company; and all acts of said Attorney pursuant to the authority given are hereby ratified and confirmed.

This power of attorney is made and executed pursuant to and by authority of the following resolution duly adopted by the board of directors of the Company:

"RESOLVED, that the president, or any vice president be, and each hereby is, authorized and empowered to appoint attorneys-in-fact of the Company, and to authorize them to execute and deliver on behalf of the Company any and all bonds, forms, applications, memorandums, undertakings, recognizances, transfers, contracts of indemnity, policies, contracts guaranteeing the fidelity of persons holding positions of public or private trust, and other writings obligatory in nature that the business of the Company may require; and to modify or revoke, with or without cause, any such appointment or authority; provided, however, that the authority granted hereby shall in no way limit the authority of other duly authorized agents to sign and countersign any of said documents on behalf of the Company."

"RESOLVED FURTHER, that such attorneys-in-fact shall have full power and authority to execute and deliver any and all such documents and to bind the Company subject to the terms and limitations of the power of attorney issued to them, and to affix the seal of the Company thereto; provided, however, that said seal shall not be necessary for the validity of any such documents."

This power of attorney is signed and sealed under and by the following bylaws duly adopted by the board of directors of the Company.

Execution of Instruments. Any vice president, any assistant secretary or any assistant treasurer shall have the power and authority to sign or attest all approved documents, instruments, contracts, or other papers in connection with the operation of the business of the company in addition to the chairman of the board, the chief executive officer, president, treasurer or secretary; provided, however, the signature of any of them may be printed, engraved, or stamped on any approved document, contract, instrument, or other papers of the Company.

IN WITNESS WHEREOF, the Company has caused this instrument to be sealed and duly attested by the signature of its officer the 20th day of August, 2021.

Antonio C. Albanese, Vice President of Nationwide Mutual Insurance Company

ACKNOWLEDGMENT

STATE OF NEW YORK COUNTY OF NEW YORK: ss

On this 20th day of August, 2021, before me came the above-named officer for the Company aforesaid, to me personally known to be the officer described in and who executed the preceding instrument, and he acknowledged the execution of the same, and being by me duly sworn, deposes and says, that he is the officer of the Company aforesaid, that the seal affixed hereto is the corporate seal of said Company, and the said corporate seal and his signature were duly affixed and subscribed to said instrument by the authority and direction of said Company.



Stephanie Rubino McArthur  
Notary Public, State of New York  
No. 02MC6270117  
Qualified in New York County  
Commission Expires October 19, 2024

Notary Public  
My Commission Expires  
October 19, 2024

CERTIFICATE

I, Laura B. Guy, Assistant Secretary of the Company, do hereby certify that the foregoing is a full, true and correct copy of the original power of attorney issued by the Company; that the resolution included therein is a true and correct transcript from the minutes of the meetings of the boards of directors and the same has not been revoked or amended in any manner; that said Antonio C. Albanese was on the date of the execution of the foregoing power of attorney the duly elected officer of the Company, and the corporate seal and his signature as officer were duly affixed and subscribed to the said instrument by the authority of said board of directors; and the foregoing power of attorney is still in full force and effect.

IN WITNESS WHEREOF, I have hereunto subscribed my name as Assistant Secretary, and affixed the corporate seal of said Company this 10TH day of OCTOBER, 2024

Assistant Secretary

**CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT**

**CIVIL CODE § 1189**

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 California )  
County of San Diego )

On 10/10/2024 before me, Lynn R. Murison-Eroles, Notary Public  
*Date Here Insert Name and Title of the Officer*

personally appeared Philip E. Waterman  
*Name(s) of Signer(s)*

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 of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.



Signature Lynn R. Murison-Eroles  
*Signature of Notary Public*

*Place Notary Seal Above*

**OPTIONAL**

*Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.*

**Description of Attached Document**

Title or Type of Document: Bid Bond  
Document Date: 10/10/2024 Number of Pages: 1  
Signer(s) Other Than Named Above: \_\_\_\_\_

**Capacity(ies) Claimed by Signer(s)**

Signer's Name: Philip E. Waterman Signer's Name: \_\_\_\_\_  
 Corporate Officer — Title(s): President  Corporate Officer — Title(s): \_\_\_\_\_  
 Partner —  Limited  General  Partner —  Limited  General  
 Individual  Attorney in Fact  Individual  Attorney in Fact  
 Trustee  Guardian or Conservator  Trustee  Guardian or Conservator  
 Other: \_\_\_\_\_  Other: \_\_\_\_\_  
Signer Is Representing: \_\_\_\_\_ Signer Is Representing: \_\_\_\_\_



**CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS**

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against the Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.

CHECK ONE BOX ONLY.

- The undersigned certifies that within the past 10 years the Bidder has NOT been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers.
  
- The undersigned certifies that within the past 10 years the Bidder has been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers. A description of the status or resolution of that complaint, including any remedial action taken and the applicable dates is as follows:

DATE OF CLAIM	LOCATION	DESCRIPTION OF CLAIM	LITIGATION (Y/N)	STATUS	RESOLUTION/REMEDIAL ACTION TAKEN
		None			

Contractor Name: Southern Contracting Company

Certified By Philip E. Waterman Title President

Name



Signature

Date 10/17/2024

**USE ADDITIONAL FORMS AS NECESSARY**

## Mandatory Disclosure of Business Interests Form

### BIDDER/PROPOSER INFORMATION

Legal Name		DBA	
Southern Contracting Company		Southern Contracting Company	
Street Address	City	State	Zip
559 N. Twin Oaks Valley Road, San Marcos		California	92069
Contact Person, Title		Phone	Fax
Philip E. Waterman, President		(760) 744-0760	(760) 744-6475

Provide the name, identity, and precise nature of the interest\* of all persons who are directly or indirectly involved\*\* in this proposed transaction (SDMC § 21.0103).

\* The precise nature of the interest includes:

- the percentage ownership interest in a party to the transaction,
- the percentage ownership interest in any firm, corporation, or partnership that will receive funds from the transaction, the value of any financial interest in the transaction,
- any contingent interest in the transaction and the value of such interest should the contingency be satisfied, and any philanthropic, scientific, artistic, or property interest in the transaction.

\*\* Directly or indirectly involved means pursuing the transaction by:

- communicating or negotiating with City officers or employees,
- submitting or preparing applications, bids, proposals or other documents for purposes of contracting with the City,
- or directing or supervising the actions of persons engaged in the above activity.

Name	Title/Position
Timothy R. McBride	CEO
City and State of Residence	Employer (if different than Bidder/Proposer)
Escondido, CA	
Interest in the transaction	
90%	

Name	Title/Position
Richard W. McBride	COB
City and State of Residence	Employer (if different than Bidder/Proposer)
Escondido, CA	
Interest in the transaction	
10%	

### \* Use Additional Pages if Necessary \*

Under penalty of perjury under the laws of the State of California, I certify that I am responsible for the completeness and accuracy of the responses contained herein, and that all information provided is true, full and complete to the best of my knowledge and belief. I agree to provide written notice to the Mayor or Designee within five (5) business days if, at any time, I learn that any portion of this Mandatory Disclosure of Business Interests Form requires an updated response. Failure to timely provide the Mayor or Designee with written notice is grounds for Contract termination.

Philip E. Waterman, President



10/17/2024

Print Name, Title

Signature

Date

**Failure to sign and submit this form with the bid/proposal shall make the bid/proposal non-responsive. In the case of an informal solicitation, the contract will not be awarded unless a signed and completed Mandatory Disclosure of Business Interests Form is submitted.**

**DEBARMENT AND SUSPENSION CERTIFICATION**  
**PRIME CONTRACTOR**  
**FAILURE TO COMPLETE AND SUBMIT AT TIME OF BID SHALL RENDER BID NON-RESPONSIVE**

EFFECT OF DEBARMENT OR SUSPENSION
To promote integrity in the City's contracting processes and to protect the public interest, the City shall only enter into contracts with responsible- bidders and contractors. In accordance with San Diego Municipal Code §22.0814 (a): <i>Bidders</i> and <i>contractors</i> who have been <i>debarred</i> or <i>suspended</i> are excluded from submitting bids, submitting responses to requests for proposal or qualifications, receiving <i>contract</i> awards, executing <i>contracts</i> , participating as a <i>subcontractor</i> , employee, agent or representative of another <i>person</i> contracting with the City.

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of Names of the Principal Individual owner(s).

The names of all persons interested in the foregoing proposal as Principals are as follows:

NAME	TITLE
Philip E. Waterman	President

**IMPORTANT NOTICE:** If Bidder or other interested person is a corporation, state secretary, treasurer, and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners composing firm; if Bidder or other interested person is an individual, state first and last names in full.

The Bidder, under penalty of perjury, certifies that, except as noted below, he/she or any person associated therewith in the capacity of owner, partner, director, officer, manager:

- Is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any Federal, State or local agency;
- has not been suspended, debarred, voluntarily excluded or determined ineligible by any Federal, State or local agency within the past 3 years;
- does not have a proposed debarment pending; and
- has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 3 years.

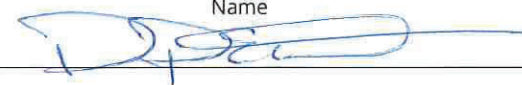
If there are any exceptions to this certification, insert the exceptions in the following space.

Exceptions will be considered in determining bidder responsibility. For any exception noted above, indicate below to whom it applies, initiating agency, and dates of action.

Contractor Name: Southern Contracting Company

Certified By Philip E. Waterman Title President

Name



Signature

Date 10/17/2024

**NOTE:** Providing false information may result in criminal prosecution or administrative sanctions.

**DEBARMENT AND SUSPENSION CERTIFICATION**  
**SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS**  
**\*TO BE COMPLETED BY BIDDER\***  
**FAILURE TO COMPLETE AND SUBMIT AT TIME OF BID SHALL RENDER BID NON-RESPONSIVE**

Names of the Principal individual owner(s)

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of Names of the Principal Individual owner(s) for their subcontractor/supplier/manufacturers.

Please indicate if principal owner is serving in the capacity of **subcontractor, supplier, and/or manufacturer:**

SUBCONTRACTOR / CONSULTANT     SUPPLIER     MANUFACTURER

NAME	TITLE
JEFF PUZZULLO, PUZZULLO CONSULTING	OWNER / PRINCIPAL

SUBCONTRACTOR     SUPPLIER     MANUFACTURER

NAME	TITLE

SUBCONTRACTOR     SUPPLIER     MANUFACTURER

NAME	TITLE

SUBCONTRACTOR     SUPPLIER     MANUFACTURER

NAME	TITLE

Contractor Name: PUZZULLO CONSULTING

Certified By JEFF PUZZULLO Title OWNER / PRINCIPAL

 Name  
 \_\_\_\_\_ Date OCTOBER 16, 2024  
 Signature

**\*\*USE ADDITIONAL FORMS AS NECESSARY\*\***

**DEBARMENT AND SUSPENSION CERTIFICATION**  
**SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS**  
**\*TO BE COMPLETED BY BIDDER\***  
**FAILURE TO COMPLETE AND SUBMIT AT TIME OF BID SHALL RENDER BID NON-RESPONSIVE**

Names of the Principal individual owner(s)

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of Names of the Principal Individual owner(s) for their subcontractor/supplier/manufacturers.

Please indicate if principal owner is serving in the capacity of **subcontractor, supplier, and/or manufacturer:**

SUBCONTRACTOR                       SUPPLIER                       MANUFACTURER

NAME	TITLE
Brian Jennette	President

SUBCONTRACTOR                       SUPPLIER                       MANUFACTURER

NAME	TITLE

SUBCONTRACTOR                       SUPPLIER                       MANUFACTURER

NAME	TITLE

SUBCONTRACTOR                       SUPPLIER                       MANUFACTURER

NAME	TITLE

Contractor Name: Jennette Company, Inc.

Certified By Brian Jennette Title President

  
 Name  
 Signature

Date 10/17/24

**\*USE ADDITIONAL FORMS AS NECESSARY\*\***

# City of San Diego

CITY CONTACT: Brittany Friedenreich, Senior Contract Specialist, Email: [BFriedenreic@sandiego.gov](mailto:BFriedenreic@sandiego.gov)  
Phone No. (619) 533-3104

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## ADDENDUM A



## FOR

## PQPS GAS SENSOR REPLACEMENT AND PQPS VFD REPLACEMENT

BID NO.:	<u>K-25-2338-DBB-3</u>
SAP NO. (WBS/IO/CC):	<u>B-22035, B-22032</u>
CLIENT DEPARTMENT:	<u>2000</u>
COUNCIL DISTRICT:	<u>5</u>
PROJECT TYPE:	<u>BP</u>

---

### BID DUE DATE:

**2:00 PM**  
**OCTOBER 17, 2024**

**CITY OF SAN DIEGO'S ELECTRONIC BIDDING SITE, PLANETBIDS**

<http://www.sandiego.gov/cip/bidopps/>

## **A. CHANGES TO CONTRACT DOCUMENTS**

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

## **B. BIDDER'S QUESTIONS**

Q1. I have been in contact with MSA, the specified company from the spec book, and their H2S sensor doesn't have the range that is requested in the spec, their sensor goes from 0-500ppm. Can I get some clarification?

A1. No exception taken to the sensor with a range of 0-500 ppm.

Q2. Please provide Technical Specification Section for the Schneider VFD's. Although the specific Manufacturer & model number is called out for the VFD's, having the Technical Specification will ensure that there are no issues when the VFD's are procured & commissioned.

A2. Technical Specification 26 29 23.23 Variable Frequency Motor Controller – Process is included.

Rania Amen, Director  
Engineering & Capital Projects Department

Dated: *October 1, 2024*  
San Diego, California

RA/MJN/rs

# City of San Diego

CITY CONTACT: Brittany Friedenreich, Senior Contract Specialist, Email: [BFriedenreic@sandiego.gov](mailto:BFriedenreic@sandiego.gov)  
Phone No. (619) 533-3104

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## ADDENDUM B



## FOR

## PQPS GAS SENSOR REPLACEMENT AND PQPS VFD REPLACEMENT

BID NO.: K-25-2338-DBB-3  
SAP NO. (WBS/IO/CC): B-22035, B-22032  
CLIENT DEPARTMENT: 2000  
COUNCIL DISTRICT: 5  
PROJECT TYPE: BP

---

### **BID DUE DATE:**

**2:00 PM  
OCTOBER 17, 2024**

**CITY OF SAN DIEGO'S ELECTRONIC BIDDING SITE, PLANETBIDS**

<http://www.sandiego.gov/cip/bidopps/>



## **A. CHANGES TO CONTRACT DOCUMENTS**

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

## **B. BIDDER'S QUESTIONS**

Q1. The LEL range is 0-9000 ppm of methane (= 18% LEL). The min range we can set is 0-10,000 ppm methane (= 20% LEL or 1% methane). Is this OK?

A1. Use 5%, 0-100%LEL, 20% full range.

Q2. The H2S range is 0-1000 ppm. We typically see 0-100ppm H2S. The max we can provide is 0-500ppm H2S, but that 500 ppm sensor has a shorter warranty period (1 year vs. 3 years). Please confirm the H2S range.

A2. Use 0-100 ppm.

Q3. We will be proposing the catalytic bead type LEL Sensor. IR based LEL is mentioned in the spec, but I am interpreting the "D" mounting type as the cat bead LEL sensor. Please confirm.

A3. D is for diffusion type.

Q4. The MSA Model X5000 transmitter can support 2 sensors. Do you want us to utilize this dual channel capability or propose single channel X5000's (one sensor per X5000)?

A4. Use single channel.

Q5. Sheets E202 have nomenclatures on cable/wires shown going to pump room that are shown going to opposing VFDs. Is this intended or do these need to be shown going to the corresponding VFDs?

A5. This is not intended, each cable needs to go to its corresponding VFD as listed on the Sheet E602 Wire & Conduit Schedule.

Q6. On Sheet ED201 the general and key notes both state to reuse cable/wiring if possible. How is the contractor to verify the cable/wiring conditions based on the print package? Or is this to be verified after the project is been awarded?

- A6. Verification to be done after project award.
- Q7. Sheet E201 states conduit is to be reused if possible. How is the contractor to verify conditions based on the print package? Or is this to be verified after the project is been awarded?
- A7. Verification to be done after project award.
- Q8. Sheet E202 states to reuse cable if possible. How is the contractor to verify conditions based on the print package? Or is this to be verified after the project is been awarded?
- A8. Verification to be done after project award.
- Q9. Sheet E201 Key Note 4 states to reused conduit stub ups and to replace if not reuseable. How does contractor determine if the conduit is reusable base on print package? Or is this to be verified after the project is been awarded?
- A9. Verification to be done after project award.
- Q10. Sheet ED601& E601 Key Note 2 states to retain conduit and wiring for reuse with new equipment.
- A10. Refer to the Wire & Conduit schedule on Sheet E602.
- Q11. Sheet E601 Key Note 3 states to reconnect the new VFD to existing feeds (this contradicts the notes on previous pages shown on questions# 2& 4) are these supposed to read if possible or does the contractor proceed to attempt to reuse?
- A11. Reuse existing feeds. Bid as shown.
- Q12. Sheet E601 Key Note 4 states to reconnect motors to existing feeds (this contradicts the notes on previous pages shown on questions# 2& 4) are these supposed to read if possible or does the contractor proceed to attempt to reuse?
- A12. Reuse existing feeds. Bid as shown.
- Q13. Sheet E002 General Notes 15-21 states the contractor is responsible for programming plc's and the city is providing sample programming. Is this going to be VFD parameters or a PLC programming program?

- A13. Notes 15 and 18 on Sheet E002 should state MMR (Motor Management Relay), not PLC (Programmable Logic Controller). The VFDs are being controlled via an integral MMR panel that will integrate into the existing system. The contractor is responsible for providing the VFDs and programming their modules (MMRs) based on sample programming from another Schneider VFD set that was recently replaced. Refer to Sheet I003 for additional information.
- Q14. Sheet E002 General notes 16 if a contractor is to integrate the new VFD to the existing system we need to know what PLC is being used and in need of programming?
- A14. Refer to A13 of this Addendum regarding the contractor's responsibility of programming the VFD Module (MMRs). Note 16 on Sheet E002 is regarding the Distributed Control System (DCS). The contractor will provide the DCS components listed on Sheet I003 and work with the City and their separate contractor who will connect the system to the DCS and perform the DCS programming.

Rania Amen, Director  
Engineering & Capital Projects Department

Dated: *October 10, 2024*  
San Diego, California

RA/MJN/rs

## Bid Results

### Bidder Details

**Vendor Name** Southern Contracting Company  
**Address** 559 North Twin Oaks Valley Road  
San Marcos, California 92069  
United States  
**Respondee** Philip Waterman  
**Respondee Title** President  
**Phone** 760-744-0760  
**Email** pwaterman@southerncontracting.com  
**Vendor Type** CADIR  
**License #** 222252  
**CADIR** 1000002172

### Bid Detail

**Bid Format** Electronic  
**Submitted** 10/17/2024 11:01 AM (PDT)  
**Delivery Method**  
**Bid Responsive**  
**Bid Status** Submitted  
**Confirmation #** 398461

### Respondee Comment

### Buyer Comment

### Attachments

File Title	File Name	File Type
Contractor's Certificate of Pending Actions.pdf	Contractor's Certificate of Pending Actions.pdf	Contractors Certification of Pending Actions
Mandatory Disclosure of Business Interests.pdf	Mandatory Disclosure of Business Interests.pdf	Mandatory Disclosure of Business Interests
Debarment and Suspension Cert - PRIME.pdf	Debarment and Suspension Cert - PRIME.pdf	Prime Contractors - Debarment and Suspension Certification
Subcontractors Debarment and Suspension Certification.pdf	Subcontractors Debarment and Suspension Certification.pdf	Subcontractors, Suppliers & Mfgs - Debarment and Suspension Certification
Bid Bond.pdf	Bid Bond.pdf	Bid Bond

## Subcontractors

Showing 2 Subcontractors

Name & Address	Desc	License Num	CADIR	Amount	Type
<b>Jennette Company, Inc.</b> 9235 Trade Place Suite B San Diego, California 92126	Replace Gas Sensors	1007413	1000042413	\$34,500.00	ELBE, CADIR, Local
<b>Puzzullo Consulting</b> 504 Machado Way Vista, California 92083	Consulting / Scheduling	N/A	N/A	\$52,000.00	ELBE, CAU, MALE, Local

## Line Items

Discount Terms No Discount

Item #	Item Code	Type	Item Description	UOM	QTY	Unit Price	Line Total	Response	Comment
<b>Main Bid - PQPS Gas Sensor Replacement</b>							<b>\$155,600.00</b>		
1	524126		Bonds (Payment and Performance) - Gas Sensor	LS	1	\$1,150.00	\$1,150.00	Yes	
2	236220		Building Permits (EOC Type I) - Gas Sensor	AL	1	\$3,000.00	\$3,000.00	Yes	
3	238210		Mobilization - Gas Sensor	LS	1	\$35,000.00	\$35,000.00	Yes	
4			Field Orders (EOC Type II) - Gas Sensor	AL	1	\$4,600.00	\$4,600.00	Yes	
5	238210		Remove and Replace H2S Gas Sensor - Gas Sensor	EA	2	\$10,000.00	\$20,000.00	Yes	
6	238210		Remove and Replace Oxygen Sensor - Gas Sensor	EA	2	\$10,000.00	\$20,000.00	Yes	
7	238210		Remove and Replace Explosive Gas Sensor - Gas Sensor	EA	2	\$10,000.00	\$20,000.00	Yes	
8	238210		#16 AWG 3/C Shielded Cable - Gas Sensor	LF	1000	\$19.00	\$19,000.00	Yes	
9	238210		Testing and Commissioning - Gas Sensor	LS	1	\$32,850.00	\$32,850.00	Yes	
<b>Main Bid - PQPS VFD Replacement</b>							<b>\$1,412,200.00</b>		
10	524126		Bonds (Payment and Performance) - VFD	LS	1	\$7,700.00	\$7,700.00	Yes	
11	236220		Building Permits (EOC Type I) - VFD	AL	1	\$5,000.00	\$5,000.00	Yes	
12	238210		Mobilization - VFD	LS	1	\$35,000.00	\$35,000.00	Yes	
13			Field Orders (EOC Type II) - VFD	AL	1	\$99,200.00	\$99,200.00	Yes	
14	238210		Demolition, Removal and Initial Studies - VFD	EA	4	\$6,500.00	\$26,000.00	Yes	
15	238210		500 HP Variable Frequency Drive for Pump - VFD	EA	4	\$263,575.00	\$1,054,300.00	Yes	
16	238210		Instrumentation and Controls - VFD	EA	4	\$29,000.00	\$116,000.00	Yes	
17	238210		Startup and Commissioning - VFD	EA	4	\$13,325.00	\$53,300.00	Yes	
18	237110		Extended Manufacturer Warranty - VFD	EA	4	\$3,925.00	\$15,700.00	Yes	

## Line Item Subtotals

Section Title	Line Total
Main Bid - PQPS Gas Sensor Replacement	\$155,600.00
Main Bid - PQPS VFD Replacement	\$1,412,200.00
<b>Grand Total</b>	<b>\$1,567,800.00</b>