Title: Contract: Sump 1A Variable Frequency Drive Replacement Project

Location: Citywide

Recommendation: Pass a Motion: 1) approving the contract plans and specifications for the Sump 1A Variable Frequency Drives (VFDs) Replacement Project; and 2) awarding the contract to Schrader Mechanical Inc. for an amount not-to-exceed $334,000.

Contact: Danny Vang, Project Manager (916) 808-3952; Dave Hansen, Supervising Engineer, (916) 808-1421; Dan Sherry, Engineering & Water Resources Division Manager, (916) 808-1419; Department of Utilities

Presenter: None

Attachments:
1-Description/Analysis
2-Contract
Description/Analysis

Issue Detail: Staff recommends Council award a construction contract to Schrader Mechanical Inc. to replace the Variable Frequency Drives (VFDs) and soft-starter unit at Sump 1A. Sump 1A currently has a failed VFD unit, and the installed VFDs and soft-start are obsolete and are no longer supported through the manufacturer.

Policy Considerations: City Council approval is required to award construction contracts of $100,000 or more. The action requested conforms with City Code Chapter 3.60, Articles I and III, which provide for award of competitively bid contacts to the lowest responsible bidder. VFDs and soft-starter replacement at Sump 1A is consistent with the criteria set forth in the Department of Utilities’ Capital Improvement Programming Guide to ensure reliability and safety of the City’s drainage system.

Economic Impacts: This project is expected to create 1.34 total jobs (0.77 direct jobs and 0.57 jobs through indirect and induced actives) and create $206,223 in total economic output ($129,984 of direct output and another $76,239 of output through indirect and induced activities).

The indicated economic impacts are estimates calculated using a calculation tool developed by the Center for Strategic Economic Research (CSER). CSER utilized the IMPLAN input-output model (2009 coefficients) to quantify the economic impacts of a hypothetical $1 million of spending in various construction categories within the City of Sacramento in an average one-year period. Actual impacts could differ significantly from the estimates and neither the City of Sacramento nor CSER shall be held responsible for consequences resulting from such differences.

Environmental Considerations: The subject project has been reviewed and determined to be categorically exempt from the California Environmental Quality Act (CEQA) pursuant to CEQA Guidelines Sections 15301(b) and 15302(c). The project includes: the operation, repair, and minor alteration of existing facilities and mechanical equipment used to provide public utility services involving negligible expansion of use (CEQA Guidelines 15301(b)); and replacement of existing electrical gear involving negligible expansion of capacity (CEQA Guidelines Section 15302 (c)).

Sustainability: The proposed project is consistent with the 2035 General Plan as it improves infrastructure reliability, which will increase the reliability of the facility.

Commission/Committee Action: Not applicable.
Rationale for Recommendation: The project was advertised, and six bids were received and opened on March 21, 2018. Schrader Mechanical Inc. was the lowest responsible bidder. The bid results are as follows:

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Converse Construction</td>
<td>$316,185</td>
</tr>
<tr>
<td>Schrader Mechanical</td>
<td>$334,000</td>
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<tr>
<td>American System Controls</td>
<td>$351,390</td>
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<tr>
<td>Lord Electric Inc.</td>
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<td>Royal Electric</td>
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<td>A.K. Mechanical Inc.</td>
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The low bid from Converse Construction was rejected by City staff because it lacked adequate Local Business Enterprise (LBE) participation. The LBE requirements associated with this contract is 5% or greater participation, which for a bid amount of $316,185 equates to an amount of $15,809.25 or greater. Converse Construction is not an LBE and their subcontractors list contained one LBE for an amount of $11,500. This amount did not meet the minimum LBE participation, causing their bid to be rejected. Therefore, Schrader Mechanical Inc. became the lowest responsible bidder.

Schrader Mechanical’s bid of $334,000 is 35% higher than the Engineer’s estimate of $233,200. Their proposed cost for the electrical gear and supplies is $178,000, which is comparable to the Engineer’s cost estimate. However, the bid reflected higher labor costs due to increased construction activity in the Sacramento region, which was not considered in the Engineer’s estimate.

Financial Considerations: The total estimated cost for the project is $456,000, based on the low bid of $334,000. Sufficient funds exist in the VFD Replacement Project (X14131500) to complete this project.

There are no General Funds allocated or planned for this project.

Local Business Enterprise (LBE): Schrader Mechanical Inc. is not an LBE, but has partnered with an LBE, Rexel, for this project to exceed the minimum LBE participation requirement. Rexel will provide electrical supplies, Motor Control Center and hardware.
CONTRACT SPECIFICATIONS
FOR
SUMP 1A VFD REPLACEMENT PROJECT

PN: X14131507
B18141321018
Engineer’s Estimate: $233,200

Non-Mandatory Pre-Bid Site Visit: March 7, 2018 at 9:00 AM
Pre-Bid Site Visit Location: the corner of U Street and 2101 Front Street
Sacramento, CA 95818

For Pre-Bid Information Call: Danny Vang
Associate Electrical Engineer
(916) 808-3952

No Separate Plans
Bid to be received before 2:00 PM
March 21, 2018
New City Hall, Office of the City Clerk
915 I Street, 5th Floor, Mayor’s Reception Desk
Sacramento, CA 95814

LBE PROGRAM PARTICIPATION
For information on meeting the City of Sacramento’s Local Business Enterprise (LBE) project goals, please contact Procurement Services at (916) 808-6240, or visit the City of Sacramento’s small business web site at: http://portal.cityofsacramento.org/Finance/Procurement/Bid-Information#bidding-options
SUMP 1A VFD REPLACEMENT PROJECT  
(PN: X14131507)  

ADDENDUM #01  

March 9, 2018  

To All Potential Bidders:  

Attached hereto are addenda items, which shall be incorporated into the Plans and Specifications for the above noted project. These changes shall be considered as part of the original documents, as if they were originally provided therein, and as such shall be used as contractual documents. All other terms, conditions, and specifications of the bid remain unchanged. Bidders must acknowledge receipt of this addendum prior to the hour and date specified for bids to be received by one of the following methods:  

(a) By acknowledging receipt on the sealed proposal in the space provided.  
(b) By separate letter that includes a reference to the Project Name and the Addendum Number.  

Failure to acknowledge receipt of this addendum in one of the above methods and cause acknowledgment to be received prior to the hour and date specified for receipt of proposals may result in rejection of your proposal. If by virtue of this addendum you decide to change a proposal already submitted, such change may be made by letter, provided such letter makes reference to the Project Name and this Addendum, and is received prior to the hour and date specified for receipt of proposals.  

For any questions related to this addendum, contact the Project Manager, Danny Vang at (916) 808-3952.  

Sincerely,  

[Signature]  
David Hansen, Supervising Engineer  

Addendum  
Enclosure  

cc: Distribution List  
Planholders
SUMP 1A VFD REPLACEMENT PROJECT
(PN: X14131507)

1. PLAN SHEETS

DELETE plan sheet E-9 for the plan set and REPLACE with the enclosed plan sheet E-9.
DELETE plan sheet E-10 for the plan set and REPLACE with the enclosed plan sheet E-10.
DELETE plan sheet E-11 for the plan set and REPLACE with the enclosed plan sheet E-11.
DELETE plan sheet E-12 for the plan set and REPLACE with the enclosed plan sheet E-12.

2. PREBID SITE VISIT SIGN IN SHEET

See enclosed prebid site visit sign in sheet.
### SUMP 1A CONDUIT SCHEDULE

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**CONDUIT MATERIALS**

- 

**INSTRUMENTATION CABLES**

- Cable Type: 
- Diameter: 
- Color: 
- Marking: 
- Notes:
TYPICAL MOTOR CONNECTION DETAIL

WALL/FLOOR PENETRATION DETAIL
# SUMP 1A VFD REPLACEMENT PROJECT

**NON-Mandatory Site Visit**  
March 7, 2018

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>E-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danny Vang</td>
<td>City of Sacramento</td>
<td><a href="mailto:dvang@cityofsacramento.org">dvang@cityofsacramento.org</a></td>
</tr>
</tbody>
</table>
| Val U.         | Lords Electric Inc.   | Lords.electric.Val@gmail.com  
(916)410-2336-(916)2440322|
| Jon Hill       | Rexe\  916-292-2569  | Jonathan.Hill@RexeUSA.com  |
| Greg Garrison  | ASCIi                 | ggarrivon@americanasciic.org|
| Alexandria Zepepa | AK Mechanical       | Azepeda@jakmechanical.com  |
| Walt Bruce     | SMI                   | Walt.B@SMIWest.com         |
INVITATION TO BID

LBE INFORMATION

NOTICE TO CONTRACTORS

BAN THE BOX

ASSEMBLY BILL 626

DEPARTMENT OF INDUSTRIAL RELATIONS NEWSLINE

PROPOSAL FORMS (TO BE SUBMITTED BY ALL BIDDERS AS THE BID PAGE)

- Sealed Proposal
- Bid Proposal Guarantee
- Subcontractor and LBE Participation Verification
- Drug-Free Workplace Policy and Affidavit
- Minimum Qualifications Questionnaire
- Requirements of the Non-Discrimination in Employee Benefits Code
- LBE Requirements (City Contracts no Federal Funds Used)

CONTRACT FORMS (Only for successful Bidder)

- Worker’s Compensation Insurance Certification
- Agreement
- Bonds
  - Performance Bond
  - Payment Bond

CALIFORNIA LABOR CODE RELATING TO APPRENTICES

http://www.dir.ca.gov/dlse/dlsePublicWorks.html

TAX FORMS (REQUIRED UPON AWARD)

- CA Form 590  https://www.ftb.ca.gov/forms/2018/18_590.pdf

SPECIAL PROVISIONS
The City of Sacramento’s Local Business Development program establishes an annual local business enterprise (LBE) participation goal for City contracts, and authorizes City departments to require minimum LBE participation levels in individual contracts. Under City Code section 3.60.270, all bidding contractors must meet or exceed the minimum LBE participation requirement specified in the contract’s bid specifications to qualify as a responsive bidder.

For information on meeting the City of Sacramento’s Local Business Enterprise (LBE) project goals, please contact Procurement Services at (916) 808-6240, or visit the City of Sacramento’s small business web site at: http://portal.cityofsacramento.org/Finance/Procurement/Bid-Information#bidding-options
NOTICE TO CONTRACTORS

CITY OF SACRAMENTO

Sealed Proposals will be received by the City Clerk of the City of Sacramento at the Office of the City Clerk, New City Hall, located at 915 I Street, 5th Floor, Mayor’s Reception Desk, up to the hour of 2:00 p.m. on March 21, 2018 and opened at and read after 2:00 p.m. on March 21, 2018, or as soon thereafter as business allows, in the Hearing Room, 2nd Floor Room, in Historic City Hall, for construction of:

SUMP 1A VFD REPLACEMENT PROJECT

(PN: X14131507) (B18141321018)

as set forth in the Contract Documents.

Proposals received and work performed thereunder shall comply with the requirements of Chapter 3.60 of the Sacramento City Code. Each Bid Proposal shall be accompanied by bid security of at least 10% of the sum the Bid Proposal. The City reserves the right to reject proposals or to waive any error or omission in any Bid Proposal received. Signed proposals shall be submitted on the printed forms contained herein and enclosed in an envelope marked:

SEALED PROPOSAL FOR
SUMP 1A VFD REPLACEMENT PROJECT
(PN: X14131507) (B18141321018)

You can view and download the plans and Contract Documents from:

PLANET BIDS
http://www.planetbids.com/portal/portal.cfm?CompanyID=15300#

The contractor and all subcontractors shall comply with the rates of wages currently established by the Director of Industrial Relations under provisions of Sections 1773 of the Labor Code of the State of California, a copy of which is on file in the office of the City Clerk and available to any interested party on request. In accordance with Sacramento City Code Section 3.60.180 and Section 1771.5 of the California Labor Code, the payment of the general prevailing rate of per diem wages or the general prevailing rate of per diem wages for holiday and overtime is not required for any construction project of $25,000 or less, or an alteration, demolition, repair, and maintenance project of $15,000 or less. The City of Sacramento has an approved Labor Compliance Program. The City uses an electronic system for the submission of Labor Compliance Reports, which became effective May 1, 2007. The contractor and every lower-tier subcontractor shall submit certified payrolls and labor compliance documentation electronically at the discretion of and in the manner specified by the City of Sacramento.

Electronic submittal is via a web-based system, accessed on the World Wide Web by a web browser. Each contractor and subcontractor is given a Log On identification and password to access the City of Sacramento’s reporting system.

Use of the system may entail additional data entry of weekly payroll information including employee identification, labor classification, total hours worked and hours worked on this project, wage and benefit rates paid, etc. The contractor’s payroll and accounting software might be capable of generating a 'comma delimited file' that will interface with the software.
Department of Industrial Relations Registration and Reporting Requirements (SB 854)

Labor Code Section 1725.5 (enacted by SB 854) requires all contractors bidding on this contract, all subcontractors listed in a bid for this contract, and any contractor or subcontractor performing any work under this contract, to be currently registered with the California Department of Industrial Relations (DIR), as specified in Labor Code Section 1725.5. Labor Code Section 1771.1 (enacted by SB 854) provides that a contractor or subcontractor shall not be qualified to bid on, be listed in a bid 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. Every bidding contractor shall list the contractor’s current DIR registration number, and the current DIR registration number of all listed subcontractors, on the Subcontractor and Local Business Enterprise (LBE) Participation Verification Form included in the contractor’s bid.

Pursuant to Labor Code Section 1771.1(b): (1) any bid received from a contractor that is not currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5 shall be rejected as non-responsive; and (2) any bid listing one or more subcontractors on the bidder’s Subcontractor and Local Business Enterprise (LBE) Participation Verification Form that are not currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5, shall be rejected as non-responsive, unless the listing was an inadvertent error and any of the conditions specified in Labor Code Section 1771.1(c) apply.

This contract also is subject to compliance monitoring and enforcement by the DIR. For all contracts awarded on or after April 1, 2015, California Labor Code Section 1771.4 (enacted by SB 854) requires the contractor and all subcontractors to furnish electronic payroll records directly to the Labor Commissioner (in addition to City staff via the City’s electronic system).

A Fact Sheet summarizing the provisions of SB 854 is attached. This is provided solely for informational purposes, and does not in any way affect the contractor’s and subcontractors’ obligation to comply in all respects with the provisions of SB 854, including the provisions referenced above, as well as all other applicable laws and regulations.

The contractor shall disseminate these provisions to every lower-tier subcontractor and vendor required to provide labor compliance documentation.

All questions regarding the City’s Labor Compliance Program should be directed to the Department’s contracts staff or the Labor Compliance Officer at (916) 808-4011.

Pursuant to Sacramento City Code Section 3.60.190, all contractors and subcontractors shall comply with Section 1777.5 et seq., of the California Labor Code governing the employment of apprentices. Pursuant to Sacramento City Code Section 3.60.250 and Public Contract Code Section 22300, any contract awarded pursuant to this invitation to bid shall contain a provision permitting the substitution of securities for monies withheld to ensure performance under the contract, in accordance with the requirements and form specified by the City.

Bid protests must be filed and maintained in accordance with the provisions of Sections 3.60.460 through 3.60.560 of the Sacramento City Code. Bid protests that do not comply with Sections 3.60.460 through 3.60.560 of the Sacramento City Code shall be invalid and shall not be considered. A bid protest fee of $750.00 is required at the time of filing. The term "bid protest" includes any bid protest that (1) claims that one or more bidders on this contract should be disqualified or rejected for any reason, (2) contests a City staff recommendation to award this contract to a particular bidder, or (3) contests a City staff recommendation to disqualify or reject one or more bidders on this contract. A copy of Sections 3.60.460 through 3.60.560 of the Sacramento City Code may be obtained from the Project Manager, or from the City Clerk, located at 915 I Street, 5th Floor, Sacramento, CA 95814.
The Project Manager’s contact information is:

Danny Vang, Department of Utilities, Engineering & Water Resource Division
1395 35th Avenue, Sacramento, CA 95822
Phone: (916) 808-3952 / Fax: (916) 808-1497/Email: dvang@cityofsacramento.org
BAN-THE-BOX REQUIREMENTS

INTRODUCTION

On September 6, 2016, the City of Sacramento enacted an ordinance regarding criminal conviction information in the employment application process (the “Ban-the-Box Ordinance”), which added Chapter 3.62 to the Sacramento City Code and amended Section 2.40.050 of the Sacramento City Code. The Ban-the-Box Ordinance prohibits “covered employers” from asking an applicant for employment to disclose, orally or in writing, information concerning the criminal conviction history of the applicant, including any inquiry about criminal conviction history on any employment application, until the employer has determined the applicant meets the minimum employment qualifications stated in any notice issued for the position.

APPLICATION

“City Contract”

The Ban-the-Box Ordinance applies to all “city contracts.” The term “city contract” means a contract awarded after January 1, 2017 to a “covered employer” for services or a public project in return for compensation of $100,000 or more. The term “city contract” includes contracts for services or public projects that were awarded for an amount less than $100,000, but were amended to increase the total compensation to $100,000 or more. The Ban-the-Box Ordinance also applies when the aggregate value of all contracts for services or public projects the City has awarded to the same “covered employer” within the previous 12 months is $100,000 or more.

The Ban-the-Box Ordinance does not apply to: (1) contracts awarded by the City Manager in response to an emergency; and (2) contracts for the purchase or lease of equipment, supplies, or other personal property, even if they include incidental services such as delivery, installation, or maintenance.

“Covered Employer”

The Ban-the-Box Ordinance only applies to “covered employers.” The term “covered employer” means a person who is a party to a “city contract” and has at least 20 employees working either full or part time. The number of employees that a contractor has is determined by adding the contractor’s employees and the employees of any “related person.” A person is a “related person” when any of the following circumstances exists:

(1) The person and the person that is a party to a “city contract” are both corporations and:

   (a) Share a majority of members of their governing boards; or
   (b) Have two or more officers in common; or
   (c) Are controlled by the same majority shareholder or shareholders (control means more than 50% of the corporation’s voting power); or
   (d) Are in a parent-subsidiary relationship (such a relationship exists when one corporation directly or indirectly owns shares possessing more than 50% of another corporation’s voting power).

(2) The person otherwise controls and directs, or is controlled and directed by, the person that is a party to a city contract, as determined by the City Manager, or City Manager designee.
The term “covered employer” includes a subcontractor providing services under a “city contract” if the subcontractor has at least 20 employees, whether full- or part-time, or the amount of the subcontract is at least 25% of the amount of the “city contract.”

The term “covered employer” does not include any unit of federal, state or local government.

Exceptions

The Ban-the-Box Ordinance provisions do not apply to: (1) a position for which a “covered employer” is otherwise required by law to conduct a criminal conviction history background check; or (2) a position that will not involve work pursuant to a “city contract.” Additionally, the Ban-the-Box Ordinance does not prevent a “covered employer” from conducting a criminal conviction history background check in subsequent stages of the application process after initially determining whether the applicant meets the minimum employment qualifications.

COMPLIANCE

It is the contractor’s responsibility to determine whether the aggregate value of $100,000 or more has been met, and to notify the City in writing whenever this is the case. It is also the contractor’s responsibility to ensure that all of its subcontractors who are covered by the Ban-the-Box Ordinance comply with the provisions of the Ban-the-Box Ordinance by including these requirements in all subcontracts covered by the Ban-the-Box Ordinance.

VIOLATIONS AND MONITORING

The Ban-the-Box Ordinance provides that any violation of the Ban-the-Box Ordinance by a “covered employer” constitutes a material breach of the contract, and authorizes the City to terminate the contract. The City may also enforce the Ban-the-Box Ordinance by investigating any alleged violation (but any failure of the City to investigate does not create a right of action against the City). The City may further require “covered employers” to verify compliance.

ADDITIONAL INFORMATION

For a complete description of the Ban-the-Box Ordinance provisions related to City contracts, refer to the Ban-the-Box Ordinance, codified at Sacramento City Code Chapter 3.62. The Sacramento City Code is available on the internet at www.cityofsacramento.org.

For more information on the City’s Ban-the-Box Ordinance, contact Procurement Services at 916-808-6240.
NOTICE REGARDING ASSEMBLY BILL 626

Assembly Bill 626 (AB 626), signed into law September 29, 2016, established a new claim resolution process for public works project contracts entered into on or after January 1, 2017. AB 626 is codified in Section 9204 of the California Public Contract Code. Section 9204 remains in effect until January 1, 2020, and as of that date will be repealed unless another statute extends or deletes this sunset date.

Public Contract Code Section 9204 applies to any “claim,” as defined in Section 9204, which is presented by the Contractor to the City. Section 9204 defines a “claim” as a separate demand by the Contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following: (1) a time extension, including, without limitation, for relief from damages or penalties for delay assessed by the City; (2) payment by the City of money or damages arising from work done by, or on behalf of, the Contractor pursuant to the Contract and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled; or (3) payment of an amount that is disputed by the City.

If Contractor presents a claim to the City in accordance with the provisions of Public Contract Code Section 9204 (hereafter referred to as a “Claim”), the process specified in Section 9204 will be followed, and the provisions of Section 4-8 (Disputed Claims) and Section 4-9 (Review by Claim Review Committee and Issuance of Decision by Department Director) of the City’s Standard Specifications for Public Construction will not apply to the Claim. Contractor’s Claim shall comply with the provisions of Section 4-7 (Notice of Claims for Additional Compensation or Damages) of the City’s Standard Specifications or Contractor shall give a separate written notice of potential claim that complies with the requirements specified in Section 4-7, except in any case where compliance with the requirements specified in Section 4-7 would conflict with Public Contract Code Section 9204.

Subsection (e) of Public Contract Code Section 9204 requires that the text of Section 9204 or a summary be set forth in the plans or specifications for any public works project that may give rise to a claim under Section 9204.

The full text of Public Contract Code Section 9204 is as follows:

9204.
(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.
(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.
(c) For purposes of this section:
(1) “Claim” means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:
(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.
(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.
(C) Payment of an amount that is disputed by the public entity.
(2) “Contractor” means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3) (A) “Public entity” means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) “Public entity” shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) “Public works project” means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) “Subcontractor” means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d) (1) (A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) (A) If the claimant disputes the public entity’s written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the
disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each
party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with
regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective
mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the
claim remaining in dispute shall be subject to applicable procedures outside this section.
(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to,
neutral evaluation or a dispute review board, in which an independent third party or board assists the parties
in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform
to the timeframes in this section.
(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted
pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation
has been commenced.
(E) This section does not preclude a public entity from requiring arbitration of disputes under private
arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve
the parties’ dispute.
(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this
subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed
rejected in its entirety. A claim that is denied by reason of the public entity’s failure to have responded to a
claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse
finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.
(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.
(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity
because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of
a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own
behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was
performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The
subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation
to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the
subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original
contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having
done so.
(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public
works project that may give rise to a claim under this section.
(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that
(1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly
to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may
prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to
the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the
timeframes and procedures set forth in this section.
(g) This section applies to contracts entered into on or after January 1, 2017.
(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available
through a competitive application process, for the failure of an awardee to meet its contractual obligations.
(i) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later
enacted statute, that is enacted before January 1, 2020, deletes or extends that date.
THE FOLLOWING DOCUMENTS ARE TO BE COMPLETED AND SUBMITTED WITH THE BID PACKAGE
CITY OF SACRAMENTO

SEALED PROPOSAL

(MUST BE SIGNED BY BIDDER)

The Sealed Proposal will be received not later than March 21, 2018, at the Office of the City Clerk, New City Hall, at 915 I Street, 5th Floor, Mayor’s Reception Desk, Sacramento, California and opened at 2:00 PM, or as soon thereafter as business allows, on March 21, 2018, by the Office of the City Clerk, 915 I Street, Historic City Hall, 2nd Floor, Hearing Room, Sacramento, California.

TO THE HONORABLE CITY COUNCIL:

The undersigned hereby proposes and agrees to furnish any and all required labor, material, transportation, and services for

SUMP 1A VFD REPLACEMENT PROJECT

( PN: X14131507 ) ( B18141321018 )

in the City and County of Sacramento, California.

TOTAL BID: Three Hundred Thirty Four Thousand Dollars ($ 334,000.00 ).

The work herein described is to be performed in strict conformity with the Plans, City of Sacramento Standard Specifications (Resolution No. 89-216) and these Special Provisions, all as on file in the Office of the City Clerk, at the following unit prices.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sump 1A VFD Replacement Install New MCC and Electrical Improvements</td>
<td>1</td>
<td>LS</td>
<td>$ 334,000.00</td>
</tr>
</tbody>
</table>

TOTAL BID: $ 334,000.00
The undersigned agrees to execute the Agreement and provide City the executed Agreement, the required insurance certificates, endorsements, and waivers of subrogation, and the required surety bonds within ten (10) calendar days after the undersigned’s receipt of the City’s notice that the undersigned will be recommended for Contract award and prior to award of the Contract by the City Council.

In determining the amount bid by each bidder, City shall disregard mathematical errors in addition, subtraction, multiplication and division that appear obvious on the face of the Proposal. When such a mathematical error appears on the Proposal, the City shall have the right to correct such error and to compute the total amount bid by said bidder on the basis of the corrected figure or figures.

When the unit price of an item is required to be set forth in the Proposal, and the total for the item set forth separately does not agree with a figure derived by multiplying the item unit price times the Engineer’s estimate of the quantity of work to be performed for said item, the item unit price shall prevail over the sum set forth as the total for the item unless, in the sole discretion of the City, such a procedure would be inconsistent with the policy of the City’s bidding procedures. The total paid for each such item of work shall be based upon the item unit price and not the total price.

Should the Proposal contain only a total price for an item and the item unit price is omitted, the City shall determine the item unit price by dividing the total price of the item by the Engineer’s estimate of the quantity of work to be performed for the item of work.

If the Proposal contains neither the item price nor the total price for the item, then it shall be deemed incomplete and the Proposal shall be disregarded.

It is understood that this bid is based upon completion of the work within a period of One Hundred Ten (110) working days commencing on the date specified in the Notice to Proceed.

The amount of liquidated damages to be paid by the Contractor for failure to complete the work by the completion date (as extended, if applicable) shall be Seven Hundred Dollars ($700) for each calendar day, continuing to the time at which the work is completed. Such amount is the actual cash value agreed upon as the loss to the City resulting from the default of the Contractor.

The undersigned represents and warrants that he/she has examined the location of the proposed work and is familiar with the conditions at the place where the work is to be done. The undersigned further represents that he/she has reviewed and understands the Plans, Special Provisions, and other contract documents, and the undersigned is satisfied with all conditions for the performance of the work.

The undersigned has carefully checked all of the above figures and understands that the City of Sacramento will not be responsible for any errors or omissions on the part of the undersigned in making up this bid.

This proposal shall not be withdrawn for the time periods specified in Section 3-2 of the City of Sacramento Standard Specifications for award of contract to respective low bidders. This proposal is submitted in accordance with Chapter 3.60 of the Sacramento City Code and Sections 1, 2, and 3 of the City of Sacramento Standard Specifications.

In accordance with Standard Specification Section 3-2, the City shall award this contract to the lowest responsible bidder, if such award is made, within sixty (60) working days after opening of the Proposals. The City reserves the right to reject any and all bids.
BID DEPOSIT ENCLOSED IN THE FOLLOWING FORM:

$10,080.00 not less than ten (10) percent of amount bid.

- CERTIFIED CHECK
- MONEY ORDER
- CASHIERS' CHECK
- BID BOND

CONTRACTOR

Addendum No. 1  Received 3/9/18  Schrader Mechanical, Inc.
Addendum No. 2
Addendum No. 3
Addendum No. 4

By: [Signature]
Title: President
Address: 1015 Black Diamond Way
No PO Box – Physical Address ONLY
Lodi, CA 95240

Telephone No. (209)369-6888
Fax No. (209) 369-6681
Email: chris.s@smiwest.com/walt.b@smiwest.com

(Federal Tax ID # or Social Security #)
Under penalty of perjury, I certify that the Taxpayer Identification Number and all other information provided here are correct.

26-1635570

DIR Registration Number: 1000006479

Valid Contractor's License No. 907665 Classification C38, C10, C20, B C36 is held by the bidder.
Expiration date 2/29/2020 Representation made herein are true and correct under penalty of perjury

PN: X14131507 (B18141321018)
KNOW ALL MEN BY THESE PRESENTS,

That we, _______________________,
as Principal, and _______________________,
a corporation duly organized under the laws of the State of California and duly licensed to become sole surety on bonds required or authorized by the State of California, as Surety, are held and firmly bound unto
the City of Sacramento, hereinafter called the City, in the penal sum of ten percent (10%) of the (BASE OR LUMP SUM) Proposal of the Principal above named, or other amount as set forth in the Invitation to Bidders, submitted by said Principal to the City for the Work described below, for the payment of which sum in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

Not to exceed $23,320.00

THE CONDITION OF THIS OBLIGATION IS SUCH

That whereas the Principal has submitted the above mentioned proposal to the City, for which Proposals are to be opened by the Office of the City Clerk, Historic City Hall, Hearing Room, 2nd Floor, 915 I Street, Sacramento, California, on March 21, 2018 for the Work specifically described as follows:

SUMP 1A VFD REPLACEMENT PROJECT
(PN: X14131507) (B18141321018)

NOW, THEREFORE, if the aforesaid Principal is award the Agreement and within the time and manner required under the Contract Documents, enters into a written Agreement, in the prescribed form, in accordance with the Proposal, and files two (2) bonds with the City, one to guarantee faithful performance and the other to guarantee payment for labor and materials, and files the required insurance policies with the City, all as required by the Contract Documents or by law, then the obligation shall be null and void; otherwise it shall be and remain in full force and effect.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorney's fee to be fixed by the court, which sums shall be additional to the principal amount of this bond.

IN WITNESS THEREOF, We have hereunto set our hands and seal this _______ day of March, 2018.

Schrader Mechanical Inc.

By: __________________________
   President

American Contractors Indemnity Company

By: __________________________
   Attorney-in-Fact

Title
   Valley Surety Insurance Agency

Agent Name and Address
   947 Enterprise Drive Unit A
   Sacramento, CA 95825
   916-567-6676

Agent Phone #
   310-649-0990

Surety Phone #
   0799396

California License #
To be eligible for award of this contract, the bidder shall list the business entities used to attain the 5% LBE requirement. Additionally, the bidder shall list all subcontractors who perform work, render service, or provide materials in an amount in excess of one-half of 1 percent of the total bid amount. In the case of bids for the construction of streets and highways, including bridges, subcontractors whose subcontract value exceeds one-half of 1 percent of the total bid or ten thousand dollars ($10,000), whichever is greater, shall be listed. Estimated dollar values shall be provided for all work/services listed. The failure to attain the 5% LBE participation or the inclusion of false information or the omission of required information will render the bid non-responsive.

<table>
<thead>
<tr>
<th>Prime Contractor Name</th>
<th>Schrader Mechanical, Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime Contractor Address</td>
<td>1015 Black Diamond Way, Lodi, CA 95240</td>
</tr>
<tr>
<td>Date</td>
<td>3/21/2018</td>
</tr>
<tr>
<td>Bid Amount</td>
<td>$334,800.00</td>
</tr>
<tr>
<td>Is Prime LBE?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| Business Name  | Rexel |
| License Number |  |
| Address        | 1534 N Market Blvd |
| City, State, Zip | Sacramento, CA 95834 |
| Contact Person | John Hill |
| Phone          | (916) 928-9700 |
| LBE?           | Yes |
| Type of Work, Services, or Supplies to be provided to complete contract | Electrical Supplies, MCC & Hardware |
| Estimated Dollar Value of Work, Services or Supplies to be Performed of Provided | $178,000.00 |

COPY AND ATTACH ADDITIONAL SHEETS AS NECESSARY

I hereby certify that each subcontractor listed on this Subcontractor and LBE Participation Form has been notified that it has been listed and has consented in writing to its name being submitted for this contract. The Prime Contractor also certifies that it will notify each subcontractor listed on this Form in writing if the contract award is made to the Prime Contractor, and will make all documentation relevant to the subcontractor and LBE participation available to City of Sacramento upon request. The Prime Contractor further certifies that all of the information contained in this Form is true and correct and acknowledges that the City will rely on the accuracy of this information in awarding the contract.

Principal of Firm: [Signature]  
President  
Date: 3/20/2018
DRUG-FREE WORKPLACE POLICY AND AFFIDAVIT

BID MAY BE DECLARED NONRESPONSIVE IF THIS FORM (COMPLETED) IS NOT ATTACHED.

Pursuant to City Council Resolution CC90-498 dated 6/26/90 the following is required.

The undersigned contractor certifies that it and all subcontractors performing under this contract will provide a drug-free workplace by:

1. Publishing a "Drug-Free Workplace" statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Establishing a Drug-Free Awareness Program to inform employees about:
   a. The dangers of drug abuse in the workplace.
   b. The contractor's policy of maintaining a drug-free workplace.
   c. Any available drug counseling, rehabilitation, and employee assistance program.
   d. The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

3. Notify employees that as a condition of employment under this contract, employees will be expected to:
   a. Abide by the terms of the statement.
   b. Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace.

4. Making it a requirement that each employee to be engaged in the performance of the contract be given a copy on the "Drug-Free Workplace" statement.

5. Taking one of the following appropriate actions, within thirty (30) days of receiving notice from an employee or otherwise receiving such notice, that said employee has received a drug conviction for a violation occurring in the workplace:
   a. Taking appropriate disciplinary action against such an employee, up to and including termination; or
   b. Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a federal, state, or local health, law enforcement or other appropriate agency.

* I certify that no person employed by this company, corporation, or business has been convicted of any criminal drug statute violation on any job site or project where this company, corporation, or business was performing work within three (3) years of the date of my signature below.

EXCEPTION:

The above statement will also be incorporated as a part of each subcontract agreement for any and all subcontractors selected for performance on this project.

IN THE EVENT THIS COMPANY, CORPORATION, OR BUSINESS IS AWARDED THIS CONSTRUCTION CONTRACT, AS A RESULT OF THIS BID; THE CONTRACTOR WITH HIS/HER SIGNATURE REPRESENTS TO THE CITY THAT THE INFORMATION DISCLOSED IN THIS DOCUMENT IS COMPLETE AND ACCURATE. IT IS UNDERSTOOD AND AGREED THAT FALSE CERTIFICATION IS SUBJECT TO IMMEDIATE TERMINATION BY THE CITY.

The Representations Made Herein On This Document Are Made Under Penalty Of Perjury.

CONTRACTOR'S NAME:  Schrader Mechanical, Inc.

BY:  President

Date:  3/21/2018

Signature

Title

Effects of violations:  a. Suspension of payments under this contract.  b. Suspension or termination of the contract.  c. Suspension or debarment of the contractor from receiving any contract from the City of Sacramento for a period not to exceed five years.

FM 681 7/10/9
Sacramento City Code Section 3.60.020 authorizes the Sacramento City Council to adopt standard minimum qualifications for bidders on competitively bid public works construction projects, and requires, among other provisions, that a bidder meet such minimum qualifications at the time of bid opening in order to bid. On July 31, 2007, the City Council adopted Resolution No. 2007-574 establishing these standard minimum qualifications. Pursuant to City Code section 3.60.020, a bidder failing to meet these minimum qualifications at the time of bid opening shall not be considered a responsible bidder for purposes of bidding on the subject project.

All bidders must demonstrate compliance with the minimum qualifications established by Resolution No. 2007-574 by completing all of the questions contained in this questionnaire. Bidder responses shall be limited to those operating business units, offices, branches and/or subsidiary divisions of the bidder that will be involved with the performance of any project work if awarded the contract. If a bidder answers “yes” to any single question, fails to submit a fully completed questionnaire, or submits false information, this will result in a determination that the minimum qualifications are not met, and the bidder shall not be considered a qualified bidder for purposes of bidding on this contract. If two or more entities submit a bid on a contract as a Joint Venture, each entity within the Joint Venture must separately meet these minimum qualifications for the Joint Venture to be considered a qualified bidder.

The City of Sacramento (“City”) shall make its determination on the basis of the submitted questionnaire, as well as any relevant information that is obtained from others or as a result of investigation by the City. While it is the intent of this questionnaire to assist the City in determining whether bidders possess the minimum qualifications necessary to submit bids on the City’s competitively bid public works construction contracts, the fact that a bidder submits a questionnaire demonstrating that it meets these minimum qualifications shall not in any way limit or affect the City’s ability to: (1) review other information contained in the bid submitted by the bidder, and additional relevant information, and determine whether the contractor is a responsive and/or responsible bidder; or (2) establish pre-qualification requirements for a specific contract or contracts.

By submitting this questionnaire, the bidder consents to the disclosure of its questionnaire answers: (i) to third parties for purposes of verification and investigation; (ii) in connection with any protest, challenge or appeal of any action taken by the City; and (iii) as required by any law or regulation, including without limitation the California Public Records Act (Calif. Gov't Code sections 6250 et seq.). Each questionnaire must be signed under penalty of perjury in the manner designated at the end of the form, by an individual who has the legal authority to bind the bidder submitting the questionnaire. If any information provided by a bidder becomes inaccurate, the bidder shall immediately notify the City and provide updated accurate information in writing, under penalty of perjury.
QUESTIONNAIRE

NOTICE: For firms that maintain other operating business units, offices, branches and/or subsidiary divisions that will not be involved with the performance of any project work if the firm is awarded the contract, references hereafter to “your firm” shall mean only those operating business units, offices, branches and/or subsidiary divisions that will be involved with the performance of any project work.

All of the following questions regarding “your firm” refer to the firm (corporation, partnership or sole proprietor) submitting this questionnaire, as well as any firm(s) with which any of your firm’s owners, officers, or partners are or have been associated as an owner, officer, partner or similar position within the last five years.

The firm submitting this questionnaire shall not be considered a responsible bidder if the answer to any of these questions is “yes”, or if the firm submits a questionnaire that is not fully completed or contains false information.

1. **Classification & Expiration Date(s) of California Contractor’s License Number(s) held by firm:**

   C38, C36, C20, C10, B

2. Has a contractor’s license held by your firm and/or any owner, officer or partner of your firm been revoked at any time in the last five years?

   ☐ Yes ☑ No

3. Within the last five years, has a surety firm completed a contract on your firm’s behalf, or paid for completion of a contract to which your firm was a party, because your firm was considered to be in default or was terminated for cause by the project owner?

   ☐ Yes ☑ No

4. At the time of submitting this minimum qualifications questionnaire, is your firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either California Labor Code section 1777.1 (prevailing wage violations) or Labor Code section 1777.7 (apprenticeship violations)?

   ☐ Yes ☑ No

5. At any time during the last five years, has your firm, or any of its owners, officers or partners been convicted of a crime involving the awarding of a contract for a government construction project, or the bidding or performance of a government contract?

   ☐ Yes ☑ No
6. Answer either subsection A or B, as applicable:

A. Your firm has completed three or more government construction contracts in Sacramento County within the last five years: Within those five years, has your firm been assessed liquidated damages on three or more government construction contracts in Sacramento County for failure to complete contract work on time?

NOTE: If there is a pending administrative or court action challenging the assessment of liquidated damages on a government contract within the last five years, you need not include that contract in responding to this question.

☐ Yes ☑ No ☐ Not applicable

OR

B. Your firm has not completed at least three government construction contracts in Sacramento County within the last five years: Within the last three years, has your firm been assessed liquidated damages on three or more government construction contracts for failure to complete contract work on time?

NOTE: If there is a pending administrative or court action challenging an assessment of liquidated damages on a government contract within the last three years, you need not include that contract in responding to this question.

☐ Yes ☐ No ☑ Not applicable

7. In the last three years has your firm been debarred from bidding on, or completing, any government agency or public works construction contract for any reason?

NOTE: If there is a pending administrative or court action challenging a debarment, you need not include that debarment in responding to this question.

☐ Yes ☑ No

8. Has CAL OSHA assessed a total of three or more penalties against your firm for any “serious” or “willful” violation occurring on construction projects performed in Sacramento County at any time within the last three years?

NOTE: If there is a pending administrative or court action appealing a penalty assessment, you need not include that penalty assessment in responding to this question.

☐ Yes ☑ No
9. Answer either subsection A or B, as preferred:

A. In the last three years has your firm had a three year average Workers' Compensation experience modification rate exceeding 1.1?

☐ Yes  ☐ No

OR

B. In the last three years has your firm had a three-year average incident rate for total lost workday cases exceeding 10?

NOTE: Incident rates represent the number of lost workday cases per 100 full-time workers and is to be calculated as: (N/EH) x 200,000, where

\[
N = \text{number of lost workday cases (as defined by the U.S. Dept. of Labor, Bureau of Labor Statistics)} \\
EH = \text{total hours worked by all employees during the calendar year} \\
200,000 = \text{base for 100 equivalent full-time working (working 40 hours per week, 50 weeks per year)}
\]

☐ Yes  ☑ No

10. In the past three years, has the federal EPA, Region IX or a California Air Quality Management District or Regional Water Quality Control Board assessed penalties three or more times, either against your firm, or against the project owner for a violation resulting in whole or in part from any action or omission by your firm on a project on which your firm was a contractor in Sacramento County?

NOTE: If there is a pending administrative or court action appealing a penalty assessment, you need not include that penalty assessment in responding to this question.

☐ Yes  ☑ No

11. In the past three years, has the federal EPA, Region IX or a California Air Quality Management District or Regional Water Quality Control Board assessed a single penalty of $100,000 or more, either against your firm, or against the project owner for a violation resulting in whole or in part from any action or omission by your firm on a project on which your firm was the contractor in Sacramento County?

NOTE: If there is a pending administrative or court action appealing a penalty assessment, you need not include that penalty assessment in responding to this question.

☐ Yes  ☑ No
12. In the past three years, have civil penalties been assessed against your firm pursuant to California Labor Code 1777.7 for violation of California public works apprenticeship requirements, three or more times?

**NOTE:** If there is a pending administrative or court action appealing a penalty assessment, you need not include that penalty assessment in responding to this question.

☐ Yes  ✔ No

13. In the past three years, has a public agency in California withheld contract payments or assessed penalties against your firm for violation of public works prevailing wage requirements, three or more times?

**NOTE:** If there is a pending administrative or court action appealing a withholding or penalty assessment, you need not include that withholding or penalty assessment in responding to this question.

☐ Yes  ✔ No

14. Has your firm been assessed penalties for violation of public works prevailing wage requirements in California, in an aggregate amount for the past three years of $50,000 or more?

**NOTE:** If there is a pending administrative or court action appealing a penalty assessment, you need not include that penalty assessment in responding to this question.

☐ Yes  ✔ No
VERIFICATION AND SIGNATURE

I, the undersigned, certify and declare that I have read all the foregoing answers to this Minimum Qualifications Questionnaire, and know their contents. The matters stated in these Questionnaire answers are true of my own knowledge and belief, except as to those matters stated on information and belief, and as to those matters I believe them to be true. I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Signed at 1015 Black Diamond Way, Lodi, CA 95240, on 3/20/2018
(Location) (Date)

Signature: ________________

Print name: Christopher Schrader

Title: President

NOTE: If two or more entities submit a bid on a contract as a Joint Venture, each entity within the Joint Venture must submit a separate Minimum Qualifications Questionnaire.
REQUIREMENTS OF THE NON-DISCRIMINATION IN EMPLOYEE BENEFITS CODE

INTRODUCTION

The Sacramento Non-Discrimination In Employee Benefits Code (the “Ordinance”), codified as Sacramento City Code Chapter 3.54, prohibits City contractors from discriminating in the provision of employee benefits between employees with spouses and employees with domestic partners, and between the spouses and domestic partners of employees.

APPLICATION

The provisions of the Ordinance apply to any contract or agreement (as defined below), between a Contractor and the City of Sacramento, in an amount exceeding $100,000.00. The Ordinance applies to that portion of a contractor’s operations that occur: (i) within the City of Sacramento; (ii) on real property outside the City of Sacramento if the property is owned by the City or if the City has a right to occupy the property; or (iii) at any location where a significant amount of work related to a City contract is being performed.

The Ordinance does not apply: to subcontractors or subcontracts of any Contractor or contractors; to transactions entered into pursuant to cooperative purchasing agreements approved by the Sacramento City Council; to legal contracts of other governmental jurisdictions or public agencies without separate competitive bidding by the City; where the requirements of the ordinance will violate or are inconsistent with the terms or conditions of a grant, subvention or agreement with a public agency or the instructions of an authorized representative of any such agency with respect to any such grant, subvention or agreement; to permits for excavation or street construction; or to agreements for the use of City right-of-way where a contracting utility has the power of eminent domain.

DEFINITIONS

As set forth in the Ordinance, the following definitions apply:

“Contract” means an agreement for public works or improvements to be performed, or for goods or services to be purchased or grants to be provided, at the expense of the City or to be paid out of moneys deposited in the treasury or out of the trust money under the control or collected by the City. “Contract” also means a written agreement for the exclusive use (“exclusive use” means the right to use or occupy real property to the exclusion of others, other than the right reserved by the fee owner) or occupancy of real property for a term exceeding 29 days in any calendar year, whether by singular or cumulative instrument, (i) for the operation or use by others of real property owned or controlled by the City for the operation of a business, social, or other establishment or organization, including leases, concessions, franchises and easements, or (ii) for the City’s use or occupancy of real property owned by others, including leases, concessions, franchises and easements.

“Contract” shall not include: a revocable at-will use or encroachment permit for the use of or encroachment on City property regardless of the ultimate duration of such permit; excavation, street construction or street use permits; agreements for the use of City right-of-way where a contracting utility has the power of eminent domain; or agreements governing the use of City property that constitute a public forum for activities that are primarily for the purpose of espousing or advocating causes or ideas and that are generally protected by the First Amendment to the United States Constitution or that are primarily recreational in nature.
“Contractor” means any person or persons, firm, partnership, corporation, company, or combination thereof, that enters into a Contract with the City. “Contractor” does not include a public entity.

“Domestic Partner” means any person who has a currently registered domestic partnership with a governmental entity pursuant to state or local law authorizing the registration.

“Employee Benefits” means bereavement leave; disability, life, and other types of insurance; family medical leave; health benefits; membership or membership discounts; moving expenses; pension and retirement benefits; vacation; travel benefits; and any other benefit given to employees. “Employee benefits” shall not include benefits to the extent that the application of the requirements of this chapter to such benefits may be preempted by federal or state.

**CONTRACTOR’S OBLIGATION TO PROVIDE THE CITY WITH DOCUMENTATION AND INFORMATION**

Contractor shall provide the City with documentation and information verifying its compliance with the requirements of the Ordinance within ten (10) days of receipt of a request from the City. Contractors shall keep accurate payroll records, showing, for each City Contract, the employee’s name, address, Social Security number, work classification, straight time pay rate, overtime pay rate, overtime hours worked, status and exemptions, and benefits for each day and pay period that the employee works on the City Contract. Each request for payroll records shall be accompanied by an affidavit to be completed and returned by the Contractor, as stated, attesting that the information contained in the payroll records is true and correct, and that the Contractor has complied with the requirements of the Ordinance. A violation of the Ordinance or noncompliance with the requirements of the Ordinance shall constitute a breach of contract.

**EMPLOYER NOTICE REQUIREMENTS**

(a) The Contractor shall give each existing employee working directly on a City Contract, and (at the time of hire), each new employee, a copy of the notification provided as Attachment “A.”

(b) Contractor shall post, in a place visible to all employees, a copy of the notice provided as Attachment “B.”
YOUR RIGHTS UNDER THE CITY OF SACRAMENTO’S NON-DISCRIMINATION IN EMPLOYEE BENEFITS CODE

On ……………….. (date), your employer (the “Employer”) entered into a contract with the City of Sacramento (the “City”) for ………………………… (contract details), and as a condition of that contract, agreed to abide by the requirements of the City’s Non-Discrimination In Employee Benefits Code (Sacramento City Code Section 3.54).

The Ordinance does not require the Employer to provide employee benefits. The Ordinance does require that if certain employee benefits are provided by the Employer, that those benefits be provided without discrimination between employees with spouses and employees with domestic partners, and without discrimination between the spouse or domestic partner of employees.

The Ordinance covers any employee working on the specific contract referenced above, but only for the period of time while those employees are actually working on this specific contract.

The included employee benefits are:

- Bereavement leave
- Disability, life and other types of insurance
- Family medical leave
- Health benefits
- Membership or membership discounts
- Moving expenses
- Pension and retirement benefits
- Vacation
- Travel benefits
- Any other benefits given to employees

(Employee Benefits does not include benefits that may be preempted by federal or state law.)

If you feel you have been discriminated or retaliated against by your employer in the terms and conditions of your application for employment, or in your employment, or in the application of these employee benefits, because of your status as an applicant or as an employee protected by the Ordinance, or because you reported a violation of the Ordinance, and after having exhausted all remedies with your employer,
You May . . .

- Submit a written complaint to the City of Sacramento, Contract Services Unit, containing the details of the alleged violation. The address is:

  City of Sacramento
  Procurement Services Division
  915 I Street, Second Floor
  Sacramento, CA 95814

- Bring an action in the appropriate division of the Superior Court of the State of California against the Employer and obtain the following remedies:

  - Reinstatement, injunctive relief, compensatory damages and punitive damages
  - Reasonable attorney’s fees and costs
YOUR RIGHTS UNDER THE CITY OF SACRAMENTO’S NON-DISCRIMINATION IN EMPLOYEE BENEFITS CODE

If your employer provides employee benefits, they must be provided to those employees working on a City of Sacramento contract without discriminating between employees with spouses and employees with domestic partners.

The included employee benefits are:

- Bereavement leave
- Disability, life and other types of insurance
- Family medical leave
- Health benefits
- Membership or membership discounts
- Moving expenses
- Pension and retirement benefits
- Vacation
- Travel benefits
- Any other benefits given to Employees

If you feel you have been discriminated against by your employer . . .

You May . . .

○ Submit a written complaint to the City of Sacramento, Contract Services Unit, containing the details of the alleged violation. The address is:

    City of Sacramento
    Procurement Services Division
    915 I Street, Second Floor
    Sacramento, CA 95814

○ Bring an action in the appropriate division of the Superior Court of the State of California against the employer and obtain reinstatement, injunctive relief, compensatory damages, punitive damages and reasonable attorney’s fees and costs.

Discrimination and Retaliation Prohibited.

If you feel you have been discriminated or retaliated against by your employer in the terms and conditions of your application for employment, or in your employment, because of your status as an applicant or as an employee protected by the Ordinance, or because you reported a violation of this Ordinance . . .

You May Also . . .

Submit a written complaint to the City of Sacramento, Contract Services Unit, at the same address, containing the details of the alleged violation.
LOCAL BUSINESS ENTERPRISE (LBE) PARTICIPATION REQUIREMENTS
FOR PUBLIC PROJECTS OF $100,000 OR MORE
(City Contracts no Federal Funds Used)

I. LBE PARTICIPATION REQUIREMENT

On April 3, 2012, the Sacramento City Council adopted a Local Business Enterprise (LBE) Preference Program to provide enhanced opportunities for the participation of local business enterprises (LBEs) in the City’s contracting and procurement activities. On November 19, 2013, the City Council increased the LBE preference percentage and authorized City departments to require minimum LBE participation levels in specific contracts. Under City Code section 3.60.270, when the bid specifications for a City contract establish a minimum participation level for LBEs, no bidder on the contract shall be considered responsive unless its bid meets the minimum LBE participation level required by the bid specifications.

The City has established a minimum 5% participation level for LBEs on this contract. Pursuant to City Code Section 3.60.270, no bidder on this contract shall be considered responsive unless its bid meets or exceeds this minimum participation level.

Bidder and any other business entity listed on the LBE forms submitted shall comply with all applicable laws relating to licensing, permitting, and payment of taxes and fees in the City of Sacramento or County of Sacramento; and shall not be in arrears to the City of Sacramento or County of Sacramento, upon award of a contract.

II. LBE QUALIFICATION

A. A LBE designated in the bid must be qualified as a LBE prior to the time set for submission of bids.

B. Local Business Enterprise means a business enterprise, including but not limited to, a sole proprietorship, partnership, limited liability company, corporation, or other business entity that has a legitimate business presence in the City or unincorporated county of Sacramento. Proof of legitimate business presence in the City or unincorporated county of Sacramento shall include:

1. Having a current City of Sacramento Business Operation Tax or County of Sacramento Business License for at least twelve (12) consecutive months prior to submission of bid; and
2. Having either of the following types of offices or workspace operating legally within the City or unincorporated county of Sacramento for at least twelve (12) consecutive months prior to submission of bid:
   a. The LBE’s principle business office or workspace; or
   b. The LBE’s regional, branch or satellite office with at least one full time employee located in the City or unincorporated county of Sacramento.
C. A LBE must provide a physical address for the basis of location. This excludes P.O. Box addresses.

D. A LBE must provide a current copy of the City of Sacramento Business Operations Tax Certificate or County of Sacramento Business License.

III. DETERMINATION OF LBE PARTICIPATION LEVEL

A. LBE Participation: The percentage of LBE participation is determined based on the dollar value of the work to be performed or supplies to be furnished by certified LBEs designated in the bidder’s Subcontractor and LBE Participation Verification Form, relative to the total dollar amount of the bid.

B. Participation Credit: To receive credit for participation: (1) a LBE subcontractor must be responsible for the execution of a distinct element of the work, must possess any license or certification required for the work, and must actually perform, manage, or supervise the work without subcontracting or otherwise shifting any portion of the work to another subcontractor; and (2) a LBE supplier must furnish materials, equipment, or supplies that the supplier sells as a recurring, although not necessarily primary, part of its business, and that are necessary for performance of the work.

C. Suppliers: Credit for a LBE supplier of materials, equipment, or supplies is counted as one hundred (100) percent of the amount paid to the supplier for the material, equipment, or supplies. To receive this credit, LBE suppliers must be listed on the bidder’s Subcontractor and LBE Participation Verification Form.

D. Subcontractors (including truckers): To receive credit for a LBE subcontractor, the subcontractor must be listed on the bidder’s Subcontractor and LBE Participation Verification Form. 
   - Truckers: Credit for a LBE trucker is counted as one hundred (100) percent of the amount paid to the trucker for trucking services, not including any amount paid to the trucker for the cost of any materials, equipment, or supplies being transported by the trucker.

IV. LBE REQUIREMENTS FOR CONTRACTOR

A. LBE Records: The Contractor shall maintain records of all subcontracts with verified LBE subcontractors and records of materials purchased from verified LBE suppliers for one (1) year after receiving final payment from the City. Such records shall show the name and business address of each LBE subcontractor or supplier and the total dollar amount actually paid each LBE subcontractor or supplier.

Not later than 30 days after completion of the work performed under the contract, a summary of these records shall be prepared, certified correct by the Contractor’s authorized representative and furnished to the City. The Contractor shall provide such other information, records, reports, certifications or other documents as may
be required by City, to determine compliance with any provision of the LBE program or these specifications.

B. Performance of LBE Subcontractors and Suppliers: The LBEs listed by the Contractor shall perform the work and supply the materials, equipment, and supplies for which they are listed unless the Contractor has received prior written authorization from the City to perform the work with other forces or to obtain the material, equipment, or supplies from other sources. Reasons for requesting such authorization would include:

1. The listed LBE fails to execute a written contract based upon the general terms, conditions, plans, and specifications for the project.

2. The listed LBE becomes bankrupt or insolvent.

3. The listed LBE subcontractor fails to meet the bond requirements of the Contractor.

4. The work performed or the materials/equipment/supplies provided by the listed LBE are unsatisfactory or are not in accordance with the plans and specifications, or the listed LBE fails to perform its contractual obligations.

5. It would be in the best interest of the City.

C. Subcontractor Substitution: No substitution of a LBE subcontractor shall be made at any time without compliance with the Subletting and Subcontracting Fair Practices Act. If a LBE subcontractor is unable to perform successfully and is to be replaced, the Contractor shall make reasonable efforts to replace the original LBE subcontractor with another verified LBE subcontractor. The new LBE subcontractor must be verified at the time of substitution.

D. Reporting and Utilization Requirements and Sanctions: Failure to provide specific information, records, reports, certifications, or any other documents required for compliance with these specifications, or failure to utilize one or more LBEs in substantial compliance with the LBE utilization indicated in the Contractor's bid (unless otherwise authorized by City as provided herein, or when such failure results from changes to the work approved by the City), shall be considered a breach of the contract, and a deduction may be made from the contract amount. The deduction shall be not more than ten (10) percent of the value of the work or materials/equipment/supplies that the subject LBE(s) were listed to perform/provide in the Contractor's bid, and shall be deducted from any payment due to the Contractor. This is in addition to any deduction that may be made under any other provision of the contract, the Sacramento City Code, or State law.

E. Hearing and Review of Division Manager Decision: Prior to making a deduction pursuant to Section IV (D), above, the City shall provide written notice of the proposed deduction to the Contractor, and the Contractor may, not later than five (5) working days after receiving such notice, provide a written request to City for a hearing to contest the proposed deduction. Upon receipt of a timely written
request from the Contractor, the City shall schedule a hearing before the Division Manager (as defined in the City’s Standard Specifications for Public Construction), and written notice of the date, time and location of the hearing shall be provided to the Contractor not less than five (5) working days prior to the date of the hearing. The hearing shall be conducted in the manner specified in Section 4-8 of the Standard Specifications, and the Division Manager shall prepare and forward to the Contractor a written decision as soon as practicable after the hearing. The Division Manager’s decision shall be subject to review in accordance with the provisions of Section 4-9 of the Standard Specifications. Failure to request such review in compliance with the requirements set forth in Section 4-9 shall constitute acceptance of the Division Manager’s decision by the Contractor.

The written notices and requests described above shall be provided by registered or certified mail (return receipt requested), by telecopy, by personal delivery, or by any other method that provides reliable evidence of the date of receipt. Written notice provided by telecopy shall be deemed received on the date that it is transmitted and transmission is confirmed by the transmitting machine. Written notice provided by personal delivery shall be deemed received on the date of delivery.

V. DEFINITIONS

A. Local Business Enterprise (LBE): A business enterprise, including but not limited to, a sole proprietorship, partnership, limited liability company, corporation, or any other business entity that has a legitimate business presence in the City of Sacramento or unincorporated county of Sacramento.

B. Contractor: The sole proprietorship, partnership, limited liability company, corporation, or any other business entity entering into a contract with the City of Sacramento.

C. Subcontractor: The sole proprietorship, partnership, limited liability company, corporation, or other business entity entering into a contract with the prime contractor to perform a portion of the work.

D. Supplier: The sole proprietorship, partnership, limited liability company, corporation, or other business entity to provide materials, equipment, or supplies necessary for performance of the work.

E. Proposal: Any response to a City solicitation for Proposals or Qualifications.

F. Bid: Any response to a City solicitation for bids.
FOLLOWING FORMS TO BE FILLED OUT AND SIGNED ONLY

IF AWARDED CONTRACT
WORKER'S COMPENSATION INSURANCE CERTIFICATION

TO THE CITY OF SACRAMENTO:

The undersigned does hereby certify that he is aware of the provisions of Section 3700 et seq. of the Labor Code which require every employer to be insured against liability for worker's compensation claims or to undertake self-insurance in accordance with the provisions of said Code, and that he/she will comply with such provisions before commencing the performance of the work on this contract.

Schrader Mechanical
Bidder

By: [Signature]

Title: President

Address: 1015 Black Diamond Way

Lodi, CA 95240

Date: 4/18/18

PLEASE READ CAREFULLY BEFORE SIGNING

To be signed by authorized corporate officer or partner or individual submitting the bid. If bidder is: (example)

1. An individual using a firm name, sign: "John Doe, and individual doing business as Blank Company".

2. An individual doing business under his own name, sign: Your name only.

3. A co-partnership, sign: "John Doe and Richard Doe, co-partners doing business as Blank Company, by, John Doe, Co-Partner".

4. A corporation, sign: "Blank Company, by John Doe, Secretary". (Or other title)
AGREEMENT
(Construction Contract Over $25,000)

THIS AGREEMENT, dated for identification __________, 20__, is made and entered into between the CITY OF SACRAMENTO, a municipal corporation (“City”), and Schrader Mechanical, 1015 Black Diamond Way, Lodi, CA 95240 (“Contractor”).

The City and Contractor hereby mutually agree as follows:

1. CONTRACT DOCUMENTS

The Contract Documents, sometimes also referred to as the “Contract,” consist of the following items, which are hereby incorporated by reference as if set forth in full in this Agreement:

Notice to Contractors
Proposal Form submitted by the Contractor
Instructions to Bidders
Subcontractor and Local Business Enterprise Participation Form
Drug-Free Workplace Policy and Affidavit
Construction and Demolition (C&D) Debris Recycling Requirements
Workers’ Compensation Insurance Certification
Federal or State funding requirements (if applicable)
Local Business Enterprise (LBE) Requirements
Requirements of the Non-Discrimination in Employee Benefits Code
Ban-The-Box Requirements
Notice Regarding Assembly Bill 626
Addenda, if any
This Agreement
Standard Specifications
Special Provisions
Plans and Technical Specifications
The drawings and other data and all developments thereof prepared by City pursuant to the Contract
Any modifications of any of the foregoing made or approved by City, including but not limited to duly authorized change orders

Unless specifically noted otherwise, references to the “Standard Specifications” shall mean and refer to the Standard Specifications for Public Construction of the City of Sacramento approved by the Sacramento City Council on June 4, 2007 (Resolution No. 2007-350), and any subsequent amendments thereto approved by the Sacramento City Council or the Sacramento City Manager. Work called for in any one Contract Document and not mentioned in another is to be performed and executed as if mentioned in all Contract Documents. The table of contents, titles and headings contained in the Contract Documents are provided solely to facilitate reference to various provisions of the Contract Documents and in no way affect or limit the interpretation of the provisions to which they refer.

2. DEFINITIONS

Unless otherwise specifically provided herein, all words and phrases defined in the Standard Specifications shall have the same meaning and intent in this Agreement.
3. AGREEMENT CONTROLS

In the event of a conflict between any of the terms and conditions set forth in this Agreement and the terms and conditions set forth in other Contract Documents, the terms and conditions set forth in this Agreement shall prevail, except that the provisions of any duly authorized change order shall prevail over any conflicting provisions of this Agreement.

4. SCOPE OF CONTRACT

Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor, material and transportation necessary to perform and complete in a good and workmanlike manner to the satisfaction of City, all the Work called for in the Contract Documents entitled:

SUMP 1A VFD REPLACEMENT PROJECT (PN:X14131507)

Including the Work called for in the following alternative bid items described in the Proposal Form:

Contractor agrees to perform such Work in the manner designated in and in strict conformity with the Contract Documents.

5. CONTRACT AMOUNT AND PAYMENTS

City agrees to pay and Contractor agrees to accept, as complete payment for the above Work, in accordance with the schedule and procedures set forth in the Contract Documents and subject to deductions, withholdings and additions as specified in the Contract Documents, a total sum that shall not exceed the total bid amount set forth in Contractor’s Proposal Form. In addition, subject to deductions, withholdings and additions as specified in the Contract Documents, payment for individual items of the Work shall be computed as follows:

A. For items of the Work for which a lump sum price is specified in Contractor’s Proposal Form, Contractor shall be paid the lump sum price(s) specified in Contractor’s Proposal Form; and

B. For items of the Work for which a unit price is specified in Contractor’s Proposal Form, Contractor shall be paid the sum computed at such unit price, or computed at a different price if such different price is determined by City in accordance with the Standard Specifications, based on the actual amount of each such item performed and/or furnished and incorporated in the Work; provided that in no event shall the total sum for a unit price item exceed the total bid amount set forth for such item in the Contractor’s Proposal Form, unless authorized by Change Order.

6. PROGRESS PAYMENTS

Subject to the terms and conditions of the Contract, City shall cause payments to be made upon demand of Contractor as follows:

A. On or about the first of the month, the Engineer shall present to the Contractor a statement showing the amount of labor and materials incorporated in the Work through the twentieth (20) calendar day of the preceding month. After both Contractor and Engineer approve the
statement in writing, and the City’s labor compliance officer provides written approval, the City shall issue a certificate for ninety-five (95) percent of the amount it shall find to be due, subject to any deductions or withholdings authorized or required under the Contract or any applicable Laws or Regulations.

B. No inaccuracy or error in said monthly estimates shall operate to release Contractor from damages arising from such Work or from enforcement of each and every provision of the Contract Documents, and City shall have the right subsequently to correct any error made in any estimate for payment.

C. Contractor shall not be paid for any defective or improper Work.

D. The remaining five (5) percent of the value of the Work performed under the Contract, if unencumbered and subject to any deductions or withholdings authorized or required under the Contract or any applicable Laws or Regulations, shall be released not later than sixty (60) days after completion and final acceptance of the Work by City. Acceptance by Contractor of the final payment shall constitute a waiver of all claims against the City arising under the Contract Documents, except for disputed claims in stated amounts that the Contractor specifically reserves in writing, but only to the extent that the Contractor has complied with all procedures and requirements applicable to the presentation and processing of such claim(s) under the Contract Documents. Contractor shall be entitled to substitute securities for retention or to direct that payments of retention be made into escrow, as provided in Public Contract Code Section 22300, upon execution of the City’s Escrow Agreement for Security Deposits in Lieu of Retention.

E. The parties agree that, for purposes of the timely progress payment requirements specified in Public Contract Code Section 20104.50, the date that the City receives a statement jointly approved by the Contractor and the Engineer as provided above shall be deemed to constitute the date that City receives an undisputed and properly submitted payment request from the Contractor. Progress payments not made within 30 days after this date may be subject to payment of interest as provided in Public Contract Code Section 20104.50.

F. This Contract is subject to compliance monitoring and enforcement by the California Department of Industrial Relations, as specified in California Labor Code section 1771.4.

7. RETENTION OF SUMS CHARGED AGAINST CONTRACTOR

When, under the provisions of this Contract or any applicable Laws or Regulations, City is authorized or required to withhold, deduct or charge any sum of money against Contractor, City may deduct and retain the amount of such charge from the amount of the next succeeding progress estimate(s), or from any other moneys due or that may become due Contractor from City. If, on completion or termination of the Contract, sums due Contractor are insufficient to pay City's charges, City shall have the right to recover the balance from Contractor or its Sureties.

8. COMMENCEMENT AND PROSECUTION OF WORK

Contractor shall commence the Work not later than fifteen (15) working days after the date of the written Notice to Proceed from City to Contractor and shall diligently prosecute the Work to
completion. The phase “commence the Work” means to engage in a continuous program on-site including, but not limited to, site clearance, grading, dredging, land filling and the fabrications, erection, or installation of the Work. The Notice to Proceed shall be issued within fifteen (15) calendar days following execution of the Agreement by the City and the filing by Contractor of the required Bonds and proof of insurance, provided that the Engineer may delay issuance of the Notice to Proceed if the Engineer determines in the Engineer’s sole discretion that conditions on the site of the Work are unsuitable for commencement of the Work. After the Notice to Proceed is issued, the continuous prosecution of Work by Contractor shall be subject only to Excusable Delays as defined in this Agreement.

9. TIME OF COMPLETION

The entire Work shall be brought to completion in the manner provided for in the Contract Documents on or before one hundred ten (110) working days from the date of the Notice to Proceed (hereinafter called the “Completion Date”) unless extensions of time are granted in accordance with the Contract Documents.

Failure to complete the entire Work by the Completion Date and in the manner provided for in the Contract Documents shall subject Contractor to liquidated damages as provided in this Agreement. Time is and shall be of the essence in the performance of the Contract and the Work.

10. PAYMENTS DO NOT IMPLY ACCEPTANCE OF WORK

The payment of any progress payment, or the acceptance thereof by Contractor, shall not constitute acceptance of the Work or any portion thereof and shall in no way reduce the liability of Contractor to replace unsatisfactory work or material, whether or not the unsatisfactory character of such work or material was apparent or detected at the time such payment was made.

11. ACCEPTANCE NOT RELEASE

Contractor shall correct immediately any defective or imperfect work or materials that may be discovered before final acceptance of the entire Work, whether or not such defect or imperfection was previously noticed or identified by the City. The inspection of the Work, or any part thereof, shall not relieve Contractor of any of its obligations to perform satisfactory work as herein specified.

Failure or neglect on the part of City or any of its officers, employees or authorized agents to discover, identify, condemn or reject defective or imperfect work or materials shall not be construed to imply an acceptance of such work or materials, if such defect or imperfection becomes evident at any time prior to final acceptance of the entire Work, nor shall such failure or neglect be construed as barring City from enforcing Contractor’s warranty(ies) or otherwise recovering damages or such a sum of money as may be required to repair or rebuild the defective or imperfect work or materials whenever City may discover the same, subject only to any statutes of limitation that may apply to any such claim.

12. CITY’S RIGHT TO TAKE POSSESSION OF THE WORK IN WHOLE OR IN PART

The City shall have the right at any time to enter upon the Work and perform work not covered by this Contract, or to occupy and use a portion of the Work, prior to the date of the final acceptance
of the Work as a whole, without in any way relieving Contractor of any obligations under this Contract.

13. NO WAIVER OF REMEDIES

Neither the inspection by City, its officers, employees or agents, nor any certificate or other approval for the payment of money, nor any payment for, nor acceptance of the whole or any part of the Work by City, nor any extensions of time, nor any position taken by City, its officers, employees or its agents shall operate as a waiver of any provision of the Contract Documents nor of any power herein reserved to City or any right to damages herein provided, nor shall any waiver of any breach of this Agreement be held to be a waiver of any other or subsequent breach. All remedies provided in the Contract Documents shall be taken and construed as cumulative; in addition to each and every other remedy herein provided, the City shall have any and all equitable and legal remedies that it would in any case have.

14. WARRANTY

Except as otherwise expressly provided in the Contract Documents, and excepting only items of routine maintenance, ordinary wear and tear and unusual abuse or neglect by City, Contractor warrants and guarantees all Work executed and all supplies, materials and devices of whatsoever nature incorporated in or attached to the Work, or otherwise provided as a part of the Work pursuant to the Contract, to be absolutely free of all defects of workmanship and materials for a period of one year after final acceptance of the entire Work by the City. Contractor shall repair or replace all work or material, together with any other work or material that may be displaced or damaged in so doing, that may prove defective in workmanship or material within this one year warranty period without expense or charge of any nature whatsoever to City.

In the event that Contractor shall fail to comply with the conditions of the foregoing warranty within ten (10) days after being notified of the defect in writing, City shall have the right, but shall not be obligated, to repair, or obtain the repair of, the defect and Contractor shall pay to City on demand all costs and expense of such repair. Notwithstanding anything herein to the contrary, in the event that any defect in workmanship or material covered by the foregoing warranty results in a condition that constitutes an immediate hazard to public health or safety, or any property interest, or any person, City shall have the right to immediately repair, or cause to be repaired, such defect, and Contractor shall pay to City on demand all costs and expense of such repair. The foregoing statement relating to hazards to health, safety or property shall be deemed to include both temporary and permanent repairs that may be required as determined in the sole discretion and judgment of City.

In addition to the above, the Contractor shall make a written assignment of all manufacturer’s and other product warranties to the City, prior to completion and final acceptance of the Work by City.

The Contractor’s Performance Bond shall secure the performance of the Contractor’s obligations under this Section 14, and the Contractor and its Surety shall be jointly and severally liable for these obligations.
15. LIQUIDATED DAMAGES IF WORK NOT COMPLETED ON TIME

A. The actual fact of the occurrence of damages and the actual amount of the damages that City would suffer if the entire Work, and/or any specified portion thereof, were not completed within the time(s) specified herein are dependent upon many circumstances and conditions that could prevail in various combinations, and for this reason, it is impracticable and extremely difficult to fix the actual damages. Damages that City would suffer in the event of such delay include: loss of the use of the project; expenses of prolonged assignment to the project of an architectural and/or engineering staff; prolonged costs of administration, inspection, and supervision; increased operational expenses and/or impaired operation of other facilities dependent upon completion of the project; and the loss and inconvenience suffered by the public within the City of Sacramento by reason of the delay in the completion of the project or portion thereof. Accordingly, the parties agree, and by execution of this Agreement, Contractor acknowledges that it understands and agrees, that the amount(s) set forth herein as liquidated damages reflect the parties’ best efforts at the time of entering into the Contract to estimate the damages that may be incurred by City and the public due to the Contractor’s delay in completion of the Work and/or any specified portion thereof, and shall be presumed to be the amount of damages sustained by the failure of Contractor to complete the entire Work and/or any specified portion thereof within the time(s) specified herein.

B. Contractor shall pay liquidated damages to City for failure to complete the entire Work by the Completion Date (as extended in accordance with the Contract Documents, if applicable) in the amount of seven hundred dollars ($700) for each calendar day after the Completion Date (as extended in accordance with the Contract Documents, if applicable), continuing to the time at which the entire Work is completed. Such amount is the actual cash value agreed upon by the City and Contractor as the loss to City and the public resulting from Contractor’s default.

The parties agree, and by execution of this Agreement, Contractor acknowledges that it understands and agrees, that the foregoing provisions provide for the imposition of liquidated damages from the Completion Date (as extended in accordance with the Contract Documents, if applicable) until the date of completion of the entire Work as determined by the Engineer in accordance with Section 8-4 of the Standard Specifications, whether or not the Work or any portion thereof is claimed or determined to be substantially complete prior to such date of completion.

C. In the event Contractor shall become liable for liquidated damages, City, in addition to all other remedies provided by law, shall have the right to withhold any and all payments that otherwise would be or become due Contractor until the liability of Contractor under this section is finally determined. City shall have the right to use and apply such payments, in whole or in part, to reimburse City for all liquidated damages due or to become due to City. Any remaining balance of such payments shall be paid to Contractor only after discharge in full of all liability incurred by Contractor under this section or otherwise under any provision of the Contract Documents or any applicable Law or Regulation. If the sum so retained by City is not sufficient to discharge all such liabilities of Contractor, Contractor shall continue to remain liable to City until all such liabilities are satisfied in full. No failure by City to withhold any payment as specified above shall in any manner be construed to constitute a release of any such liabilities nor a waiver of the City’s right to withhold payment for such liabilities.
16. INDEMNITY AND HOLD HARMLESS

A. Contractor shall defend, hold harmless and indemnify the City, its officers, employees, and agents, and each and every one of them, from and against any and all actions, damages, costs, liabilities, claims, demands, losses, judgments, penalties, costs and expenses of every type and description, whether arising on or off the site of the Work, including, but not limited to, any fees and/or costs reasonably incurred by City’s staff attorneys or outside attorneys and any fees and expenses incurred in enforcing this provision (hereafter collectively referred to as “Liabilities”), including but not limited to Liabilities arising from personal injury or death, damage to personal, real or intellectual property or the environment, contractual or other economic damages, or regulatory penalties, arising out of or in any way connected with performance of or failure to perform the Work by the Contractor, any subcontractor or agent, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, whether or not (i) such Liabilities are caused in part by a party indemnified hereunder, or (ii) such Liabilities are litigated, settled or reduced to judgment; provided that the foregoing indemnity does not apply to liability for damages for death or bodily injury to persons, injury to property, or other loss, damage or expense to the extent arising from (i) the sole negligence or willful misconduct of, or defects in design furnished by, City, its agents, servants, or independent contractors who are directly responsible to City, or (ii) the active negligence of City.

B. The existence or acceptance by City of any of the insurance policies or coverages described in this Agreement shall not affect or limit any of City’s rights under this Section 16, nor shall the limits of such insurance limit the liability of Contractor hereunder. The provisions of this Section 16 shall survive any expiration or termination of the Contract.

17. CONTRACTOR SHALL ASSUME RISKS

Until the completion and final acceptance by City of all Work under this Contract, the Work shall be under Contractor’s responsible care and charge, and Contractor, at no cost to City, shall rebuild, repair, restore and make good all injuries, damages, re-erections, and repairs occasioned or rendered necessary by accidental causes of any nature, to all or any portions of the Work.

18. GENERAL LIABILITY OF CONTRACTOR

Except as otherwise herein expressly stipulated, Contractor shall perform all the Work and furnish all the labor, materials, tools, equipment, apparatus, facilities, transportation, power and light, and appliances, necessary or proper for performing and completing the Work herein required in the manner and within the time herein specified. The mention of any specific duty or liability of Contractor shall not be construed as a limitation or restriction of any general liability or duty of Contractor, and any reference to any specific duty or liability shall be construed to be solely for the purpose of explanation.

19. INSURANCE

During the entire term of the Contract, Contractor shall maintain the insurance coverage described in this Section 19.
Full compensation for all premiums that Contractor is required to pay for the insurance coverage described herein shall be included in the compensation specified for the Work performed by Contractor under this Contract. No additional compensation will be provided for Contractor’s insurance premiums. Any available insurance proceeds in excess of the specified minimum limits and coverages shall be available to the City.

It is understood and agreed by the Contractor that its liability to the City shall not in any way be limited to or affected by the amount of insurance coverage required or carried by the Contractor in connection with this Contract.

A. Minimum Scope & Limits of Insurance Coverage

(1) **Commercial General Liability Insurance** providing coverage at least as broad as ISO CGL Form 00 01 on an occurrence basis for bodily injury, including death, of one or more persons, property damage, and personal injury, arising out of activities performed by or on behalf of Contractor and its subcontractors, products and completed operations of Contractor and its subcontractors, and premises owned, leased, or used by Contractor and its subcontractors, with limits of not less than one million dollars ($1,000,000) per occurrence. The policy shall provide contractual liability and products and completed operations coverage for the term of the policy.

(2) **Automobile Liability Insurance** providing coverage at least as broad as ISO Form CA 00 01 for bodily injury, including death, of one or more persons, property damage, and personal injury, with limits of not less than one million dollars ($1,000,000) per accident. The policy shall provide coverage for owned, non-owned, and/or hired autos as appropriate to the operations of the Contractor.

No automobile liability insurance shall be required if Contractor completes the following certification:

“I certify that a motor vehicle will not be used in the performance of any work or services under this agreement.” ________ (Contractor initials)

(3) **Excess Insurance**: The minimum limits of insurance required above may be satisfied by a combination of primary and umbrella or excess insurance coverage; provided that any umbrella or excess insurance shall contain, or be endorsed to contain, a provision that it shall apply on a primary basis for the benefit of the CITY, and any insurance or self-insurance maintained by CITY, its officials, employees, or volunteers shall be in excess of such umbrella or excess coverage and shall not contribute with it.

(4) **Workers’ Compensation Insurance** with statutory limits, and **Employers’ Liability Insurance** with limits of not less than one million dollars ($1,000,000).
Workers’ Compensation policy shall include a waiver of subrogation in favor of the City.

No Workers’ Compensation insurance shall be required if Contractor completes the following certification:

“I certify that my business has no employees, and that I do not employ anyone. I am exempt from the legal requirements to provide Workers' Compensation insurance.” ________ (Contractor initials)

B. Additional Insured Coverage

(1) Commercial General Liability Insurance: The City, its officials, employees, and volunteers shall be covered by policy terms or endorsement as additional insureds as respects general liability arising out of: activities performed by or on behalf of Contractor and its subcontractors; products and completed operations of Contractor and its subcontractors; and premises owned, leased, or used by Contractor and its subcontractors.

(2) Automobile Liability Insurance: The City, its officials, employees, and volunteers shall be covered by policy terms or endorsement as additional insureds as respects auto liability.

C. Other Insurance Provisions

The policies are to contain, or be endorsed to contain, the following provisions:

(1) Contractor’s insurance coverage, including excess insurance, shall be primary insurance as respects City, its officials, employees, and volunteers. Any insurance or self-insurance maintained by City, its officials, employees, or volunteers shall be in excess of Contractor’s insurance and shall not contribute with it.

(2) Any failure to comply with reporting provisions of the policies shall not affect coverage provided to City, its officials, employees, or volunteers.

(3) Coverage shall state that Contractor’s 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.

(4) City will be provided with thirty (30) days written notice of cancellation or material change in the policy language or terms.

D. Acceptability of Insurance

Insurance shall be placed with insurers with a Bests’ rating of not less than A:VI. Self-insured retentions, policy terms or other variations that do not comply with the requirements of this Section 3 must be declared to and approved by the City in writing.
prior to execution of this Contract.

E. Verification of Coverage

(1) Contractor shall furnish City with certificates and required endorsements evidencing the insurance required. Copies of policies shall be delivered to the City on demand. Certificates of insurance shall be signed by an authorized representative of the insurance carrier.

(2) For all insurance policy renewals during the term of this Contract, Contractor shall send insurance certificates reflecting the policy renewals directly to:

City of Sacramento
c/o EXIGIS LLC
P.O. Box 4668 ECM- #35050
New York, NY 10168-4668

Insurance certificates also may be faxed to (888) 355-3599, or e-mailed to: certificates-sacramento@riskworks.com

(3) The City may withdraw its offer of contract or cancel this Contract if the certificates of insurance and endorsements required have not been provided prior to execution of this Contract. The City may withhold payments to Contractor or cancel the Contract if the insurance is canceled or Contractor otherwise ceases to be insured as required herein.

F. Subcontractors

Contractor shall require and verify that all subcontractors maintain insurance coverage that meets the minimum scope and limits of insurance coverage specified in subsection A, above.

20. FAILURE TO MAINTAIN BONDS OR INSURANCE

If, at any time during the performance of this Contract, Contractor fails to maintain any item of the bonds and/or insurance required under the Contract in full force and effect, Contractor shall immediately suspend all work under the Contract and notify City in writing of such failure. After such notice is provided, or if City discovers such failure and notifies Contractor, the City thereafter may withhold all Contract payments due or that become due until notice is received by City that such bonds and/or insurance have been restored in full force and effect and that the premiums therefor have been paid for a period satisfactory to the Division of Risk Management. Contractor shall not resume work until notified by City to do so, and the City shall have no responsibility or liability for any costs incurred by Contractor as a result of such suspension of Work.

In addition to the foregoing, any failure to maintain any item of the required bonds and/or insurance at any time during the performance of this Contract will be sufficient cause for termination of the Contract by City.
The Contractor shall be solely responsible for, and shall defend, indemnify and hold harmless the City, its officers, employees and agents against and from, any and all damages, claims, losses, actions, costs or other expenses of any kind incurred by any party as a direct or indirect result of any suspension of Work or termination of the Contract under the provisions of this Section.

21. EXCUSABLE DELAYS

For the purpose of these Contract Documents, the term "Excusable Delay" shall mean, and is limited to, delay caused directly by: acts of God; acts of a public enemy; fires; inclement weather as determined by the Engineer; riots; insurrections; epidemics; quarantine restrictions; strikes; lockouts; sitdowns; acts of a governmental agency; priorities or privileges established for the manufacture, assemble, or allotment of materials necessary in the Work by order, decree or otherwise of the United States or by any department, bureau, commission, committee, agent, or administrator of any legally constituted public authority; changes in the Work ordered by City insofar as they necessarily require additional time in which to complete the Work; the prevention of Contractor from commencing or prosecuting the Work because of the acts of others, excepting Contractor's subcontractors or suppliers; or the prevention of Contractor from commencing or prosecuting the Work because of a Citywide failure of public utility service.

The term "Excusable Delay" shall specifically not include: (i) any delay that could have been avoided by the exercise of care, prudence, foresight and diligence on the part of Contractor; (ii) any delay in the prosecution of any part of the Work that does not constitute a Controlling Operation, whether or not such delay is unavoidable; (iii) any reasonable delay resulting from time required by City for review of any Contractor submittals and for the making of surveys, measurements and inspection; and, (iv) any delay arising from an interruption in the prosecution of the Work on account of reasonable interference by other Contractors employed by City that does not necessarily prevent the completion of the entire Work within the time specified. Excusable Delays, if any, shall operate only to extend the Completion Date (not in excess of the period of such delay as determined by City) and shall not under any circumstances increase the amount City is required to pay Contractor except as otherwise provided in these Contract Documents.

22. CONTRACTOR TO SERVE NOTICE OF DELAYS

Whenever Contractor foresees any delay in the prosecution of the Work, and in any event as soon as possible (not to exceed a period of ten (10) calendar days) after the initial occurrence of any delay that Contractor regards as or may later claim to be an Excusable Delay, the Contractor shall notify the Engineer in writing of such delay and its cause, in order that the Engineer: (i) may take immediate steps to prevent if possible the occurrence or continuance of the delay; or (ii) if this cannot be done, may determine whether the delay is to be considered excusable, how long it continues, and to what extent the prosecution and completion of the Work are delayed thereby. Said written notice shall constitute an application for an extension of time only if the notice requests such an extension and sets forth the Contractor's estimate of the additional time required together with a full description of the cause of the delay relied upon.

After the completion of any part or whole of the Work, the Engineer, in estimating the amount due Contractor, will assume that any and all delays that may have occurred in its prosecution and completion were not Excusable Delays, except for such delays for which the Contractor has provided timely written notice as required herein, and that the Engineer has found to be excusable.
Contractor shall not be entitled to claim Excusable Delay for any delay for which the Contractor failed to provide such timely written notice.

23. EXTENSION OF TIME

If the Contractor complies with Section 22, above, and the Engineer finds a delay claimed by the Contractor to be an Excusable Delay, the Contractor shall be allowed an extension of time to complete the Work that is proportional to the period of Excusable Delay determined by the Engineer, subject to the approval by City of a change order granting such time extension. During a duly authorized extension for an Excusable Delay, City shall not charge liquidated damages against the Contractor for such delay.

If the City extends the time to complete the Work as provided herein, such extension shall in no way release any warranty or guarantee given by Contractor pursuant to the provisions of the Contract Documents, nor shall such extension of time relieve or release the sureties of the Bonds provided pursuant to the Contract Documents. By executing such Bonds, the Sureties shall be deemed to have expressly agreed to any such extension of time. The granting of any extension of time as provided herein shall in no way operate as a waiver on the part of City of its rights under this Contract, excepting only extension of the Completion Date for such period of Excusable Delay as may be determined by the Engineer and approved by a duly authorized change order.

24. NO PAYMENT FOR DELAYS

No damages or compensation of any kind shall be paid to Contractor or any subcontractor because of delays in the progress of the Work whether or not such delays qualify for extension of time under this Agreement; except that this provision shall not preclude the recovery of damages for a delay caused by the City that is unreasonable under the circumstances and that is not within the contemplation of the parties, provided that the Contractor timely submits all such written notice(s) and fully complies with such other procedures as may be specified in the Contract Documents or any Laws or Regulations for Contractor to claim damages for such delay.

25. CHANGES IN THE WORK

Changes in the Work authorized or directed in accordance with the Contract Documents and extensions of time of completion made necessary by reason thereof shall not in any way release any warranty or guarantee given by Contractor pursuant to the provisions of the Contract Documents, nor shall such changes in the Work relieve or release the Sureties on Bonds provided pursuant to the Contract Documents. By executing such Bonds, the Sureties shall be deemed to have expressly agreed to any such change in Work and to any extension of time made by reason thereof.

26. TERMINATION AFTER COMPLETION DATE

In addition to any other rights City may have, if any services or work required under the Contract (including but not limited to punch list items) are not completed as of the Completion Date (as adjusted by any extensions of time for Excusable Delays granted pursuant to the Contract Documents), City may terminate the Contract at any time after the Completion Date (as adjusted by any extensions of time for Excusable Delays granted pursuant to the Contract Documents), by providing a written notice to Contractor specifying the date of termination. Such notice also may specify conditions or requirements that Contractor must meet to avoid termination of the Contract.
on such date. If Contractor fails to fulfill all such conditions and requirements by such termination date, or, if no such conditions or requirements are specified, Contractor shall cease rendering services and performing work on such termination date, and shall not be entitled to receive any compensation for services rendered or work performed after such termination date. In the event of such termination, Contractor shall remain liable to City for liquidated damages incurred for any period of time prior to the termination date.

In addition to any other charges, withholdings or deductions authorized under the Contract or any Laws or Regulations, if City terminates the Contract pursuant to this section, City may withhold and deduct from any payment and/or retention funds otherwise due Contractor any sum necessary to pay the City’s cost of completing or correcting, or contracting for the completion or correction of, any services or work under the Contract that are not completed to the satisfaction of the City or that otherwise are deficient or require correction as of such termination date, including but not limited to incomplete punch list items. Such costs shall include all of the City’s direct and indirect costs incurred to complete or correct such services or work, including the City’s administrative and overhead costs. If the amount of payment(s) and/or retention funds otherwise due the Contractor are insufficient to pay such costs, City shall have the right to recover the balance of such costs from the Contractor and/or its Surety(ies).

27. TERMINATION FOR CONVENIENCE

Upon written notice to the Contractor, the City may at any time, without cause and without prejudice to any other right or remedy of the City, elect to terminate the Contract for the convenience of City. In such case, the Contractor shall be paid (without duplication of any items, and after deduction and/or withholding of any amounts authorized to be deducted or withheld by the Contract Documents or any Laws or Regulations):

A. For Work executed in accordance with the Contract Documents prior to the effective date of termination and determined to be acceptable by the Engineer, including fair and reasonable sums for overhead and profit on such Work;

B. For reasonable claims, costs, losses, and damages incurred in settlement of terminated contracts with subcontractors, suppliers, and others; and

C. For reasonable expenses directly attributable to termination.

Contractor shall not be paid for any loss of anticipated profits or revenue for any Work not performed prior to termination, nor for any economic loss arising out of or resulting from such termination, except for the payments listed in this section. Contractor’s warranty under Section 14 of this Agreement shall apply, and Contractor shall remain responsible for all obligations related to such warranty, with respect to all portions of the Work performed prior to the effective date of the termination for convenience pursuant to this section. The City shall be entitled to have any or all remaining Work performed by other contractors or by any other means at any time after the effective date of a termination for convenience pursuant to this section.

28. TERMINATION FOR BREACH OF CONTRACT

If Contractor abandons the Work under this Contract, or if the Contract or any portion of the Contract is sublet or assigned without the consent of the City, or if the Engineer determines in the
Engineer’s sole discretion that the conditions of the Contract in respect to the rate of progress of the Work are not being fulfilled or any part thereof is unnecessarily delayed, or if Contractor violates or breaches, or fails to execute in good faith, any of the terms or conditions of the Contract, or if Contractor refuses or fails to supply enough properly skilled labor or materials or refuses or fails to make prompt payment to subcontractors for material or labor, or if Contractor disregards any Laws or Regulations or proper instruction or orders of the Engineer, then, notwithstanding any provision to the contrary herein, the City may give Contractor and its Sureties written notification to immediately correct the situation or the Contract shall be terminated.

In the event that such notice is given, and, in the event such situation is not corrected, or arrangements for correction satisfactory to the City are not made, within ten (10) calendar days from the date of such notice or within such other period of time as may be specified by the City in the notice, the Contract shall upon the expiration of said period cease and terminate. In the event of any such termination, City may take over the Work and prosecute the Work to completion, or otherwise, and the Contractor and its Sureties shall be liable to City for any cost occasioned City thereby, as hereinafter set forth.

In the event City completes the Work, or causes the Work to be completed, no payment of any kind shall be made to Contractor until the Work is complete. The cost of completing the Work, including but not limited to, extra costs of project administration and management incurred by City, both direct or indirect, shall be deducted from any sum then due, or that becomes due, to Contractor from City. If sums due to Contractor from City are less than the cost of completing the Work, Contractor and its Sureties shall pay City a sum equal to this difference on demand. In the event City completes the Work, and there is a sum remaining due to Contractor after City deducts the costs of completing the Work, then City shall pay such sum to Contractor. The Contractor and Contractor’s Sureties shall be jointly and severally liable for all obligations imposed on Contractor hereunder.

No act by City before the Work is finally accepted, including, but not limited to, exercise of other rights under the Contract, actions at law or in equity, extensions of time, payments, assessments of liquidated damages, occupation or acceptance of any part of the Work, waiver of any prior breach of the Contract or failure to take action pursuant to this section upon the happening of any prior default or breach of Contractor, shall be construed to be a waiver or estoppel of the City’s right to act pursuant to this Section upon any subsequent event, occurrence or failure by Contractor to fulfill the terms and conditions of the Contract. The rights of City to terminate the Contract pursuant to this Section and pursuant to Sections 26 and 27 are cumulative and are in addition to all other rights of City pursuant to the Contract and at law or in equity.

29. CONTRACTOR BANKRUPT

If Contractor should commence any bankruptcy proceeding, or if Contractor is adjudged a bankrupt, or if Contractor makes any assignment for the benefit of creditors, or if a receiver is appointed on account of Contractor’s insolvency, then the City may, without prejudice to any other right or remedy, terminate the Contract and complete the work by giving notice as provided in Section 28 above.

30. SURETIES’ OBLIGATIONS UPON TERMINATION

If the City terminates the Contract pursuant to Section 28 or Section 29 above:
A. The Surety under Contractor’s performance bond shall be fully responsible for all of the Contractor’s remaining obligations of performance under the Contract as if the Surety were a party to the Contract, including without limitation Contractor’s obligations, as provided in the Contract Documents, to complete and provide a one-year warranty of the entire Work, pay liquidated damages and indemnify, defend and hold harmless City, up to the full amount of the performance bond.

B. The Surety under Contractor’s payment bond shall be fully responsible for the performance of all of the Contractor’s remaining payment obligations for work, services, equipment or materials performed or provided in connection with the Work or any portion thereof, up to the full amount of the payment bond.

31. ACCOUNTING RECORDS OF CONTRACTOR

During performance of the Contract and for a period of three (3) years after completing the entire Work, Contractor shall maintain all accounting and financial records related to the Contract and performance of the Work in accordance with generally accepted accounting practices, and shall keep and make such records available for inspection and audit by representatives of the City upon reasonable written notice.

32. USE TAX REQUIREMENTS

During the performance of this Agreement, CONTRACTOR, for itself, its assignees and successors in interest, agrees as follows:

A. **Use Tax Direct Payment Permit**: For all leases and purchases of materials, equipment, supplies, or other tangible personal property used to perform the Agreement and shipped from outside California, the Contractor and any subcontractors leasing or purchasing such materials, equipment, supplies or other tangible personal property shall obtain a Use Tax Direct Payment Permit from the California State Board of Equalization (“SBE”) in accordance with the applicable SBE criteria and requirements.

B. **Sellers Permit**: For any construction contract and any construction subcontract in the amount of $5,000,000 or more, Contractor and the subcontractor(s) shall obtain sellers permits from the SBE and shall register the jobsite as the place of business for the purpose of allocating local sales and use tax to the City. Contractor and its subcontractors shall remit the self-accrued use tax to the SBE, and shall provide a copy of each remittance to the City.

C. The above provisions shall apply in all instances unless prohibited by the funding source for the Agreement.

33. NON-DISCRIMINATION IN EMPLOYEE BENEFITS

This Agreement may be subject to the requirements of Sacramento City Code Chapter 3.54, Non-Discrimination in Employee Benefits by City Contractors. The Contract Documents include a summary of the requirements of Sacramento City Code Chapter 3.54, entitled “Requirements of the Non-Discrimination in Employee Benefits Code.” By signing this Agreement, Contractor
acknowledges and represents that Contractor has read and understands these requirements and agrees to fully comply with all applicable requirements of Sacramento City Code Chapter 3.54. If requested by City, Contractor agrees to promptly provide such documents and information as may be required by City to verify Contractor’s compliance. Any violation by Contractor of Sacramento City Code Chapter 3.54 constitutes a material breach of this Agreement, for which the City may terminate the Agreement and pursue all available legal and equitable remedies.

34. CONSIDERING CRIMINAL CONVICTION INFORMATION IN THE EMPLOYMENT APPLICATION PROCESS

This Agreement may be subject to the requirements of Sacramento City Code Chapter 3.62, Procedures for Considering Criminal Conviction Information in the Employment Application Process. The Contract Documents include a summary of the requirements of Sacramento City Code Chapter 3.62, entitled “Ban-The-Box Requirements.” By signing this Agreement, Contractor acknowledges and represents that Contractor has read and understands these requirements and agrees to fully comply with all applicable requirements of Sacramento City Code Chapter 3.62. If requested by City, Contractor agrees to promptly provide such documents and information as may be required by City to verify Contractor’s compliance. Any violation by Contractor of Sacramento City Code Chapter 3.62 constitutes a material breach of this Agreement, for which the City may terminate the Agreement and pursue all available legal and equitable remedies. Contractor agrees to require its subcontractors to fully comply with all applicable requirements of Sacramento City Code Chapter 3.62, and include these requirements in all subcontracts covered by Sacramento City Code Chapter 3.62.
IN WITNESS WHEREOF, the parties hereto have signed this Agreement on the date set for opposite their names.

DATE 4/18/18

CONTRACTOR

Under penalty of perjury, I certify that the taxpayer identification number and all other information provided here are correct.

BY

Christopher E. Schrader
Print Name
President
Title

BY

Print Name
Title

1000006479
DIR Registration #
26-1635570
Federal ID#
283-5453-8
State ID#
1033973
City of Sacramento Business Operation Tax Certificate No. (City will not award contract until Certificate Number is obtained)

Type of Business Entity (check one):

Individual/Sole Proprietor
Partnership
Corporation
Limited Liability Company
Other (please specify:________________________)

CITY OF SACRAMENTO
a municipal corporation

DATE ____________________

BY ____________________

For: Howard Chan, City Manager

Original Approved As To Form:

Attest:

City Attorney

City Clerk

Form approved by City Attorney 1-11-17
WHEREAS, the City of Sacramento, State of California, hereinafter called City, has conditionally awarded to

Schrader Mechanical Inc.
1015 Black Diamond Way
Lodi, CA 95240

as principal, hereinafter called Contractor, a contract for construction of:

SUMP 1A VFD REPLACEMENT PROJECT
(PN: X14131507) (B118141321018)

which contract is by reference incorporated herein and made a part hereof as if the Surety named below were a party to the contract, and is hereinafter referred to as the Contract; and

WHEREAS, under the terms of the Contract, Contractor is required to furnish a bond for the faithful performance of the Contract.

NOW, THEREFORE, we the Contractor and (here insert full name and address of Surety):
American Contractors Indemnity Company
801 S. Figueroa Street Suite 700
Los Angeles, CA 90017

a corporation duly authorized and admitted to transact business and issue surety bonds in the State of California, hereinafter called Surety, are held and firmly bound unto the City, as obligee, in the sum of: Three Hundred Thirty Four Thousand Dollars ($334,000.00) for the payment of which sum well and truly to be made, we the Contractor and Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally. The condition of this obligation is such that, if the Contractor, Contractor's heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and fully perform all covenants, conditions and agreements required to be kept and performed by Contractor in the Contract and any changes, additions or alterations made thereto, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meanings, and shall indemnify and save harmless the City, its officers, employees and agents, as therein provided, then the Surety's obligations under the Contract and this bond shall be null and void; otherwise they shall be and remain in full force and effect. This obligation shall remain in full force and effect through the end of the Contract warranty period, which will expire one year after the completion of work date specified in the Notice of Completion filed for the above-named project.

As part of the obligations secured hereby and in addition to the sum specified above, there shall be included all costs, expenses and fees, including attorney's fees, reasonably incurred by City in successfully enforcing such obligations, all to be taxed as costs and included in any judgment rendered.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or to the specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration or addition.

IN WITNESS WHEREOF, this instrument has been duly executed by authorized representatives of the Contractor and Surety.
SIGNED AND SEALED on April 12, 2018.

Schrader Mechanical Inc.
By: (Contractor) (Seal)
Title: President

American Contractors Indemnity Company
By: (Surety) (Seal)
Title: Attorney-in-Fact
Agent Name and Address: Valley Surety Insurance Agency
947 Enterprise Drive Unit A
Sacramento, CA 95825
Agent Phone #: 916-567-6676
Surety Phone #: 310-649-0990
California License #: 0799396
Surety Email: shirley@valleysurety.com
WHEREAS, the City of Sacramento, in the State of California, hereinafter called City, has conditionally awarded to:

Schrader Mechanical Inc
1015 Black Diamond Way
Lodi, CA 95240

hereinafter called Contractor, a contract for construction of:

SUMP 1A VFD REPLACEMENT PROJECT
(PN: X14131507) (B10314121018)

Which contract is by reference incorporated herein and made a part hereof, and is hereinafter referred to as the Contract; and

WHEREAS, under the terms of the Contract and pursuant to Chapter 5 of Title 3 of Part 6 of Division 4 of the California Civil Code (commencing with Civil Code Section 9550), Contractor is required to furnish a good and sufficient payment bond to secure payment of the claims to which reference is made in Civil Code Section 9554.

NOW, THEREFORE, we the Contractor and (here insert full name and address of Surety):

American Contractors Indemnity Company 801 S. Figueroa Street #700 Los Angeles, CA 90017, a corporation duly authorized and admitted to transact business and issue surety bonds in the State of California, hereinafter called Surety, are held and firmly bound unto the City, and unto all persons or entities entitled to assert a claim against a payment bond under any of the aforesaid Civil Code provisions in the sum of Three Hundred Thirty Four Thousand Dollars ($334,000.00) on the condition that if Contractor shall fail to pay for any materials or equipment furnished or used in performance of the Contract, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, or for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board or the Employment Development Department from the wages of employees of the Contractor and all subcontractors with respect to such work or labor, then the Surety shall pay the same in an amount not exceeding the sum specified above. If suit is brought upon this bond, Surety shall pay, in addition to the above sum, all costs, expenses and fees, including attorney’s fees, reasonably incurred by any party in successfully enforcing the obligation secured hereby, all to be taxed as costs and included in any judgment rendered. Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect, and shall bind Contractor, Surety, their heirs, executors, administrators, successors and assigns, jointly and severally.

It is hereby stipulated and agreed that this bond shall inure to the benefit of all persons, companies, corporations, political subdivisions, State agencies and other entities entitled to assert a claim against a payment bond under any of the aforesaid Civil Code provisions, as to give a right of action to them or their assigns in any suit brought upon this bond. The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or to the specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration or addition.

IN WITNESS WHEREOF, this instrument has been duly executed by authorized representatives of the Contractor and Surety. SIGNED AND SEALED on April 12, 2018.

Schrader Mechanical Inc.

By: ____________ (Contractor)
Title: President

American Contractors Indemnity Company

By: Shirley Baugh (Surety)
Title: Attorney-in-Fact
Agent Name and Address: Valley Surety Insurance Agency
947 Enterprise Drive Unit A Sacramento, CA 95825
Agent Phone #: 916-567-6676
Surety Phone #: 310-649-0990
California License #: 0799396
Surety Email: shirleys@valleysurety.com

Original Approved As To Form:

City Attorney

Effective 7-1-12
See following links: www.dir.ca.gov and/or www.leginfo.ca.gov

http://www.dir.ca.gov/dlse/dlsePublicWorks.html
TAX FORMS AS APPLICABLE

Refer to the links below:
CA Form 590   https://www.ftb.ca.gov/forms/2018/18_590.pdf
CA Form 587 ... https://www.ftb.ca.gov/forms/2018/18_587.pdf
SPECIAL PROVISIONS
# SUMP 1A VFD REPLACEMENT PROJECT

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ITEMS OF THE PROPOSAL

All Items shall be constructed as shown on the Plans in accordance with the Special Provisions whether or not they are included in the following list of bid items. There will be no separate compensation for items shown on the Plans or where Contractor is directed in the Special Provisions but not included in the following list of bid items and the price thereof shall be included in whatever bid items the Contractor deems appropriate.

Item No. 1 - Install New MCC and Electrical Improvements

The work to be performed for this item includes, but is not limited to, furnishing and installing all necessary equipment and materials for the motor control centers (MCCs), variable frequency drives (VFD), soft starter, conduits, conductors, and all appurtenances as indicated on the Plan sheets and called for in these Special Provisions.

This item of work also includes the cut over from the existing electrical gear to the new electrical gear.

Payment shall be at the lump sum price bid and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in furnishing and installing the MCC, VFD, soft start, conduits, conductors, and all appurtenances in accordance with the Plans and these Special Provisions.
PART 1 - GENERAL

1.01 GOVERNING DOCUMENTS

A. All work performed under this Contract shall be in accordance with the following General Conditions:
   1. Sealed Proposal
   2. Agreement
   3. City of Sacramento Standard Specifications, June 2007 (hereinafter CSSS) Sections 1 through 8 and as noted otherwise.

B. All work performed under this Contract, unless noted otherwise, shall be in accordance with the following:
   1. Technical Specifications
   2. Contract Drawings
   3. CSSS - Sections 10 through 38
   4. Payment Bond
   5. Performance Bond
   6. California Labor Code, Chapter 4 of Division 3.

C. In the event of a conflict in the Contract Documents, priorities, as appropriate, set forth below shall govern:
   1. General Conditions
   2. Technical Specifications
   3. Drawings
   4. CSSS
   5. Conflicts
      b. In case of conflict within the drawings involving quantities, furnish the greater quantity.
      c. In case of conflict within the Special Provisions involving quality of material or procedure, furnish the higher quality material and
procedure.

d. Where provisions of codes, safety orders, Contract Documents, referenced manufacturer's specifications or industry standards are in conflict, the more restrictive and higher quality shall govern.

1.02 DEFINITIONS

A. For definitions not found herein, refer to CSSS, Section 1.

B. “City” shall mean the City of Sacramento.

C. “Engineer” shall mean the director of Utilities or his designated representative.

D. “Calendar Day” shall mean every day shown on the calendar, Sundays and holidays included.

E. “Working Day” see CSSS, Section 1, definition 1-34, page 1(4).

F. “Contract Documents” shall mean the General Conditions identified in Paragraph 1.01.A and the Special Provisions identified in Paragraph 1.01.B of this Section.

G. “Drawings” shall mean the Contract Drawings.

H. “Provide” shall mean furnish and install, in accordance with the contract documents.

I. “Addenda” shall mean a written or graphic instrument issued prior to the execution of the Contract, which modify or interpret the Contract Documents, Drawings, and Specifications, by additions, deletions, clarifications, or corrections.

J. “Proposed Change Order” shall mean a written request for the Contractor’s Cost and Time Estimate covering an addition, deletion, or revision in the work, within the General Scope of the Contract.

K. “Change Order” shall mean a written order to the Contractor authorizing an addition, deletion, or revision in the work, within the General Scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

L. “Field Order” shall mean a written order from the Engineer to the Contractor, directing an addition or revision in the work.

1.03 CSSS CHANGES

A. All references in Section 8 of the Standard Specifications to actions by the “City Council” shall be amended to read action by the “City”.

B. Wherever reference is made to City Manager, Director of Utilities, Engineer,
Finance Director, Inspector, or other specifically identified individuals, it shall include their designated representative.

C. In Section 2-9 SUBCONTRACTORS, delete the statement reading “Contractor shall perform with his own organization and with the assistance of workers under his immediate superintendence, work of a value not less than fifty percent (50%) of the value of all work in the contract.”

1.04 EXCAVATIONS AND TRENCHING

A. Excavations or trenches crossing roadways, walks, or traffic ways shall be provided with suitable traffic bearing steel plate or wood planking temporary covers. Contractor shall verify location of all underground facilities prior to excavating and shall perform the work to avoid damage to existing underground facilities. Contractor shall repair at no additional cost to the City and to prior condition, any existing utility damaged due to work of this contract.

B. If unusual amounts of bone, stone or artifacts are uncovered, work within 50 meters of the area shall cease immediately and a qualified archaeologist shall be consulted to develop, if necessary, mitigation measure to reduce any archaeologist impact to a less than significant effect before construction resumes in the area.

1.05 SPECIFICATIONS

A. The specifications are those bound and enumerated in the Table of Contents. The bidding Requirements, “Items of the Proposal”, General Conditions, and Division 1 of the specifications apply to all work of this contract.

1.06 HOURS OF WORK

A. Contractor shall perform the work of this contract on normal work days and within normal work hours, except after hours work, and work on Saturdays, Sundays, and holidays may be permitted if prior approval is obtained from the City. Overtime pay required to perform the work shall be included in the Contractor’s bid prices, and no additional compensation to the Contractor will be made for overtime work.

1.07 CONTRACTOR’S SET OF PLANS AND SPECIFICATIONS

A. City Furnished Plans and Specifications:

   Upon award of contract, the City will provide plans and specifications as follows:

   1. Plans: 5 sets
   2. Specifications: 5 sets

B. The Contractor is responsible for providing copies of the plans and specifications
to all subcontractors as required for construction. Additional Sets of the plans and specifications may be obtained from the City. The cost charged the Contractor for additional copies obtained from the City shall cover all associated City procurement costs. City will not be responsible for incomplete information in the event partial sets are ordered.

1.08 INTERPRETATION OF DRAWINGS

A. The Contract Drawings consist of all of the plan sheets.

B. The data given herein, and on the drawings, are as exact as could be secured, but their absolute accuracy is not guaranteed. The Technical Specifications and drawings are for the assistance and guidance of the Contractor; exact locations, distance, elevation, etc., will be governed by the various structures, and Contractor shall use same with this understanding.

C. The drawings are diagrammatic, but shall be followed as closely as existing conditions will permit. Prior to submitting their sealed Proposal, the Contractor shall inspect the site and verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.

D. Catalog numbers on the drawings and in the Technical Specifications are from the best available information and are for guidance and assistance. The Contractor shall verify all catalog numbers and install only suitable materials.

1.09 REFERENCED PUBLICATIONS

A. The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern.

1.10 QUESTIONS PRIOR TO BID OPENING

A. Prior to the opening of the sealed proposals, all questions concerning the Contract Documents shall be directed to Danny Vang, (916) 808-3952, or facsimile (916) 808-1497.

1.11 START OF WORK

A. The Contractor shall commence work on the day the NOTICE TO PROCEED is issued.

B. Any work performed by the Contractor in advance of receipt of the NOTICE TO PROCEED shall be considered as having been done by him at his own risk and as a volunteer unless NOTICE TO PROCEED is issued by the Owner.

1.12 FACILITY ACCESS
A. The City will provide one (1) set of combination padlocks with an agreed upon combination. Contractor shall be responsible for all subsequent replacements. The Contractor shall be responsible for securing the facility after each work day and at all times during the contract.

PART 2 - PRODUCTS

2.01 CONSTRUCTION SCHEDULE

A. Contractor shall submit a Construction Schedule for the entire project with a completion date before October 1, 2018. Construction Schedule shall be in the Critical Path Method (CPM) format. The proposed dates of commencement and completion of each of the various subdivisions of work required under these Specifications. Include submittals, procurement, disposal, delivery, installation, testing, and final inspection. CPM shall be arranged in work weeks and shall show manpower. No Progress Payments will be made until the CPM schedule has been received and approved by the Engineer.

PART 3 - EXECUTION

3.01 PRE-JOB CONFERENCE

A. Pre-Job Conference

1. The Contractor, after delivery of the Contract and at least three (3) days before beginning work, shall notify Renee Graves at (916) 808-1465 and arrange a pre-job conference. At this conference, the Contractor shall deliver appropriate submittals and a Construction Schedule as detailed below. The Contractor is responsible to provide plans and special provisions to subcontractors.

3.02 CONTRACTOR COMMUNICATIONS

A. All official communications between the Contractor and the City of Sacramento shall be made through the Resident Engineer.

3.03 SUPERINTENDENT

A. Contractor shall assign a Superintendent to supervise all work and to represent the Contractor on site. Superintendent shall cooperate with the Owner and shall provide assistance at all times for inspection of the work including: removing covers, operating machinery, or performing any reasonable work which, in the opinion of the Engineer, is necessary to determine the quality or adequacy of the work. Superintendent shall also furnish material shipping labels and packing slips to the Engineer to verify that the material conforms with approved submittals and Specifications.

B. Contractor shall lay out all work in advance of fabrication and shall be responsible for coordination of all related work.
C. Contractor shall be responsible for scheduling sump and equipment shutdowns necessary to complete the work. Two (2) days prior to the proposed shutdown, the Superintendent shall obtain approval for the shutdown from the Engineer. The Engineer shall be given the following information:

1. Date and time of shutdown
2. Work to be accomplished during shutdown
3. Number of persons working during shutdown
4. Time of re-energization

D. Contractor shall monitor and assure that:

1. Shall remove spillage resulting from hauling operations along, or across, any public traveled way, at least daily, at Contractor's expense.
2. Conduct construction operations in such a manner as to cause as little inconvenience as possible to abutting property owners.
3. Water or dust palliative shall be applied, if ordered by the Engineer, for the alleviation or prevention of dust nuisance and shall be done at Contractor's expense.
4. Contractor shall contact the Engineer for a visual inspection 48 hours prior to covering any underground conduit.
5. Full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all work involved maintenance of traffic and public safety shall be considered as included in the prices paid for various Contract items of work, and no additional compensation will be allowed, therefore.

3.04 PERMITS

A. Contractor may want to use private property beyond that already owned by the City for storage and/or access. Contractor shall be responsible to the individual owner(s) to obtain and pay for any private property easements and/or right of entry permit, and for repair of any associated damage.

3.05 TRENCH SAFETY

A. Contractor's work shall conform to the provisions of Section 6705 of the Labor Code of the State of California.

B. Excavation for any trench five (5) feet, or more, in depth shall not begin until the City has received the Contractor's detailed plan for worker protection from the hazards of caving ground in and around trenches. Such plan shall be submitted at least five (5) days before the Contractor intends to begin trench excavation. Show details of the design of shoring, bracing, sloping, or other provisions to be made for worker protection. No such plan shall allow the use of shoring, sloping, or a protective system less effective than that required by the Construction Safety
Orders of the Division of Industrial Safety. If such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California.

C. In addition, the Contractor shall obtain, pay for, and comply with all provisions of the permit required by Section 6500 of the California Occupational Safety and Health Act of 1973.

3.06 PUBLIC SAFETY AND CONVENIENCE AND MAINTENANCE OF TRAFFIC

A. Contractor’s attention is directed to Sections 6-6, 6-7, 6-8, and 6-9 of the CSSS.

B. Contractor shall be responsible for traffic control and public safety at all times. Vehicle and pedestrian traffic must be allowed to traverse all streets and alleys.

C. Contractor shall furnish, install, and maintain temporary construction warning signs, flaggers, barricades, and other devices necessary to safeguard the general public and the work, and to provide for the safe and proper routing of all vehicular and pedestrian traffic within, and through, the limits of the project during the performance of the work.

D. Maintenance of traffic shall apply continuously, and shall not be limited to normal working hours. The use of flaggers, barricades, and construction warning signs shall comply with the current edition of “Work Area and Traffic Control Handbook” (WATCH), available for review at the City of Sacramento, Department of Transportation, Traffic Engineering Division, located at 915 I Street in Sacramento.

E. All lanes of traffic on adjacent street(s) shall remain open at all times during the course of construction unless otherwise approved in writing by the Engineer.

F. Contractor shall be required to establish traffic scheduling and control measures acceptable to the Engineer prior to starting any work. The Contractor shall submit to the Engineer for review and approval a plan showing proposed traffic control measures and/or detours for vehicles and pedestrians affected by the construction work. This plan shall be submitted a minimum of ten (10) working days prior to the scheduled commencement of any work by the Contractor. **Contractor will not be allowed to begin work until an approved plan is on file with the Engineer.** All advance warning and traffic delineation shall conformed to the latest edition of "Work Area and Traffic Control Handbook", (WATCH). The approved traffic control plan shall be made available to the Engineer on site at all times.

G. Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners.

3.07 PRE-CONSTRUCTION PHOTOGRAPHS
A. Pre-construction photographs shall be provided and shall conform to Section 11 of the Standard Specifications.

3.08 EXISTING UTILITIES

A. Locations of both underground and overhead utilities are shown on the drawings to the extent known. The actual location and elevation of the utilities may vary from the locations shown. Unless the drawings or specifications identify that the Contractor is responsible for relocating utilities, utilities requiring relocation will be by the governing agency or their representatives. The Contractor shall coordinate relocations requested for the Contractor’s convenience with the Engineer and the owner of the utility. The Contractor will cooperate with the relocation and/or protection of existing utilities.

B. The Contractor shall contact Doug Henry of the City of Sacramento at 808-4023 two (2) working days prior to performing excavation work within existing City facilities. The City will mark locations of existing City utilities.

3.09 MAINTAINING EXISTING DRAINAGE

A. The Contractor shall ensure that Sump 1A has the ability to pump any drainage into the adjacent canal during the entire construction period.

B. Contractor shall allow City O&M access to the facility 24 hours a day, 7 days a week.

C. The City will provide one (1) set of combination padlocks with an agreed upon combination. Contractor shall be responsible for all subsequent replacements.

3.10 PROJECT SIGN

A. Prior to beginning any onsite work, the contractor shall install a total of 1 project sign. The sign shall be supplied by the City and are approximately thirty (30) inches by fifty-four (54) inches. Location and height of sign installation shall be as directed by the Engineer. In general, the signs shall be installed a minimum of seven (7) feet and maximum of ten (10) feet above surrounding grade. If acceptable to the Engineer an existing sign post may be used, otherwise, the Contractor shall be required to install a new post for each sign. Signs shall be maintained in a good condition throughout construction, shall not be bent and shall remain legible to traffic. Any damage shall be repaired by the Contractor. The sign and post installed by the contractor shall be removed at the end of the project and the sign returned to the City.
3.11 COMPLETION AND FINAL INSPECTION

A. The work shall be so performed, that upon Contract completion, the project shall be ready for use. Included in the work shall be the furnishing of all labor, materials, tools, equipment, and incidentals necessary for completing the work, in accordance with the Contract Documents.

B. Contractor shall notify the Engineer when the project is completed. Following notification, City representatives will perform a walk through and, if required, develop and list of deficient work items.

C. Contractor shall then correct all noted deficiencies to the satisfaction of the Engineer, after which a final walk through will be scheduled with City Operation and Maintenance personnel. During the walk through, the City will develop a final punch list of deficient work items and present it to Contractor after the walk through.

D. Following correction of all deficiencies to the satisfaction of the Engineer, a completion report will be prepared by the Engineer.

3.12 WARRANTY

A. The term of the Contractor’s warranty shall begin upon the date the job is accepted by the City.

** END OF SECTION **
PART 1 - GENERAL

1.01 DESCRIPTION

A. This project consists of replacing the existing VFD's, soft-starter and low voltage motor control center at the City’s Sump 1A facility. This work consists of removing the existing VFDs, soft-starter, motor control centers, conductors, and conduits as identified on the plans; installing new VFD’s, soft-starter, MCC, conduit and conductors; and all the appurtenances as shown on the plans and in these special provisions for a complete and operable system. Sump 1A is located at the corner of U St. and 2101 Front St., Sacramento, CA 95818.

B. The work shall be in conformance with the plans and specifications hereinafter identified, including furnishing all material, labor, plant, tools, equipment, and services necessary to complete this project.

C. The Contractor, after submittal approval, is encouraged to order the switchgear and conductors for this project as soon as possible as the production lead time for this gear may be several months.

D. This Sump is a combined sewage and drainage pumping station owned and operated by the City of Sacramento, Department of Utilities. It services the downtown area and pumps to County Regional Plant via Sump 2.

F. Portions of the work will involve the following, for which no separate payment will be made, except as provided for in the items of the bid:

1. Mobilization: Supply and transport of construction equipment, crane, crane operators, materials, supplies, appurtenances, etc., to perform the work.

2. Demobilization: Demobilization of construction plant and equipment, removal thereof and final cleanup and restoration of the site.

3. Demolition: Remove and dispose of indicated materials at an approved off-site recycling or disposal facility.


5. Storage of Materials and Equipment: Provide necessary equipment to unload, and temporarily store materials and equipment, in accordance
with the manufacturer’s requirements.


7. Test and make site ready for operation.

8. Coordinate work activities with the City.

9. Provide project supervision and management in order to meet the project schedule.

1.02 BID ITEMS

A. See “Items of the Proposal” in the Bid Proposal Package of these Contract Documents.

1.03 CONTRACTOR’S BID STRUCTURE AND SCOPE OF THE WORK

A. Payment for this work will be made on a lump sum basis and/or unit price basis, as indicated in the proposal. The Contractor shall provide a detailed schedule of value.

B. The Scope of Work is defined in the Technical Specifications, the drawings, and the referenced publications that are made a part hereto.

1.04 MEASUREMENT AND PAYMENT

A. Full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in each item of the proposal as described in these Specifications, as shown on the drawings and/or as required for a complete and operational facility, shall be considered as included in the bid price and no additional compensation will be made therefor.

B. Quantities shown on the City’s estimate are approximate. The City does not expressly or by implication agree that actual quantity of work will correspond therewith, but reserves the right to increase or decrease quantities of any item or to omit portions of the work as may be deemed necessary or advisable by the City; also to make such alternatives or deviations, additions to, or omissions from the Plans and Specifications as may be determined during progress of work to be necessary and advisable for proper completion.

C. The total bid amounts shall include, without limitation, all the work shown on the drawings and as described elsewhere in these Specifications. If a specific activity of work is not called out in the bid proposal, the Contractor shall include the cost for such work in the bid item that is deemed appropriate to the Contractor as indicated in Section 8 of the CSSS.
D. Progress Payments for the work shall be made as provided in Section 8 of the CSSS.

1.05 WORK NOT INCLUDED

A. The following work is NOT included in this contract.
   1. Work shown, but marked “NIC” (Not In Contract) or shown as Existing (E).
   2. Any work otherwise designated to be done by others.

1.06 CONTRACTOR FURNISHED EQUIPMENT AND MATERIALS

A. All equipment and materials furnished by the Contractor that are to remain a part of the constructed facility shall be new and unused and shall conform to the requirements of these specifications. Where manufactured materials and equipment are specified, the same brand manufacturer for each class of material or equipment shall be used wherever possible.

B. The manufacturer's warranty shall pass to the City and shall extend for a period of one year after project acceptance by the City.

1.07 POWER DISRUPTIONS

A. No long term electrical disruptions shall be permitted by the City during Contractor's performance of the work without prior written approval of the City. The Contractor shall furnish, install, and operate all resources required for temporary power. All short term outages necessary for change over to temporary power, to make connection, or other activity shall be scheduled with the City at least three weeks in advance and will be subject to cancellation at any time by the City.

1.08 PROSECUTION AND PROGRESS OF THE WORK:

A. The Contractor shall be responsible for planning, scheduling, and reporting the progress of the work so as to ensure timely completion of the work called for in the contract. The Contractor shall prepare and submit a detailed plan as specified. The station shall be complete and operational by October 1, 2018.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials are specified in these Technical Specifications, and in Sections 10
through 38 of the CSSS.

B. Submit and obtain approval for all Submittals before commencing fabrications or moving construction materials onto the job site.

C. All equipment shall be complete, ready for installation, and tested to the satisfaction of the Engineer at the time of acceptance of the work.

D. Unless specifically excluded in the Contractor’s Proposal, all incidental parts which are not shown on the Plans, or specified herein, and which are necessary in order to have complete and operable facilities shall be furnished by the Contractor.

E. Manufactured articles, material, and equipment shall be applied, installed, connected, erected, adjusted, tested, used, cleaned, and conditioned as recommended by the manufacturer unless specified to the contrary. Copies of the manufacturer’s installation instructions and procedures shall be submitted prior to the installation of manufacturer’s articles, material, and equipment.

F. Materials and equipment shall be stored so as to insure the preservation of their quality and fitness for the work. Stores of equipment and materials shall be located to facilitate inspection. The Contractor shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment until the completion of work and final acceptance by the City.

G. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Engineer, remove the materials from the project site or storage area.

2.02 MATERIAL PROVIDED BY THE CITY

A. Equipment that is not specifically identified as being provided by the City will be provided and installed by the Contractor.

2.03 CONTRACTOR ESTIMATES

A. Contractor shall provide a written estimate for all proposed changes to the work. The estimate shall be on tabular pre-printed estimating sheets. The estimate shall list all items of deletion and addition to the Contract. Each item shall have material, equipment, and labor units extended and summed. Contractor shall apply the allowable overhead and profit (CSSS 8-16) for a total estimated cost of the proposed change order.

PART 3 - EXECUTION

3.01 CONTRACTOR’S PLANT AND EQUIPMENT
A. Security: The Contractor shall, at all times, be responsible for the security of their plant and equipment. The City will not take any responsibility for missing or damaged equipment, tools, or personal belongings. The Contractor shall provide temporary security fencing and otherwise provide for the security of the existing facilities. These sites are particularly subject to vandalism. Materials left on-site are at the Contractor's risk and, if lost, at the Contractor's expense. The Contractor shall be responsible for the salvaged materials and equipment owned by the City and removed, or relocated, until the City has taken possession of such materials and equipment.

B. Workshop and Storage Facilities: The Contractor shall provide storage facilities for the protection from weather of materials and supplies, and shall keep the facilities clean and in proper order at all times. The project site has limited space for a storage yard. Additional property may need to be leased, at the Contractor's expense, for storage facilities. Materials and equipment shall be stored so as to insure the preservation of their quality and fitness for the work and located so as to facilitate inspection. The Contractor shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment, including existing equipment, until completion and final acceptance of the work by the City.

C. Parking Facilities: Parking areas at the project location are limited for the automobiles used by the Contractor's construction employees and Contractors own vehicles. A parking area shall be designated by the Contractor and approved by the Engineer.

3.02 CONTRACTOR'S UTILITIES

A. Electrical Power

1. General: The Contractor shall provide and make arrangements for temporary electric service for all required power and lighting required for the work under this Contract and shall maintain such service until the completion of the work.

2. The Contractor shall attain approval from Tim Giffin of the City of Sacramento, (916) 808-7997, two (2) working days before installing the new electrical gear.

3. Power outage requests shall be made 48 hours in advance and shall be approved by the Engineer before proceeding.

B. Sanitary Facilities: The Contractor shall make arrangements for the maintenance of adequate toilet facilities at, or near, the work site and shall pay the costs thereof.
C. Temporary Heating: The Contractor shall provide temporary heating, covering, and enclosures, as necessary, to protect all work and material against damage by dampness and cold and to facilitate completion of the work. The Contractor shall supply all the fuel, power, equipment, and materials required for temporary heating.

3.03 LANDS PROVIDED BY CITY

A. Any additional land required for the construction of the work under this Contract, except that already owned by the City, shall be the Contractor's responsibility to obtain.

3.04 FIELD ENGINEERING

A. The Contractor shall provide and pay for the following field engineering services required for this job:

1. Laying out the work.
2. Civil, structural, electrical, surveying, or other professional services specified, or required, to execute the work.

B. The Contractor is responsible for determining the exact location of all existing utilities and for the protection of and repair of damage to them. Contact Underground Service Alert at 1-800-227-2600, 48 hours before work is to begin. Contractor shall also contact the City Department of Utilities Division, Tim Giffin at (916) 808-7997 to identify City underground facilities on site.

C. The Contractor shall be responsible for the protection of all existing survey monuments or markers during construction.

D. The Contractor shall be responsible for maintaining As-Built drawings for all underground work throughout the course of construction. Such drawings shall record the location and grade (City Datum) of all underground improvements constructed and shall be delivered to the construction inspector prior to, and in consideration of the City's acceptance of work.

3.05 SHIPPING AND PROTECTION OF EQUIPMENT

A. Definition: For the purpose of this paragraph, “equipment” means: all mechanical devices, all electrical devices, all items supplied by the City, all items removed by Contractor for later reinstallation, and all items with one or more moving parts.

B. Packing and Markings: All equipment shall be adequately and effectively
protected against damage from moisture, dust, handling or other cause during transport from manufacturer's or supplier's premises to job site. Each item or package shall be clearly marked with a fitting or distinguishing mark, which shall be shown on the packing list. Stiffeners shall be used, where necessary, to maintain shapes and to give rigidity. Parts of equipment shall be delivered in assembled or sub-assembled units, where possible.

C. Identification of Equipment: Each item of equipment shall have firmly affixed to it a nameplate, label, or tag with its equipment number or other discrete identifying mark.

D. Storage of Equipment: Contractor shall provide storage for equipment for the entire interval between receiving and installation, and for the entire interval between being removed and reinstalled. Equipment shall be stored in an enclosed space affording protection from weather, dust, and mechanical damage and providing favorable temperature, humidity and ventilation conditions, as required, to ensure against equipment deterioration. For equipment that is not intended and prepared for outdoor installation, the storage container shall be heated above dew point temperature.

E. Protection of Equipment After Installation: After installation, all equipment shall be protected, as required. During construction, and until final acceptance by the City, all equipment that may be affected must be completely covered. All equipment shall be cleaned and vacuumed inside and outside prior to acceptance.

F. Delivery of Equipment: City personnel will not accept materials or equipment deliveries for the Contractor.

G. Security: Security of equipment stored by the Contractor is the Contractor's responsibility. All losses or damage shall be replaced or repaired at the Contractor's expense.

3.07 TESTING

A. The City will field test earth work and cast-in-place concrete materials.

B. Notification: As an exception to requirements that may be stated elsewhere in the Contract, the Engineer shall be given two (2) working days notice prior to each test. The Contractor shall perform all other testing, and submit written copies of all test results to the Engineer.

C. Failure to Meet Test: Any system material or workmanship which is found defective, on the basis of acceptable tests, shall be reported to the Engineer. Contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory to the Engineer, without additional cost to
D. Operational Testing: Operational testing consists of electrical testing specified in Section 1750, TESTING, TRAINING AND FACILITY START-UP.

E. Demonstration Testing: After all operational tests specified in Section 1750 are satisfactorily completed, the Contractor shall perform a demonstration test.

3.08 SAFETY

A. Contractor shall execute and maintain all work so as to avoid injury or damage to any person or property. All work shall be done in conformance with the State of California, Division of Industrial Safety and OSHA Standards. Safety precautions, as applicable, shall include, but not be limited to, confined space procedures, adequate fume protection; adequate illumination for underground and night operation; instruction in accident prevention for all employees; such machinery guards, walkways, scaffolds, ladders, bridges, and other safety devices, equipment and wearing apparel as are necessary or lawfully required to prevent accidents or injuries; and the proper inspection and maintenance of all safety measures. Contractor shall have emergency phone numbers and addresses posted on the job site.

3.09 PROTECTION OF EXISTING IMPROVEMENTS

A. The provisions of this Section shall supplement the provisions of CSSS Section 13.

B. Existing facilities, utilities, and property shall be protected from damage resulting from the Contractor's operations. All trees, shrubbery, fences, walls, asphalt, and other improvements, including existing pavements, sidewalks, street improvements, and underground utilities, and other improvements not shown on the drawings shall be protected from damage by the Contractor throughout the construction period. Existing roadways and other improved surfaces shall be protected from damage by vehicles with tracks or lugs.

C. Any damage resulting from the Contractor's operations shall be repaired by the Contractor to the condition which existed prior to the damage, and to the satisfaction of the Engineer, at no additional cost to the City.

D. The Engineer may deduct from payments otherwise due the Contractor, the estimated cost of repairing any damage created by the Contractors operation, until such time that repairs are made by the Contractor to the Engineers satisfaction.

E. The Contractor shall be responsible for unlocking and locking the gates at the project site each work day in order to enter and exit the work area. During the
construction period, the Contractor shall be responsible, 24 hours per day, for the security and integrity of existing project facilities, including replacing stolen materials.

3.10 MATERIAL NONCONFORMANCE

A. If any material does not conform with these Specifications, the Contractor shall, within three (3) days after being notified by the Engineer, remove the materials from the project site or storage area.

3.11 RESTORATION OF STRUCTURES AND SURFACES

A. Structures, Equipment and Pipework: The Contractor shall remove such existing structures, equipment, and pipework as may be necessary for the performance of the work, and shall rebuild, or replace, the items thus removed in as good a condition as found. Contractor shall repair any existing structures which may be damaged as a result of the work.

B. Curbs, Gutters, Driveways and Sidewalks: All curbs, gutters, driveways, sidewalks, and similar structures that are broken or damaged by the installation of the work shall be reconstructed by the Contractor. Reconstruction shall be of the same kind of materials with the same finish and in not less than the same dimensions as the original work. Repairs shall be made by removing and replacing the entire portions between joints or scores, and not merely refinishing any damaged part. All work shall match the appearance of the existing improvements, as nearly as possible.

C. Roads and Streets: All roads and streets in which the surface is removed, broken, or damaged, or in which the ground has caved, or settled, due to work under this Contract, shall be completely resurfaced and brought to the original grade and crown section, unless otherwise indicated. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean, solid, vertical faces, and shall be free of any loose material. Roadways used by the Contractor for hauling materials, equipment, supplies, etc., shall be cleaned and repaired if the condition of the roadway is damaged, or otherwise affected, due to the Contractor's operations.

D. Cultivated Areas and Other Surface Improvements: All cultivated and natural areas, either agricultural or lawns, and other surface improvements which are damaged by actions of the Contractor shall be restored, including roadside drainage ditches, as nearly as possible, to their original condition.

3.12 EROSION, SEDIMENT, AND POLLUTION CONTROL

A. General
Contractor shall be responsible for controlling erosion and sedimentation within
the limits of the project at all times during the course of construction including evenings, weekends and holidays in addition to normal working days. The Contractor shall prevent sediment and construction debris from entering the City of Sacramento storm drain system.

At a minimum, the Contractor shall provide protection around any drain inlets located within the project area and any cross streets which receive runoff from the limits of the construction zone. The Contractor shall also exercise care during trench excavation so that excessive sediments are not tracked into the gutters and ultimately, the storm drain. Upon completion of the project, all areas within the limits of the project shall be cleaned and free of sediments.

The Contractor will not be allowed to clean the sediments from the street by means of using a water truck to spray the streets down into the storm drain via curb and gutter. The streets will be allowed to be sprayed by a water truck only when sediment barriers have been placed at drainage inlets to catch all sediments from the streets. Refer to the City of Sacramento's Administrative and Technical Procedures Manual for Grading, Erosion and Sediment Control dated January 1994, for information relating to sediment control measures and prevention. This Manual is available from the City of Sacramento, Department of Utilities, 1395 35th Avenue, Sacramento, CA 95822.

The Contractor shall prepare and submit to the Engineer for review and approval a drawing showing the placement of sediment control barriers, drop inlet protection, housekeeping practices, CIPP water catchments, and any other measures proposed to be used to prevent sediment and other sources of pollution from entering the City storm drainage system. The erosion, sediment and pollution control plan shall be submitted a minimum of ten (10) calendar days prior to start of the work. The Contractor will not be allowed to begin work until an approved erosion, sediment and pollution control plan is on file with the Engineer.

B. Housekeeping Practices
Contractor shall, during the construction of this project, implement, at a minimum, the following housekeeping practices: solid waste management, material storage and delivery area, concrete waste management, and spill prevention and control.

Solid Waste Management: Contractor shall maintain a clean construction site. Contractor shall provide designated areas for waste collection. The waste collection areas shall be leak-proof containers with lids or covers. Site trash shall be collected daily and placed in the disposal containers. The Contractor shall make arrangements for regular waste collection. The Contractor shall also regularly inspect the waste disposal areas to determine if potential pollutant discharges exist.

Material Storage and Delivery Area: Contractor shall provide one central
material storage and delivery area for the duration of the project. This area shall be fenced and protected such that runoff will not be allowed to leave the material storage area. The Contractor shall regularly inspect the site to ensure that any hazardous or non-hazardous materials have not spilled.

**Concrete Waste Management:** The Contractor shall arrange for concrete wastes to be disposed of off-site or in one designated area. Concrete wastes, including left-over concrete and material from washing out the concrete truck, shall not be disposed to the storm drain system. If a designated area is provided, the site shall be bermed to allow the concrete to dry. The dried concrete waste shall be removed and disposed of properly at the Contractor's expense.

**Spill Prevention and Control:** The Contractor shall be responsible for instructing employees and sub-contractors about preventing spills of hazardous materials and controlling spills if they occur. Proper spill control and cleanup materials shall be kept on site near the storage area and updated as materials change on site.

More information about Housekeeping Practices can be obtained by referring to the City of Sacramento's Administrative and Technical Procedures Manual for Grading, Erosion and Sediment Control dated January 1994, available at 1395 35th Avenue, Sacramento, CA 95822. (Revised 5/30/96)

C. **Dewatering**
Groundwater levels in the project area fluctuate with the water level of the adjacent creeks and downstream rivers. The Contractor shall be responsible for the control, removal, and disposal of any groundwater that may be encountered in the course of excavating, trenching, placing pipe, or constructing any other improvements associated with the project. Any water containing chlorine or sediments shall not be discharged to the City storm drain system unless the water is free from such constituents. No separate payment will be made to the Contractor for dewatering.

D. **Dust Control**
Contractor shall be responsible for the control of dust within the limits of the project at all times including weekends and holidays in addition to normal working days. The Contractor shall take whatever steps are necessary or required by the Engineer to eliminate the nuisance of blowing dust.

Contractor shall keep all streets as well as all grounds adjacent to the project site clean and free of dust, mud, and debris resulting from the Contractor's operations. Daily clean up throughout the project shall be required as the Contractor progresses with the work. Extra precautions and clean up efforts shall be made prior to weekends and holidays.

Spillage of earth, gravel, concrete, asphalt, or other materials resulting from
hauling operations along or across any public traveled way shall be removed immediately by the Contractor at his expense.

No separate payment will be made to the Contractor for dust control. The cost of such work shall be included in whatever bid item the Contractor deems appropriate.

3.13 CONSTRUCTION INSPECTIONS

A. Unless otherwise directed, Contractor shall contact the Public Works Construction Section two (2) working days in advance to schedule construction inspections. Inspector contact information will be provided at the pre-construction meeting.

**END OF SECTION**
PART 1 - GENERAL

1.01 STANDARD COMPLIANCE

A. When materials or equipment must conform to the standards of organizations such as, but not limited to, the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA) and Underwriter's Laboratories (UL) documents showing, or proving, conformance shall be submitted.

B. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual Sections. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization, which is competent to perform acceptable tests, and is approved by the City. The certificate shall state that the item has been tested in accordance with the specified organization’s standard. For materials and equipment whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate of compliance from the manufacturer shall be submitted for approval. The certificate shall identify the manufacturer, the product, and the referenced standard and shall state that the manufacturer certifies that the product conforms to all requirements of the project Specification and of the referenced standards listed.

1.02 REVIEW OF CONTRACTOR'S INFORMATION

A. When review and checking for acceptance is required of any drawing, or information regarding materials and equipment, the Contractor shall prepare or secure, and submit for review, four (4) copies and one (1) electronic copy in pdf format. The Engineer, after taking appropriate action, will return two (2) marked copies to the Contractor.

Within a reasonable time after receipt of said submittal copies, the Engineer will return the marked copies indicating one of the following four (4) actions:

1. If review and checking indicates no exceptions, copies will be returned marked “NO EXCEPTIONS TAKEN” and work may begin immediately on incorporating the material and equipment covered by the submittal into the work.
2. If review and checking indicates limited corrections are required, copies will be returned marked “MAKE CORRECTIONS NOTED”. Work may begin immediately on incorporating into the work the material and equipment covered by the corrected submittal.

3. If review and checking indicates insufficient, or incorrect data, has been submitted, copies will be returned marked “REVISE AND RESUBMIT”. No work may begin on incorporating the material and equipment covered by this submittal into the work until the submittal is revised, resubmitted, and returned marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED”.

4. If review and checking indicates the material and equipment submittal is unacceptable, copies will be returned marked “REJECTED”. No work may begin on incorporating the material and equipment covered by this submittal into the work until a new submittal is made and returned marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED”.

B. Approval of the submittal by the Engineer shall not relieve the Contractor from responsibility for any errors or omissions in such submittals nor from responsibility for complying with the requirements of this Contract.

C. If Shop Drawings show variations from Contract requirements, Contractor shall describe such variations in writing, separate from the drawings, at time of submission. All such variations must be approved by the Engineer.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S DATA

A. Submittals for each manufactured item shall be comprised of manufacturer's descriptive literature, drawings, diagrams, performance and characteristic curves, and catalog cuts. Manufacturer's name, trade name, model or catalog number, nameplate data, size, layout dimensions, capacity, project specification references, and any other additional information necessary to establish contract compliance shall be clearly indicated for each item submitted. Contractor shall identify items submitted for approval using an arrow or yellow highlighter. All submittals that fail to properly identify items will be returned to the Contractor.

B. Electronic submittals shall be in Adobe Acrobat pdf format, searchable and include bookmarks for submittal items on the side pane. The Contractor shall use the latest version of Adobe Acrobat.

2.02 SHOP DRAWINGS

A. Shop Drawings shall show types, sizes, accessories, elevations, floor plans, sectional views, installation details, elementary control diagrams, and wiring
diagrams. Wiring diagrams shall identify circuit terminals and shall indicate the 
internal wiring for each item of equipment. Drawings shall also indicate adequate 
clearance for operation, maintenance, and replacement of operating equipment 
deVICES. If any equipment is disapproved, the drawings shall be revised to show 
acceptable equipment and be resubmitted. **Contractor shall provide a hard 
copy and electronic copy of all shop drawings.** The electronic copies shall 
be in a searchable Adobe format (Portable Document Format), include 
bookmarks and shall be provided on a CD. Contractor shall use latest 
version of Adobe Acrobat.

### 2.03 OPERATION AND MAINTENANCE MANUAL

A. Submit an operation and maintenance manual covering the stipulated systems 
and equipment. Three (3) approved copies of the manual, bound in Avery D - 
Ring binder model number AVY79-799 or approved equal, shall be furnished to 
the City. **One (1) of the three copies of the operation and maintenance 
manual shall contain original documentation/manuals and not photocopies.** 
Each binder shall be no more than 75% full. Prior to system and equipment 
tests, one (1) complete, bound copy of the manual shall be submitted for 
approval. Three (3) approved copies of the manual each for this project, with all 
applicable test forms completed, shall be furnished to the City before completion 
of the Contract. The following identification shall be inscribed on the cover and 
spine of the binders:

```
Operation and Maintenance Manual — Electrical Switchgear  
Project: Sump 1A VFD Replacement Project  
Contractor: ____________________  
Contract No.: ____________  
Date: ____________________
```

The contractor shall also provide the City with an electronic copy of each 
O&M manual. The electronic copies shall be in a searchable Adobe format 
(Portable Document Format), include bookmarks and shall be provided on a CD. Contractor shall use the latest version of Adobe Acrobat.

B. Provide a table of contents and tab sheets to identify discrete subjects. 
Instruction sheets shall be legible and easily understood with large sheets and 
drawings folded in. Use manufacturer's original pre-printed instructions when 
available, do not xerox these pre-printed instructions. Cross out all material 
which does not apply to the equipment furnished on this job.

C. The operating and maintenance instruction shall include, as a minimum, the 
following data for each item of mechanical and electrical equipment:

1. Name and location of the manufacturer, the manufacturer's local 
representative, the nearest supplier and spare parts warehouse.
2. Approved submittals applicable to operation and maintenance.
3. Recommended installation, adjustment, start-up, calibration, and troubleshooting procedures.
4. A control sequence describing start-up, operation, and shutdown.
5. Detailed description of the function of each principal component of the systems.
6. Recommended lubrication and an estimate of yearly quantity needed.
8. Complete internal and connection wiring diagrams.
10. Recommended preventive maintenance procedures and schedule.
11. Complete parts lists, by generic title and identification number, with exploded views of each assembly.
12. Recommended spare parts.
13. Disassembly, overhaul, and reassembly instructions.
14. All completed test forms.
15. Provide ISA (International Society for Measurement and Control) TR20 forms for all instrumentation devices.
16. As built single line drawings of the entire electrical system including motor control drawings of each motor. AutoCAD files of both single line and motor control drawings on a CD.

D. Contractor is not required to provide manuals for equipment supplied by the City. However, any manuals provided to the Contractor by the City shall be returned in a condition acceptable to the Engineer, or replaced at no cost to the City.

2.04 PROJECT RECORD DRAWINGS

A. The Contractor shall maintain a neatly and accurately marked set of record drawings showing the elementary control diagrams, wiring diagrams, and final locations and layout of all mechanical, electrical, and instrumentation equipment; piping and conduit; structures; and other facilities. Drawings shall be kept current weekly, with all work instructions and change orders; mechanical, electrical, and
instrumentation equipment accommodations; and construction adjustment. Drawings shall be subject to the inspection of the Engineer at all times, and progress payments, or portions thereof, may be withheld if drawings are not accurate and current. Prior to acceptance of the work, the Contractor shall deliver to the Engineer two (2) sets of neatly marked record drawings, accurately showing all the information required above.

PART 3 - EXECUTION

3.01 SUBMITTAL PROCEDURE

A. At least thirty (30) days prior to the Contractors need for approval, Contractor shall forward to the Engineer all submittals required by the individual Sections of the Specifications. The Engineer may require that the Contractor submit a legible reproducible mylar for the City's use in lieu of multiple prints of a single drawing.

B. Identify all submittals by submittal number on letter of transmittal. Specification number shall be identified on the letter of transmittal. Submittals shall be numbered consecutively and resubmittals shall have a letter suffix. For example:

1. 1st submittal: 2
2. 1st resubmittal: 2A
3. 2nd resubmittal: 2B, etc.

3.02 INFORMATION TO BE SUBMITTED FOR REVIEW

A. Information on items to be submitted for review are specified in the individual Sections of these Specifications. Submittals for each Section shall be bound together in one book. Book shall have numbered tab dividers for each item. Submittals that are related to, or affect, each other shall be forwarded simultaneously as a package to facilitate coordinated review. Uncoordinated submittals will be rejected. Do not combine unrelated materials in the same submittal. Submittals shall be arranged in same order as they appear in the Specification Section. Items shall be highlighted and clearly marked with the same identification number as indicated on the drawings. The Contractor shall include submittal time appropriate within each item of work on the Construction Schedule. The City will receive submittals at the preconstruction meeting as specified in Section 01105, General Information and Requirements.

** END OF SECTION **
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Cooperate with the Engineer's selected testing agency and all others responsible for testing and inspecting the work as described herein.

2. Provide such other testing and inspecting as are specified to be furnished by the Contractor in this section and/or elsewhere in the contract documents.

B. Related Work

1. Requirements for testing may be described in various sections of these specifications and applicable codes.

2. Where no testing requirements are described but the Engineer decides that testing is required, the Engineer may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this section.

C. Work Not Included:

1. Selection of testing laboratory: The City will select a pre-qualified independent testing laboratory.

2. Payment for specified initial testing: The City will only pay for initial material strength testing of items described in 1.02 TESTING DESCRIPTION, subparagraph A.1, herein. Contractor shall be responsible to pay for all other testing.

1.02 TESTING DESCRIPTION

A. Material Strength:

1. The City will only pay for initial testing services for concrete strength and slump, soil compaction, and grout strength.

2. When initial tests indicate non-compliance with the Contract Documents, the costs of any additional tests required for determining compliance will
be deducted by the City from the Contract Sum as reflected in the progress payments due the Contractor.

B. Operational Testing: All operational tests shall be paid for by the Contractor.

C. Code Compliance Testing

1. Inspections and tests not identified in 1.07 of this section, that are required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

D. Contractor's Convenience Testing:

1. Inspecting and testing performed exclusively for the Contractor's convenience, such as determining grain size or index properties of material proposed for use as import, shall be the sole responsibility of the Contractor.

2. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

E. The City will provide initial testing for trench/structure backfill and embankment compaction.

### 1.03 REFERENCES

<table>
<thead>
<tr>
<th>ANSI/ASTM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI/ASTM E329</td>
<td>Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.</td>
</tr>
</tbody>
</table>

### 1.04 LABORATORY REPORTS

A. After each inspection and test, promptly submit three (3) copies of laboratory report to the Engineer. Include: Date issued, Project title and number, name of inspector, date and time of sampling or inspection, identification of product and Specifications section, location in the Project, type of inspection or test, date of test, results of tests, and conformance with Contract Documents. When requested by Engineer, provide interpretation of test results.
1.05 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop Work.

1.06 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing, together with proposed mix designs.

B. Cooperate with laboratory personnel, and provide access to Work and to manufacturer's facilities.

C. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify laboratory twenty-four (24) hours prior to expected time for operations requiring inspection and testing services.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 COOPERATION WITH TESTING LABORATORY

A. Representatives of the testing laboratory shall have access to the work at all times and at all locations where the work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

3.02 TAKING SPECIMENS

A. All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.
3.03 SCHEDULES FOR TESTING

A. Establishing Schedule:
   1. By advance discussion with the testing laboratory selected by the City, determine the time required for the laboratory to perform its tests and to issue each of its findings.
   2. Provide all required time within the construction schedule.

B. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.

C. Adherence to Schedule: When the testing laboratory is ready to test according to the established schedule, and is prevented from testing or taking specimens due to incompleteness of the work, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the City.

3.04 TESTING PROCEDURES

A. Notification: As an exception to requirements that may be stated elsewhere in the contract, the Engineer shall be given three (3) working days notice prior to each test. The Contractor shall provide all test equipment and personnel and submit written copies of all test results.

B. Failure to Meet Test: Any system material or workmanship which is found defective on the basis of acceptable tests shall be reported to the Engineer. Contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory to the Engineer without additional cost to the City.

C. Operational Testing: After all pre-operational tests are satisfactorily complete, Contractor shall perform an operational test. All mechanical and electrical equipment shall be tested by the Contractor to the satisfaction of the Engineer before any facility is put into operation. Tests shall be made to determine whether the equipment has been properly assembled, aligned, adjusted and connected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the work.

** END OF SECTION **
PART 1 - GENERAL

1.01 DESCRIPTION

A. Requirements Included:
   1. Products.
   2. Transportation and Handling.
   4. Substitutions and Product Options.

B. Related Requirements:
   1. Section 01330: Submittals: Submittal of Manufacturers’ Certificates.

1.02 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Manufacturer's Recommendations:
   1. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage and protection.
      a. Maintain packaged materials with seals unbroken and labels intact until time of use.
      b. Promptly remove damaged materials and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the City.
   2. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality, and other pertinent information.
3. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

1.04 JOB CONDITIONS

A. Storage and Protection:

1. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

2. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

3. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

4. After installation, provide coverings to protect products from damage from traffic and construction operations, remove when no longer needed.

5. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

B. Repairs and Replacements:

1. In event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the City.

2. Additional time required to secure replacements and to make repairs will not be considered to justify an extension in the Contract Time of Completion.

1.05 ALTERNATIVES

A. Product Options:

1. Within ten (10) days after date of Contract, submit complete list of major products proposed, with name of manufacturer, trade name, and model.

2. Options:

   a. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.

   b. Products Specified by Naming One (1) or More Manufacturers with
a Substitute Paragraph: Submit a request for substitution for any manufacturer not specifically named.

c. Products Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications; no options, no substitutions allowed.

d. Products Specified by Naming Only One (1) Manufacturer: No options, no substitutions allowed.

B. Substitutions:

1. Within ten (10) calendar days after date of Contract, Contractor shall submit requests to the Engineer for consideration of substitutions.

2. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

3. Request constitutes a representation that Contractor:

   a. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.

   b. Will provide the same warranty for substitution as for specified product.

   c. Will coordinate installation and make other changes that may be required for Work to be complete in all respects.

   d. Waives claims for additional costs that may subsequently become apparent.

4. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.

5. Engineer will determine acceptability of proposed substitution, and will notify Contractor of acceptance or rejection in writing within a reasonable time.

6. The Engineer can, at his option, require as a condition of acceptance of a substitution that the Contractor provide a credit to the City for the difference in cost of product(s) or components, or systems proposed as a substitution.
7. If, upon Engineer's review of a substitution, it is determined by the Engineer that the substitution is not acceptable, for whatever reason, the Contractor shall supply the specified product or products.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 SHIPPING AND PROTECTION OF EQUIPMENT

A. Definition: For the purpose of this article, "equipment" means all mechanical devices, all electrical devices, all electronic devices, and all items with one or more moving parts.

B. Packing and Marking: All equipment shall be adequately and effectively protected against damage from moisture, dust, handling or other cause during transport from manufacturer's or supplier's premises to site. Each item or package shall be clearly marked with a fitting or distinguishing mark that shall be shown on the packing lists. Stiffeners shall be used where necessary to maintain shapes and to give rigidity. Parts of equipment shall be delivered in assembled or sub-assembled units where possible.

C. Identification of Equipment: Each item of equipment shall have firmly affixed to it a nameplate, label or tag with its equipment number or other discrete identifying mark.

D. Storage of Equipment: The Contractor can elect to store all motor control centers and conductors in the screen room at the Sump 2 facility until construction begins. The Contractor shall hold the City blameless for any damaged incurred during the storage of this equipment. The equipment shall remain in its shipping package until installation.

E. Protection of Equipment After Installation: After installation, all equipment shall be protected as required. During construction, including finishing, all equipment that may be affected must be completely covered.

F. Delivery of Equipment: City personnel will not accept materials or equipment deliveries for the Contractor.

G. Security: Security of equipment stored by the Contractor is his responsibility. All losses or damage shall be replaced or repaired at the Contractor's expense.

** END OF SECTION **
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Procedures and actions required of the Contractor for Facility startup.

1.02 DEFINITIONS

A. Project Classified System (PCS): A defined part of the Project consisting of an arrangement of items, such as equipment, structures, components, piping, wiring, materials, or incidentals, related or connected to form an identifiable, unified, functional, operational, safe, and independent system.

B. Pre-Demonstration Period: The period of time, of unspecified duration after initial construction and installation activities during which the Contractor, with assistance from manufacturers’ representatives, performs the following:

1. Finishing type construction work.
2. Equipment startup.

C. Demonstration Period: A one week period of time, following the Pre-Demonstration Period, during which the Contractor initiates facility start-up and operates the Project Classified Systems, without exceeding specified downtime limitations. The purpose of the Demonstration Period is to prove the functional integrity of the mechanical and electrical equipment and components and the control interfaces of the respective equipment and components comprising the facility.

1.03 SUBMITTALS

A. Submit for review prior to completion of the Pre-Demonstration Period.

1. Master startup schedule:

   a. Schedule to include:

   1) Target date and time for City to witness each system’s initial startup.
   2) Target date for initiation of Demonstration Period.
   3) Test methods, procedures, and sample form for recording test data.
2. O&M Manuals:
   a. The required number of approved Operation and Maintenance Manuals. Manuals must be received by the Engineer a minimum of thirty (30) days prior to scheduling any required system training.

3. Equipment installation and pre-demonstration startup certifications.
   a. Letter verifying completion of all pre-demonstration startup activities, including receipt of all specified items from each manufacturer and/or supplier as the final item prior to initiation of Demonstration Period.

PART 2 PRODUCTS - (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Facility Startup is divided into two periods:

   1. Pre Demonstration Period including:
      a. Startup of Equipment in presence of City personnel.
      b. Filing of all required submittals, including O&M manuals.

   2. Demonstration Period including:
      a. Seven (7) day demonstration of functional integrity of facility or PCS.

3.02 PRE-DEMONSTRATION PERIOD

A. Equipment Startup:

   1. Requirements for individual items of equipment are included in Divisions 2 through 16 of these Specifications. Factory acceptance tests for equipment shall be submitted in advance of the Demonstration Period per the respective Specification Sections.

   2. Prepare the equipment so that it will operate properly and safely, and so that it will be ready to demonstrate functional integrity during the Demonstration Period.

   3. Operate equipment in all operable modes, including manual and automatic modes. Falsify instrumentation signals inputs into the PLC or control panel as required to operate equipment in automatic mode, where it is otherwise not possible for the equipment to run in automatic mode during the Pre-Demonstration Period. Verify that the PLC and SCADA are receiving the signals.
4. Run all additional operable equipment.

5. Procedures include, but are not limited to, the following:
   a. Test or check and correct deficiencies of:
      1) Power, control, and monitoring circuits for continuity prior to connection to power source.
      2) Voltage of all circuits.
      3) Phase sequence.
      4) Cleanliness of connecting piping systems.
      5) Alignment of connected machinery.
      6) Vacuum and/or pressure of all closed systems.
      7) Lubrication.
      8) Valve orientation and position.
      9) Pumping equipment using clean water.
      10) Instrumentation and control signal generation, transmission, reception, and response.
      11) Tagging and identification systems
      12) All equipment: Proper connections, alignment, calibration and adjustment.
   b. Calibrate safety equipment.
   c. Manually rotate or activate moving parts to ensure that there is freedom of movement.
   d. "Bump"-start electric motors to verify proper rotation.
   e. Perform other tests, checks, and activities required to make the equipment ready for the Demonstration Period.
   f. Documentation:
      1) Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Startup. Provide a place for Contractor and Engineer to record the date and the person accomplishing the required work. Submit completed document before requesting inspection for Substantial Completion certification.

6. Submit, without restrictions or qualifications, the following:
   a. Manufacturers’ equipment installation check letters.
   b. Instrumentation Supplier’s Instrumentation Installation Certificate.
B. Personnel Training:

1. See individual equipment specification sections.

2. Conduct all personnel training after completion of Equipment Startup for the equipment for which training is being conducted.
   a. Personnel training on individual equipment or systems will not be considered completed unless:
      1) All pretraining deliverables are received and approved before commencement of training on the individual equipment or system.
      2) No system malfunctions occur during training.
      3) All provisions of field and classroom training specifications are met.
   b. Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to the City.

C. Complete the filing of all required submittals:

   1. Shop drawings.

   2. Approved Operation and Maintenance Manuals – submit thirty (30) calendar days prior to first training session.

3.03 DEMONSTRATION PERIOD

A. General:

1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the facility under automatic control.

2. Demonstration Period: In the presence of City personnel, operate each pump for a period of thirty (30) consecutive minutes using line power. Flow, pressure, and level measurements shall be recorded during the entirety of the Demonstration Period.

3. If, during the Demonstration Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceeds ten (10) percent of the Demonstration Period, the demonstration of functional integrity will be deemed to have failed. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure. The new Demonstration Period shall have the same
requirements and duration as the Demonstration Period previously conducted.

4. Conduct the demonstration of functional integrity under full operational conditions for a period of seven (7) consecutive 24-hour days.

5. City will provide operational personnel to provide process decisions affecting plant performance, and will be available for process decisions and testing acceptance. Contractor shall perform all other functions including, but not limited to, equipment operation and maintenance until the successful completion of the Demonstration Period.

6. City reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.

7. The time of beginning and ending any Demonstration Period shall be agreed upon by Contractor and Engineer in advance of initiating Demonstration Period.

8. Throughout the Demonstration Period, provide knowledgeable personnel to provide final field instruction on select systems, and to respond to any system problems or failures which may occur.

9. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.

**END OF SECTION**
SECTION 01750
TESTING, TRAINING, AND FACILITY START-UP

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Equipment and system testing and start-up, services of manufacturer’s representatives, training of City personnel, and final testing requirements for the completed facility.

1.02 CONTRACT REQUIREMENTS

A. Testing, training, and start-up are requisite to the satisfactory completion of the Contract. Complete testing, training, and start-up within the Contract Time. Allow realistic time frame for testing, training, and start-up activities. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing functional testing, performance testing, and operational testing. Provide competent, experienced technical representatives of equipment manufacturers for assembly, installation and testing guidance, and operator training.

1.03 START-UP PLAN

A. Submit start-up plan for each piece of equipment and each system not less than three (3) weeks prior to planned initial equipment or system start-up.

1. Provide detailed information and schedule for the following activities:
   a. Manufacturer’s services
   b. Installation certifications
   c. Operator training
   d. Completion of Operation and Maintenance Manual
   e. Functional testing
   f. Performance testing
   g. Operational testing

B. Provide testing plan with test logs for each item of equipment and each system when specified. Include testing of alarms, control circuits, capacities, speeds, flows, pressures, vibrations, sound levels, and other parameters.

C. Provide summary of shutdown requirements for existing systems which are necessary to complete start-up of new equipment and systems.

D. Revise and update start-up plan based upon review comments, actual progress, or to accommodate changes in the sequence of activities.
1.04 PERFORMANCE TESTING

A. Test equipment for proper performance at point of manufacturer of assembly when specified.

B. When Source Quality Control Testing is Specified:
   1. Demonstrate equipment meets specified performance requirements.
   2. Provide certified copies of test results.
   3. Do not ship equipment until certified copies have received written acceptance from Engineer. Written acceptance does not constitute final acceptance.

1.05 GENERAL START-UP AND TESTING PROCEDURES

A. Mechanical Systems:
   1. Remove rust preventives and oils applied to protect equipment during construction.
   2. Flush lubrication systems and dispose of flushing oils. Recharge lubrication system with lubricant recommended by manufacturer.
   3. Flush fuel system and provide fuel for testing and start-up.
   4. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
   5. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
   6. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
   7. Perform cold alignment and hot alignment to manufacturer’s tolerances.
   8. Adjust v-belt tension and variable pitch sheaves.
   9. Inspect hand and motorized valves for proper adjustment. Tighten packing glands to insure no leakage, but permit valve stems to rotate without galling. Verify valve seats are positioned for proper flow direction.
   10. Tighten leaking flanges or replace flange gasket. Inspect screwed joints for leakage.
   11. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to operational testing.

B. Electrical Systems: As specified in Division 16.

C. Instrumentation Systems: As specified in Division 17.

1.06 FUNCTIONAL TESTING
A. Functionally test mechanical and electrical equipment for proper operation after general start-up and testing tasks have been completed.

B. Verify compatibility of new equipment with existing: Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration.

C. Perform initial checks in the presence of and with the assistance of manufacturer’s representative.

D. Demonstrate proper operation of each instrument loop function.

E. Unless otherwise approved by the Engineer, conduct continuous eight (8) hour test under full load conditions. Replace parts which operate improperly.

1.07 CERTIFICATION OF PROPER INSTALLATION

A. At completion of functional testing, furnish written report prepared and signed by manufacturer’s authorized representative, certifying equipment:

1. Has been properly installed, adjusted, aligned, and lubricated.
2. Is free of any stresses imposed by connections or anchor bolts.
3. Is suitable for satisfactory full-time operation under full load conditions.
4. Operates within the allowable limits for vibration.
5. Controls, protective devices, instrumentation, and control panels are properly installed, calibrated, and functioning, as designed.
6. Control logic for start-up, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are functioning, as designed.

B. Co-sign the reports along with the manufacturer’s representative and subcontractor.

1.08 TRAINING OF OWNER’S PERSONNEL

A. Provide at least four (4) hours of training, at agreed upon times, to designated Owners personnel in operation, adjustment, and maintenance of products, mechanical, electrical, instrumentation equipment, and installed items. Utilize manufacturer’s representatives to conduct training sessions.

B. Provide Operation and Maintenance Manual for specific pieces of equipment or systems two (2) weeks prior to training session for that piece of equipment or system.

C. Satisfactorily complete functional testing before training Owner’s personnel.

E. Schedule training sessions during the hours of Monday – Friday: 7 a.m. – 12 p.m.; and/or 1 p.m.-3:30 p.m.
1.09 OPERATIONAL TESTING

A. Conduct operational test of the entire facility after completion of operator training. Demonstrate satisfactory operation of equipment and systems in actual operation. Conduct operational test for continuous seven (7) day period.

B. Immediately correct defects in material, workmanship, or equipment which became evident during operational test.

C. Repeat operational test when malfunctions or deficiencies cause shutdown or partial operation of the facility or results in performance that is less than specified.

1.10 RECORD KEEPING

A. Maintain and submit following records generated during start-up and testing phase of project:

1. Daily logs of equipment testing identifying all tests conducted and outcome.
2. Logs of time spent by manufacturer’s representatives performing services on the job site.
3. Equipment lubrication records.
4. Electrical and instrumentation test results as required in Division 16.

** END OF SECTION **
SECTION 01770

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Requirements Included:
   2. Final Cleaning.
   3. Project Record Documents.

1.02 CLOSEOUT PROCEDURES

A. Contractor shall notify the Engineer when the project is completed after which City representatives will perform a walk through and develop a list of deficient work items.

B. Contractor shall then correct all noted deficiencies to the satisfaction of the Engineer after which City Operation and Maintenance representatives will perform a final walk through and submit to the Contractor a final list of deficient work items.

C. Contractor shall then correct all additional deficiencies to the satisfaction of the Engineer after which a completion report will be prepared by the Engineer.

1.03 FINAL CLEANING

A. Execute prior to final inspection.

B. Clean all interior and exterior surfaces; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces. Clean equipment and fixtures to a sanitary condition, clean or replace filters on mechanical equipment. Clean roofs, gutters, downspouts, and drainage systems of any debris. Vacuum inside switchgear.

C. Clean site; sweep paved areas, rake clean other surfaces.

D. Remove waste and surplus materials, rubbish, and construction facilities from the
Project and from the site.

1.04 PROJECT RECORD DOCUMENTS

A. Store documents separate from those used for construction.

B. Keep documents current; do not permanently conceal any work until required information has been reviewed and recorded.

C. At Contract closeout, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

1.05 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system and the entire system to Engineer and City’s maintenance staff and instruct City’s personnel in operation, adjustment and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction in accordance with Section 01750.

1.06 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, and maintenance materials in quantities specified in each section, in addition to that required for completion of Work including a full set of replacement fuses for all electrical equipment. Coordinate with the Engineer, deliver to Project site and obtain receipt prior to final payment.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

A. Contractor shall complete all punch list items prior to completing the work identified in this section.

** END OF SECTION **
PART 1 GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall furnish all labor, materials, equipment and incidentals necessary to maintain power to the Trash Rack and Panelboard L. It shall be the Contractor’s sole responsibility that facility power is maintained throughout the duration of the contract.

1.02 REFERENCE PUBLICATIONS

NOT USED

1.03 SUBMITTALS

A. Submit for approval at least 7 days before starting work:

1. Temporary facilities schematic drawing.
2. Materials list.
3. Proposed method of supplying electrical power to the existing facility.

B. The above submittals will be reviewed in accordance with Section 01330 - SUBMITTALS. No work shall be undertaken by the Contractor until approval by the Engineer is obtained.

C. The Contractor shall submit a written plan, to the Engineer, detailing how the existing electrical equipment will be kept operational during the construction period. The plan shall show how all pumps will be kept operational during the construction period. The Contractor shall submit these plans within 2 weeks of receiving the Notice to Proceed.

PART 2 PRODUCTS

2.01 MATERIALS

A. The Contractor shall provide all the materials as specified in these specifications in order to keep the sump operational at all times and as directed by the Engineer.

PART 3 EXECUTION

3.01 EXISTING CONDITIONS
A. Sump 1A is currently supplied with electrical power from an existing Switchboard as shown on the Plans.

3.02 TEMPORARY ELECTRICAL SITE PLAN

A. The Contractor shall leave the existing control building and switchboard in place to power the facility during construction. The Trash Rack, Panel L and all other electrical equipment outside of the scope of work shall remain operational during the construction. In addition, the SCADA system shall remain operational during construction.

B. All equipment and materials shall be in accordance with the latest version of the NEC. All work shall be coordinated with Tim Giffin of the City of Sacramento, (916) 808-7997, at least three working days in advance. The existing VFDs and MCCs shall not be removed without prior approval from Tim Giffin of the City of Sacramento.

3.03 CONTRACTOR’S RESPONSIBILITIES

A. The Contractor shall coordinate the temporary electrical plans with the City.

END OF SECTION
SECTION 02220

DEMOLITION AND SALVAGE OF MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work includes demolition, removal, and salvage where specified of all items indicated on the drawings, or specified herein.

B. All materials resulting from demolition work, except as otherwise indicated on the drawings or specified herein for re-use by the Contractor or re-use by the City shall become the property of the Contractor.

1.02 AVAILABILITY OF WORK AREAS

A. Subject to all related Contract stipulations, the contract area will be released to the Contractor, at one time, upon issuance of the Notice-to-Proceed. Unless otherwise directed, the Contractor shall maintain access to and shall not begin demolition of the existing sump electrical facilities until authorized in writing by the Engineer.

1.03 SUBMITTALS

A. The procedures proposed for the accomplishment of demolition and storage of salvaged materials shall be submitted for approval. The procedures shall provide for safe performance of work, careful removal and disposition of materials specified to be stored, protection of property which is to remain undisturbed, and coordination with other work in progress. The procedures shall include a detailed description of the methods and equipment to be reused for each operation, and the sequence of operations.

B. Submit schedule for demolition activities.

1.04 SAFETY PROCEDURES AND WORKER PROTECTION

A. Take all precautions and measures required to protect employees, related trade employees, City employees, residents, and the general public from exposure to energized parts.

1. All personnel authorized for entry into work areas shall be instructed in the proper procedures for high voltage work. In instances where off-line equipment may require removal from high voltage installations, personnel will be instructed and properly supervised for working in the vicinity of high-voltage equipment.
2. All electrical equipment upon which activities are to be performed shall be de-energized and permanently disconnected from any power source prior to commencing any work.

B. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect personnel, structures, and utilities remaining intact. Protect trees and plants from damage.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that areas to be demolished are unoccupied and no longer are in use.

B. Do not commence work until conditions are acceptable to the City.

3.02 PREPARATION

A. Contractor shall hold a field meeting at the existing sump site prior to beginning demolition work. Meeting shall cover the Contractors procedures for removal and transportation of salvaged items. Attendees shall include as a minimum: Tim Giffin (916) 808-7997 and Vernon Fields (916) 808-5542 of the Department of Utilities, Plant Services Division. Contractor shall give attendees forty-eight (48) hours notice in advance of said field meeting.

B. Remove items scheduled to be salvaged for City, and place in designated storage area. Items to be salvaged includes NEMA starters in existing VFD Cabinets.

3.03 DEMOLITION

A. Contractor shall remove and salvage materials as called for in the plans.

3.04 SALVAGE

A. The Contractor shall deliver any item to be salvaged to the City's Combined Sewage Treatment Plant, located at 1391 35th Avenue between the hours of 8:00AM and 3:00 PM. The Contractor shall contact Tim Giffin at (916) 808-7997 or Vernon Fields at (916) 808-5542 to coordinate delivery of these items. All removed conduit and conductors shall become property of the Contractor, unless otherwise directed by the Engineer.
3.05 CLEAN-UP

A. Debris and Rubbish: Debris and rubbish shall be removed from the limits of work daily to a location approved in advance by the Engineer. Do not allow to accumulate on-site.

B. Debris Control: Debris shall be removed and transported in a manner as to prevent spillage on streets or adjacent areas. Local regulations regarding hauling and disposal apply.

** END OF SECTION **
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included

1. Forms shall be designed, constructed, and maintained so as to insure that after removal of forms, the formed concrete will have true surfaces free of offset, waviness or bulges, and will conform accurately to the indicated shapes, dimensions, lines, elevations, and positions.

2. Provide form accessories and openings in forms as required for placement of equipment and materials. Remove forms after concrete has cured.

B. Related work specified in other sections

1. Section 01330: Submittals
2. Section 03300: Cast-in-place Concrete.

1.02 REFERENCE PUBLICATIONS

A. The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Unless otherwise indicated, the latest edition of referenced publications in effect at the time of the bid shall govern.

B. American Concrete Institute (ACI) standards:

<table>
<thead>
<tr>
<th>ACI 301</th>
<th>Specifications for Structural Concrete for Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACI 347</td>
<td>Recommended Practice for Concrete Formwork</td>
</tr>
<tr>
<td>ACI P4</td>
<td>Publication 4 Formwork for Concrete</td>
</tr>
</tbody>
</table>

C. U.S. Department of Commerce, National Bureau of Standards Publications, Product Standards:

| PS1 | Construction and Industrial Plywood |

D. City of Sacramento Standard Specifications (CSSS):
E. National Forest Products Association (NFPA):

F. West Coast Lumber Inspection Bureau (WCLB) Standard:

| No. 16 | Standard Grading and Dressing Rules for Douglas Fir, Western Hemlock, Western Red Cedar, White Fir, and Sitka Spruce Lumber. |

G. Western Wood Products Association (WWPA): Western Lumber Grading Rules.

1.03 SUBMITTALS

A. Submit for approval in accordance with Section 01330: SUBMITTALS

B. Shop Drawings
   1. Formwork: Before starting concrete work, submit drawings of all formwork showing form plywood patterns, formwork, ties, vertical limits of concrete placements, horizontal lifts, and construction joints.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Plywood: PS 1, B-B Plyform Class 1, EXT-APA, edge-sealed, 5/8" thick when studs are spaced 12" on center and 3/4" thick when studs are spaced 16" on center.

B. Wood strips for forming reveals, chamfers and quirks: Any close grain hardwood or softwood, free of knots.

C. Framing lumber: Douglas Fir "Standard" grade, sized to uniform width and depth.

D. Sheathing: Douglas Fir "Construction" grade boards and sheathing, 10" maximum width.

2.02 FORM ACCESSORIES
A. Form Ties: Ties shall be adjustable type, arranged to leave no metal within 1" of surface. They shall have no lugs, cones, or other devices that will leave holes larger than 1" diameter in exposed concrete surfaces. Spreaders shall be either type designed for use with approved clamps of separate metal spreaders. Do not use wood spreaders or wire ties.

B. Form Coatings: Burke Concrete Accessories, Inc.'s "Burke Release", Nox-Crete, or approved equal. Apply per manufacturer's printed instructions.

PART 3 - EXECUTION

3.01 GENERAL

A. Provisions for work of other sections: Provide openings for mechanical and electrical work and work of other sections. Place items to be incorporated in concrete and support on formwork. Seal forms around openings to prevent concrete seepage.

B. Design and erection of formwork, shoring and falsework: The design and engineering of all formwork, falsework and shoring, as well as its construction and protection, is the Contractor's responsibility. Conform to ACI 347 unless otherwise directed or approved.

C. Exposed-to-view concrete: Deflection of facing materials between studs, as well as deflection of studs and walers, shall be limited to 3/64 of an inch or 0.004 times the span length, whichever is the larger, at the midpoint between supports.

3.02 CONSTRUCTION TOLERANCES

A. Construct forms to provide concrete conforming to dimensions shown, and to tolerance limits listed in ACI 301 "Specifications for Structural Concrete for Buildings".

3.03 INSTALLATION

A. Installation shall conform to ACI 301, 347, P4 and CSSS 20-3. Design forms for easy removal. Do not pry against face of concrete. Use wooden wedges only. In order that reused forms will not contain patches resulting from alterations, forms for concrete exposed-to-view shall be reused only on identical sections.

Forms will not be used if there is any evidence of surface wear or tear which would impair the quality of the exposed-to-view concrete. Forms shall be thoroughly cleaned and relubricated before reuses. Formwork for exposed-to-view concrete shall be observed continuously while concrete is being placed to see that there are no changes of elevation, plumbness, or camber. If, during construction, any weakness develops and the falsework shows any undue settlement or distortion, the work shall be stopped, the affected construction
removed, if permanently damaged, and the falsework strengthened.

3.04 CONSTRUCTION AND SURFACE FINISH

A. Forms shall be substantial, true to line and level, sufficiently tight to prevent leakage and shall conform to indicated dimensions. Locate form ties for exposed concrete in straight horizontal and vertical lines and as indicated on Drawings and specified herein. Provide cleanout holes at bottom of forms. Remove debris before concrete is placed. Construct forms for exposed surfaces so that joints in forms are either horizontal or vertical and are located to the pattern indicated.

External corners on all concrete shall be formed with chamfer strips in corners of forms to form bevel at external angles. All form joints in forms for exposed-to-view concrete shall be sealed with specified form tape to prevent leakage. Camber soffits to accommodate anticipated deflections caused by wet concrete and construction loads. Provide positive means of adjustment for shores and struts. Take up settlement as concrete is placed.

3.05 REMOVAL AND REUSE

A. Removal of forms shall conform to CSSS 20-4 and as specified herein. Remove forms, shoring and bracing carefully to avoid damage to fresh concrete, but not before concrete is capable of self support and support of construction loads. Do not pull tie rods until concrete is hard enough to permit withdrawal without damage to concrete. Pull ties that are entirely withdrawn from wall toward inside face. When forms are removed during specified curing period, cure the concrete as specified in Section 03300.

Regardless of strengths attained by concrete, leave forms in place for following periods when supporting:

1. Vertical surfaces: 3 days minimum
2. Slabs: 7 days minimum
3. Beams and Girders: 15 days minimum, but do not remove vertical support until concrete has reached its 28-day strength.

B. Before reuse of plywood forms, thoroughly clean, sand and recoat them with form coating. Do not reuse plywood that has torn grain, patches, worn edges, damaged phenolic resin covered surfaces, or other defects which would impair texture of finished surface. Other wood forms shall be prepared for reuse by thorough cleaning and recoat with form coating. Repair damaged forms and replace loose or damaged boards.

3.06 MATERIAL APPLICATION

A. Concrete exposed-to-view in completed structures:
1. Exposed-to-view concrete: Use specified "B-B" or better plyform plywood or phenolic resin covered form board.

B. Concealed concrete:

1. Forms for concrete surfaces not visible in completed structure: Plywood, lumber or steel is acceptable. Footings may be poured directly against earth banks where soil conditions are such that vertical banks will remain stable during placing operations. Earth forms at walls are not permitted.

**END OF SECTION**
SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION: Provide reinforcing steel as shown on the Plans.

A. Related Work:
   1. Section 01330 - Submittals
   2. Section 03100 - Concrete Formwork.
   3. Section 03150 - Concrete Accessories
   4. Section 03300 - Cast-in-Place Concrete.

1.02 REFERENCE PUBLICATIONS

A. The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of publications at the time of bid shall govern.

B. American Concrete Institute (ACI) Standard

<table>
<thead>
<tr>
<th>ACI 318</th>
<th>Building Code Requirements for Reinforced Concrete.</th>
</tr>
</thead>
</table>

C. American Welding Society (AWS):

| AWS D 12.1 | Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction. |

D. City of Sacramento Standard Specifications (CSSS):

<table>
<thead>
<tr>
<th>Section 10-25</th>
<th>Reinforcing Steel</th>
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<tbody>
<tr>
<td>Section 21</td>
<td>Placing Steel Reinforcement</td>
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</table>

E. Concrete Steel Reinforcing Institute (CRSI):
1.03 SUBMITTALS

A. Shop Drawings:

1. Reinforcing Steel: Before starting concrete work, submit shop drawings in accordance with Section 01330-SUBMITTALS. Comply with requirements of ACI 318, ACI SP-66, CRSI 1MSP, CRSI 1SPLBK, and CRSI 1DET. Show bar size, dimensions, bends, placing, and construction joint details. Submit drawing showing locations of any construction joints not shown on the plans. Maximum submittal drawing size shall be 22-inches by 34-inches. Submit type, size, and location of all slab and bar supports. Hooks, lap splices, bends and offsets shall be in accordance with the drawings. Obtain approval before shop fabrication.

B. Certificates of Compliance:

1. Submit Certificate of Compliance stating that reinforcement complies with specified requirements. Reinforcing steel shall be properly identified. Contractor shall bear costs for test of steel by an approved laboratory if the reinforcing steel is not properly identified.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Conform to CSSS Section 10-25 except as modified herein. All materials covered by this Section shall be manufactured in the United States.
B. Supports for reinforcing bars: Galvanized steel chairs and accessories or plastic coated units for work exposed to view, weather, or moisture so that finished surfaces will not be marred or stained; use precast concrete only (no metal), suitably sized for load distribution, in slabs-on-grade. Use no supports of wood or other cellulose material. Do not expose supports or accessories to view in architectural concrete.

PART 3 - EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Prior to installation of reinforcing steel work, Contractor shall inspect surfaces to receive work, and arrange for satisfactory correction of defects in workmanship and material that could have adverse affect on reinforcing steel work.

3.02 FABRICATION AND DELIVERY

A. General: Conform to CSSS Section 21 except as modified herein.

B. Bending and Forming: Fabricate indicated size bars into shapes and lengths shown on approved shop drawings by methods not injurious to materials. Do not heat reinforcement for bending. Bars with kinks or bends not in schedule will be rejected.

C. Marking and shipping: Bundle reinforcement and tag with suitable identification to facilitate sorting and placing, and transport and store at site so as not to damage material.

3.03 INSTALLATION

A. General: Conform to CSSS Section 21, CRSI 1MSP, and CRSI 1PLACE except as modified herein.

B. Reinforcement Welding: Where reinforcement welding is approved by the Engineer, perform welding by direct electric arc process, with trained and experienced certified operators. Conform to AWS D12.1. Use low-hydrogen electrodes. Do not tack weld reinforcing bars.

1. Preparation: Clean surfaces to be welded of loose scale and all foreign material. Clean welds each time electrode is changed. Chip burned edges clean before welds are deposited.

2. Characteristics of welds: When brushed with wire brushes, completed welds shall exhibit uniform section, smoothness of welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion with penetration into base metal. Cut out welds, or parts
of welds found defective, and replace with proper welds.

C. Concrete pours: At each location during concrete placing, inspect reinforcement and maintain bars in correct positions. Templates to maintain the correct position of reinforcing may be required. Contractor shall install templates, if required by the inspector, at no additional cost to the City.

D. Contractor shall receive approval in writing from the Engineer of all reinforcing work prior to ordering concrete for placement.

**END OF SECTION**
SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION:
A. Scope of Work: Unless otherwise directed or modified herein, conform to the applicable portions of CSSS Sections 10-5, 10-6, 10-23, 19, 20, and 21.
B. Related Work:
   1. Section 02740 – Surface restoration

1.03 SUBMITTALS
A. Manufacturer’s data:
   1. Proposed mix designs, including admixtures and fibermesh
   2. Curing Material
B. Certificates:
   1. Certificate of Compliance that concrete and reinforcement meets the specified requirements.
   2. Delivery tickets for all concrete delivered to the project site.
C. Shop drawings: Submit plan showing expansion and control joint placement for all slab pours in excess of 100 square feet.

PART 2 - PRODUCTS

2.01 GENERAL
A. Concrete shall conform to the applicable CSSS requirements for the respective Classes of concrete specified.
B. Up to 20 percent by weight of fly ash per CSSS Section 10-5.1 may be substituted for the required Portland cement, regardless of the concrete Class.
C. Use Class “B” concrete if no other Class is indicated.
D. Concrete used to replace sidewalks, curbs, and gutter sections shall contain one pound per cubic of lamp black added per cubic yard of concrete delivered.
E. Contractor shall add 1.5lbs of fibermesh per yard of concrete for all concrete mixes except the duct bank concrete. Fibermesh shall meet the requirements of ASTM C94 and C1116.
PART 3 - EXECUTION

3.01 GENERAL

A. Do not place any concrete until all inserted and/or buried items are installed in their proper locations, secured against displacement, cleaned, inspected and approved. Furnish ties and supports necessary to keep embedded items in place when concrete is placed.

B. Earth or Gravel Subgrade: Lightly dampen subgrade no more than 24 hours in advance of concrete placement. Reroll where necessary for smoothness and remove loose earth material.

C. Wetting: Prior to placing concrete, wet wood forms sufficiently to tighten up cracks. Wet all other materials sufficiently to reduce suction and maintain concrete workability.

D. The location of all joints is subject to approval of the Engineer prior to placement of concrete.

E. Perform curing per CSSS Section 20-13. Finish formed surfaces by removing any and all fins.

**END OF SECTION**
SECTION 09900
PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Contractor shall furnish all labor, materials, equipment, and incidentals necessary to perform all painting as shown on the drawings, and as specified herein, including, but not limited to:
   1. Exposed electrical conduit and exposed ductile iron pipe.
   2. The term “paint”, as used herein, includes enamels, sealers, stains, epoxies, and other coatings, whether used as prime, intermediate, or finish coats.

1.02 REFERENCE PUBLICATIONS

A. REFERENCES: This section contains references to the following documents. They are a part of this section as specified and modified. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<table>
<thead>
<tr>
<th>Federal Specifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS TT-E-529G</td>
</tr>
<tr>
<td>FS TT-P-645B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Society for Protective Coatings (SSPC) Specifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSPC SP-1</td>
</tr>
<tr>
<td>SSPC SP-6</td>
</tr>
<tr>
<td>SSPC PAINT25</td>
</tr>
<tr>
<td>SSPC-Paint 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>American Society for Testing and Materials:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A780</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Glidden, Ameritone, Fuller-Obrien, Rust-Oleum, H&C (a Division of Sherwin Williams), Monopole, Frazee, Dunn Edwards, or approved equal.
2.02 MATERIALS

A. General: Materials shall conform to the requirements of the Specifications listed herein, and the PAINTING SCHEDULE.

B. Semi-Gloss alkyd enamel shall conform to Federal Specification TT-E-529G. The associated Primer, unless otherwise approved, shall conform to either Federal Specification TT-P-645B, or SSPC Paint 25. Finish coats shall be the color selected by the Engineer.

C. Zinc dust-zinc oxide primer coatings for repair of galvanized surfaces shall conform to SSPC-Paint 5, ASTM A780, and shall contain at least 65% zinc dust by weight when dried.

D. The concrete floor in the electrical control room shall be painted with clear Monochem Aquaseal by Frazee Paint Co., or approved equal. Contractor shall apply the Monochem Aquaseal in the presence of the inspector to insure the sealer is applied correctly.

E. All motors, trash rack motors, concrete deck, and the trash rack shall be painted per the painting schedule in Section 3.09. The exposed sides and top of the concrete deck shall be painted per the painting schedule in this specification. The new paint shall match the existing paint and the Engineer will select the color from manufacturers color chart.

F. Polyamide Epoxy shall be a two component semi-gloss pigmented system with separately packaged base and curing agent. Solids content of the finish coat material shall be at least 55% by volume. Provide Sherwin Williams Tile-Clad High Solids, or Porter Coatings' PorterGlaze 4400 HB Semi-Gloss Epoxy, or approved equal finish coat. Use finish coat manufacturer's recommended primer.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint materials in sealed, original labeled containers, bearing manufacturer's name, type of paint, brand name, color designation, and instructions for mixing and/or reducing.

B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F in well ventilated areas.

C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

3.02 ENVIRONMENTAL CONDITIONS

A. Ensure surface and surrounding air temperatures are at least 60 °F, unless a higher temperature is recommended by the manufacturer, before applying paint.

3.03 PROTECTION

A. Adequately protect other surfaces from preparation and paint damage. Repair damage and remove all splattered paint as a result of inadequate or unsuitable protection.

B. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being painted and, in particular, surfaces within storage and preparation area.

C. Place cotton waste, clothes, and material which may constitute a fire hazard in closed metal containers and remove daily from site.
3.04 INSPECTION
A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing to the Engineer, any condition that may potentially affect proper application. Do not commence until such defects have been corrected.

3.05 PREPARATION OF SURFACES
A. Preparation of metallic surfaces shall be conducted in accordance with the applicable portion of the latest surface preparation specifications of the SSPC, and the coating manufacturer’s recommendations. Any sharp or rough areas shall be ground or filed smooth prior to initiation of surface preparation for painting.
B. Blast cleaning shall conform to SSPC SP-6 “Commercial Blast Cleaning”.
C. Solvent cleaning shall conform to SSPC SP-1 “Solvent Cleaning”.
D. Pressure washing shall be performed using commercial machines operating with a nozzle pressure of at least 1000 psi, unless otherwise approved.
E. Surfaces to be painted shall be clean before applying paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.
F. Remove mildew by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow surface to dry completely.
G. Remove dirt, powdery residue, and foreign matter from piping and metals designated for finishing.
H. Remove grease, rust, scale, dirt, and dust from steel and iron surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting, or any other approved method.
I. Sand and scrape shop primed steel surfaces to remove loose primer and rust. Feather-out edges to make touch-up patches inconspicuous. Clean surfaces with solvent.
J. Shop painted ferrous surfaces shall be protected from corrosion by treating and touching-up corroded areas immediately upon detection.
K. Concrete floors shall be cleaned and cured as specified in Section 03300, CAST-IN-PLACE CONCRETE, then prepared as specified by the coating manufacturer.

3.06 APPLICATIONS
A. General: All painting shall conform to the coating manufacturer's submitted, and approved, technical data and recommendations, and to the following general conditions:
1. Thickness of coating in mils shall mean the dry film thickness. The number coats specified shall mean the minimum number of coats to be used. Additional coatings shall be required if necessary to obtain the specified film thickness.
2. Prime coats, where called for, shall be provided as part of the painting system. Shop prime coats shall conform to the specified painting system for the given item. It shall be the responsibility of the Contractor to coordinate work so that factory primed items are primed or painted with a coating compatible with the specified painting system.
B. Paint may be applied by brush, roller, or spray except as hereinafter specified. At time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be applied so finished surfaces shall be free from runs, drops, ridges,
waves, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Each coat shall be applied as a film of uniform thickness.

C. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all surfaces, including edges, corners, crevices, welds, and rivets receive a film thickness equivalent to that of adjacent painted surfaces. Adequate ventilation shall be provided during paint application. Respirators shall be worn by all persons engaged in spray painting. Adjacent areas shall be protected by the use of drop cloths or other approved precautionary measures shall be taken.

D. The first coat shall include repeated touching-up of suction spots or overall applications of primer or sealer to produce a uniform color and gloss. Paint shall be applied only to surfaces that are completely free of surface moisture, as determined by sight or touch.

E. Coating Progress: Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified, as necessary, to suit adverse weather conditions. Oil base or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

F. Metal Surfaces: Apply all coats by spray, unless otherwise approved.

G. All galvanized metal surfaces shall be painted, unless specified otherwise.

H. Time Between Surface Preparation and Painting: Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practicable after such pretreatment has been completed, but prior to any deterioration of the prepared surface.

3.07 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Do not paint over nameplates or other identification plates.

B. Do not paint flexible conduit or wiring.

3.08 CLEANING

A. As work proceeds, and upon completion, promptly remove paint where spilled, splashed or spattered.

B. During progress of work keep premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.

C. Upon completion of work leave premises neat and clean, to the satisfaction of the Engineer.

3.09 PAINTING SCHEDULE
A. The following **PAINTING SCHEDULE** prescribes the surfaces to be painted, required surface preparation, and the number and types of coats of paint to be applied. Applied dry film thicknesses per coat shall conform to the manufacturer’s recommended thicknesses.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Surface Preparation</th>
<th>1st Coat</th>
<th>2nd Coat</th>
<th>3rd Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior galvanized surfaces touch-up</td>
<td>Touch-up damaged coatings per paragraph 2.02.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete masonry units, including retaining walls, and control building exterior and interior walls.</td>
<td>See paragraph 3.05</td>
<td>Two coats of H&amp;C Shield. Apply per manufacturer’s recommendations. Color shall be selected by the Engineer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal doors, door frames, louvers, gutters, &amp; trim of control building.</td>
<td>Solvent Clean, and prepare per paragraph 3.05</td>
<td>One coat of industrial grade primer per TT-P-645B, SSPC Paint 25, or approved equal.</td>
<td></td>
<td>Two coats. Color shall be weathered copper to match the color of the building roof.</td>
</tr>
<tr>
<td>Trash rake structure. Exposed conduit.</td>
<td>Solvent Clean, and prepare per paragraph 3.05</td>
<td>One coat of industrial grade primer per TT-P-645B, SSPC Paint 25, or approved equal.</td>
<td>Two coats of “City of Sacramento - Centari Brown” alkyd enamel from Spectra-Tone Paints (916) 722-7454, per TT-E-529G, or approved equal.</td>
<td></td>
</tr>
<tr>
<td>Existing metal pump motor housings and exposed pump columns.</td>
<td>Pressure wash, then wire brush, sand, scrape, and solvent clean, per paragraph 3.05</td>
<td>One coat of industrial grade primer per TT-P-645B, SSPC Paint 25, or approved equal.</td>
<td></td>
<td>Two coats of “City of Sacramento Hi-Lite Buff” alkyd enamel form Dunn Edwards, or approved equal.</td>
</tr>
<tr>
<td>Existing steel checker plate sump wetwell covers, sump support beams, sump ladder.</td>
<td>Blast clean.</td>
<td>One coat of manufacturer’s recommended primer.</td>
<td></td>
<td>Two coats of gray Polyamide Epoxy.</td>
</tr>
<tr>
<td>Galvanized surface Repair</td>
<td>Solvent Clean, per paragraph 3.05</td>
<td>Apply one coat SSPC-Paint 5</td>
<td>Apply two coats per TT-E-529G, or as approved.</td>
<td></td>
</tr>
<tr>
<td>Concrete floor of control building</td>
<td>See paragraph 3.05</td>
<td>Two coats of H&amp;C Shield. Apply per manufacturer’s recommendations. Color shall be light gray.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**END OF SECTION**
SECTION 16050 - ELECTRICAL WORK, GENERAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide electrical work, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section apply to all sections in Division 16, except as indicated otherwise. The work of this Section is required for operation of electrically-driven equipment provided under specifications in other Divisions.

C. Provide electrical work for complete and operable pumping including all pump controls and high-level alarms.

D. Vendor supplied electrical equipment and control panels shall meet requirements of Division 16.

E. All concrete, excavation, backfill, and steel reinforcement work required for encasement, installation, or construction of the work of the various sections of Division 16 is included as a part of the work under the respective sections, including duct banks, handholes, manholes and housekeeping pads.

1.02 APPLICABLE CODES AND REQUIREMENTS

A. The work of this Section and all sections in Division 16 shall comply with the latest editions of the following:

1. NEC (NFPA 70) – National Electrical Code
2. UL- Underwriters Laboratories
3. NEMA- National Electrical Manufacturers Association
4. NETA – International Electrical Testing Association
5. NFPA 820 – National Fire Protection Association
6. Title 8, Subchapter 5, California Administrative Code – Electrical Safety Orders (Cal-OSHA)

B. All electrical equipment shall be listed by and shall bear the label of UL, or by an independent testing laboratory acceptable to the Engineer.

C. Installation of electrical equipment and materials shall comply with the NEC, Cal-OSHA, state building standards, and applicable local codes and regulations.
D. Where the requirements of the specifications conflict with the NEC, UL, NEMA, or other applicable standards; the more stringent requirements shall govern as approved by Engineer.

1.03 SIGNAGE

A. Provide danger, caution, and warning signs and equipment identification markings in accordance with Cal-OSHA and NEC requirements. Provide the following signage at a minimum, unless otherwise stated in individual equipment specifications sections.

1. Arc Flash Labels – Provide Arc Flash labels as required per NEC Article 110.16. Inscribe the label with the maximum available fault current at Panelboard main breaker with the date of calculation, per NEC Article 110.24.

2. Local Disconnect Switches and Equipment Nameplates – Each local disconnect switch and equipment, shall be legibly marked to indicate its purpose. Plastic tag shall have minimum ¼-inch lettering. Incription shall include equipment name, equipment tag number, and the source of power.

3. Warning Signs- Provide signs near equipment that can start automatically, to read: “Caution Equipment to Start Automatically”.

1.04 INSPECTION OF THE SITE AND EXISTING CONDITIONS

A. If pre-bid meeting is required and it includes a site visit; visit the sites and determine conditions at the sites and at all existing structures in order to become familiar with all existing conditions and electrical systems which will, in any way or manner, affect the work required under this Contract. No subsequent increase in Contract cost will be allowed for additional work required due to failure to fulfill this requirement.

B. Protect all existing aboveground and underground utilities during construction. Pay for all repairs should damage to underground utilities occur during construction.

1.05 RESPONSIBILITY

A. Complete systems functionally operational in accordance with the intent of these Contract Documents.

B. Coordinating the details of facility and process equipment layouts and construction for all Specification Divisions which affect the work covered under Division 16.
C. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.

D. Coordination with other Division for equipment electrical, wiring and cable requirements.

E. Coordinate, provide and install all SMUD utility requirements for electrical services.

F. Submit a complete copy of red lined as-builts every month after the Notice to Proceed date in accordance with the Record Drawing requirements of Section 01105. At end of project, prior to final acceptance and final payment, field confirm red lined as-builts with City Operation and Maintenance staff. Confirmation shall review in field the installed work versus the red lined as-builts. City Operation and Maintenance staff must approve the red lined as-builts for project acceptance and payment.

1.06 INTENT OF DRAWINGS

A. The Contract Drawings indicate the extent, general location, and arrangement of equipment. Duct bank and conduit runs are diagrammatic and may not show the exact locations for installation. Verify the locations of conduit stub-ups based upon conduit entry space of equipment furnished from the manufacturer’s certified shop drawings and by inspection of the actual equipment to be installed. Coordinate with serving utilities and City for exact location of substructures.

B. In general, where the background on Contract Drawings has been screened, the area screened is work other than electrical, unless otherwise noted. Work under this Division 16 is shown heavier for contrast.

1.07 DUCTBANKS AND TRENCHES

A. “Duct banks” contain four or more conduits and shall be encased with non-reinforced concrete; refer to Detail DB. Electrical “trenches” contain three or less conduits and shall have sand backfill and concrete cap; refer to Detail TD.

B. As-built the duct banks and trenches. Provide physical locations with width and depth call outs.

1.08 SUBMITTALS

A. General

1. Provide manufacturers' descriptive information and shop drawings for all equipment, material, and devices furnished under Division 16. Submit
schematic (elementary) diagrams, equipment dimensional drawings, interconnection and connection diagrams, catalog cut sheet information, nameplate schedules, and calculations in accordance with Section 01105 and this Section. Device designations and symbols for schematic (elementary) connection or interconnection diagrams shall conform to the latest edition of NEMA ICS 1.

2. Submit complete electrical drawings for all equipment furnished in accordance with other Divisions that interface with electrical equipment. These drawings shall contain panel elevation, bill of materials, control schematic diagrams (complete with terminal numbers, device names, field equipment tag numbers) to provide complete identification of the circuits and provide coordination between the equipment. Both AutoCAD and PDF-type files are required.

3. Submit listing of equipment nameplates complete with inscriptions for review.

4. Check submittals for proper number of copies, adequate identification, correctness and compliance with Drawings and Specifications.

5. Submit Operation and Maintenance (O&M) Manuals per Section 01330.

B. Submit certified shop drawings and diagrams as follows, separate submittals for each facility:

1. Layouts indicating conformity with space requirements, including front and rear access requirements.

2. Detailed anchoring requirements, including stamped and signed seismic calculations confirming anchor type, size and depth.

3. Assembly drawings in sufficient detail to identify every part of the specified equipment, including bills of material.

4. General dimension, outline, and panel, section, and structure layout drawings showing the principal dimensions of the equipment, the location of all devices therein, and the size of electrical conduit windows and cable connections. Include front, rear, side elevations and top view. Include front and rear access requirements. Provide finish and materials, temperature limitations, and grounding requirements. Provide nameplate inscription schedule. Provide manufacturer anchoring requirements to confirm seismic results and equipment weights.

C. Seismic

1. Submit proof of compliance that the following electrical equipment items are seismically anchored: Panelboards, Motor Control Centers, VFD units and Soft-Starter unit. Proof of compliance shall include complete
anchorage details coordinated with equipment mounting provisions showing weights, calculations, anchoring points, welding, and any special considerations. Proof of compliance for each listed piece of equipment is to be prepared, stamped and signed by a licensed civil engineer in the state of California.

1.09 AREA DESIGNATIONS

A. General

1. Raceway system and enclosures shall comply with Section 16010.
2. Table 1 lists the type of Electrical Equipment and Materials to be used based on applied area in Table 2.

<table>
<thead>
<tr>
<th>Applied Area Classification</th>
<th>Enclosure, Pull or J-Box NEMA Rating</th>
<th>Device Box or Small Enclosure</th>
<th>Strut and Mounting Hardware</th>
<th>Exposed Conduit System</th>
<th>Concrete Encased Conduit System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior General</td>
<td>NEMA 12</td>
<td>Cast Steel</td>
<td>Electro-galvanized Steel</td>
<td>Rigid Galvanized Steel</td>
<td>N/A</td>
</tr>
<tr>
<td>Corrosive &amp; Class 1, Div.1</td>
<td>NEMA 7</td>
<td>304 Stainless Steel</td>
<td>304 Stainless Steel</td>
<td>316 Stainless Steel, Explosion Proof Flexible</td>
<td>N/A</td>
</tr>
<tr>
<td>Exterior Wet</td>
<td>NEMA 4</td>
<td>Cast Steel</td>
<td>304 Stainless Steel</td>
<td>Rigid Galvanized Steel</td>
<td>PVC SCH 40</td>
</tr>
<tr>
<td>Corrosive &amp; Class 1, Div.2</td>
<td>NEMA 4X (non-sparking) NEMA 7 (sparking)</td>
<td>PVC Coated Cast Steel</td>
<td>304 Stainless Steel</td>
<td>PVC Coated Rigid Galvanized Steel</td>
<td>PVC SCH 40</td>
</tr>
</tbody>
</table>

3. Table 2 identifies Area Classifications.
<table>
<thead>
<tr>
<th>Building/Facility</th>
<th>Area</th>
<th>Area Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Building</td>
<td>All Rooms</td>
<td>Interior General</td>
</tr>
<tr>
<td>Storm Drainage Sump (Storm)</td>
<td>Interior of Storm Wetwell</td>
<td>Corrosive &amp; Class 1, Div. 1</td>
</tr>
<tr>
<td></td>
<td>Outside of Storm Wetwell</td>
<td>Exterior Wet</td>
</tr>
<tr>
<td>Sewage Sump (Sewage)</td>
<td>Interior of Sewage Wetwell</td>
<td>Corrosive &amp; Class 1, Div. 1</td>
</tr>
<tr>
<td></td>
<td>Outside of Sewage Wetwell (60” high located 3’ from hatch edge)</td>
<td>Corrosive &amp; Class 1, Div. 2</td>
</tr>
<tr>
<td>Metering Vault</td>
<td>Interior</td>
<td>Corrosive &amp; Class 1, Div. 2</td>
</tr>
<tr>
<td>General Site</td>
<td>All exterior Site Areas not otherwise designated</td>
<td>Exterior Wet</td>
</tr>
</tbody>
</table>

4. Installations in hazardous locations shall conform to the requirements of the National Electrical Code.

B. Material Requirements

1. NEMA 4 and 12 enclosures shall be steel coated with ANSI 61 light grey polyester paint.

2. NEMA 4X enclosure material shall be 304 stainless steel.

1.10 TESTS

A. Furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor, due to damage resulting from damaged equipment or from testing and correction of faulty installation.

B. Factory Acceptance Testing shall take place within 100 miles of project site. If Factory Acceptance Testing is greater than 100 miles, reimburse City and Engineer for travel and lodging expenses at no extra cost to the City.

C. All test forms shall be submitted and approved prior to scheduling testing.

D. Provide a minimum of a two-week notification of Field Tests to the Engineer. Field Tests shall be witnessed and signed off by the Engineer in order to be considered valid.

E. NETA testing to be performed prior to energizing equipment.
1.11 TEMPORARY POWER AND LIGHTING

A. Provide temporary power and lighting for in accordance with NEC article 590. The average lighting level (foot-candle) shall meet OSHA 1926.56 and CAL-OSHA requirements.

1.12 DEFINITIONS (APPLICABLE TO SPECIFICATIONS AND DRAWINGS)

A. Above Grade – Not buried in ground and not embedded in concrete slab on ground.

B. Below Grade – Buried in ground and below floor-slab as applicable, and not embedded in concrete slab on ground.

C. Certified: – Confirmed to be accurate, or as represented, or as meeting standards.

D. Concealed – Inside building above grade and located within walls, furred spaces, crawl spaces, attics, above suspended ceiling, etc. In general, any item not visible or directly accessible.

E. Connect – Complete hookup of item with required services, including conduits, wires, and other accessories.

F. Engineer- Design Engineer, Inspector, or City of Sacramento designated construction coordinator

G. Exposed – Either visible or subject to mechanical or weather damage, indoor or outdoor, include areas such as mechanical and storage rooms. In general, any item that is directly accessible without removing walls, panels, ceilings or other parts of structure.

H. Underground – Buried in ground, including under building slabs.

I. Wiring – Electrical conduit, raceway, conductors and connections.

1.13 WARRANTY

A. The warranty for all provided equipment shall be not less than one year after approved and witnessed startup and receipt of approved as-built drawings and O&M Manuals, or City beneficial use, whichever is later.

PART 2 - PRODUCTS

2.01 GENERAL
A. All equipment and materials shall be new, shall be listed by UL, and shall bear the UL label where UL requirements apply. All equipment and materials shall be the products of experienced and reputable manufacturers in the industry. Similar items in the work shall be products of the same manufacturer. All equipment and materials shall be of industrial grade standard of construction.

B. Where a NEMA enclosure type is indicated in a non-hazardous location, utilize that type of enclosure, despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.

### 2.02 MOUNTING HARDWARE

A. Miscellaneous Hardware

1. All nuts, bolts, and washers shall be 304 stainless steel.
2. Threaded rods for trapeze supports shall be continuous threaded, galvanized steel, and 3/8-inch diameter minimum.
3. Strut materials shall be per Table 1 in paragraph 1.10 Area Designations.
4. Where contact with concrete or dissimilar metals may cause galvanic corrosion, suitable non-metallic insulators shall be utilized to prevent such corrosion. Where ends are exposed from cutting, coat ends of strut with zinc rich galvanizing compound.
5. Anchors for attaching equipment to concrete walls, floors and housekeeping pads shall be 304 stainless steel chemical anchors unless Contract Drawing details call for cast in place anchorage.

### 2.03 ELECTRICAL IDENTIFICATION

A. Submit list of electrical equipment with associated tag inscription and tag materials for approval.

B. All conduits, cables and individual wires shall be labeled. All terminal blocks shall be labeled.

C. All equipment, control devices, and panels shall include nameplate with description and tag number.

### 2.04 EQUIPMENT FINISH

A. Provide materials and equipment with manufacturers, standard finish application system with ANSI 61, light gray. Provide two spray cans of touchup paint, for each color. Some exterior equipment shall have other finish applied as specified in the individual equipment specifications.
2.05 OUTDOOR EQUIPMENT

A. Provide equipment and devices to be installed outdoors capable of continuous operation within an ambient temperature range of 0° C to 50° C. Equipment must be capable of proper operation at rated output continuously in this ambient temperature range in direct sun.

PART 3 - EXECUTION

3.01 GENERAL

A. Incidentals: Provide all materials and incidentals required for a complete and operable system, even if not required explicitly by the Specifications or the Drawings. Typical incidentals are terminal lugs not furnished with vendor supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor furnished equipment to connect with other equipment indicated in the Contract Documents.

B. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. Exact locations shall be determined based on the physical size and arrangement of equipment, finished elevations, and other obstructions.

1. Where "home runs" are shown, route the conduits in accordance with the indicated installation requirements. Routings shall be exposed or encased as indicated.

2. All conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Lighting fixture locations and sensors shall be adjusted to avoid obstructions, hatches, openings and room reserved for equipment removal.

C. Workmanship: All materials and equipment shall be installed in strict accordance with the printed recommendations of the manufacturer. Installation shall be accomplished by workers skilled in the work. Installation shall be coordinated in the field with other trades to avoid interferences.

D. Protection of Equipment and Materials: Protect all materials and equipment against damage from any cause. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, dust, dirt, plaster, or paint. All moving parts shall be kept clean and dry. Replace or
refinish all damaged materials or equipment, including face plates of panels, at no additional expense to the contract.

E. Cap and label all spare conduits. Include pull tape in all spare conduits.

3.02 CONCRETE SLABS ON GRADE

A. Concrete slabs on grade shall be provided for all outdoor free-standing electrical equipment. Slabs on grade shall be four inches above the surrounding grade and a minimum of two inches larger in all dimensions than the equipment, or greater if required by anchoring calculations or shown on Contract Drawings.

3.03 EQUIPMENT ANCHORING

A. Floor-supported equipment and conduits shall be anchored in place by methods that will meet project seismic requirements.

B. Anchoring methods and leveling criteria specified in the printed recommendations of the equipment manufacturers are a part of the work of this Contract. Such recommendations shall be submitted as shop drawings.

3.04 EQUIPMENT IDENTIFICATION

A. General: Equipment and Devices shall be Identified as Follows:

1. Nameplates shall be provided for all equipment and instruments. Equipment description and equipment tag number, and electrical power source shall be utilized on all nameplates. If no tag number is given, assign and submit a number for approval.

2. All conduits and cables shall be labeled. Provide conduit tag, cable tag and wire tag label inscriptions for all new work. If no tag number is given, assign and submit a number for approval.

3. Furnish typewritten circuit directories for all panelboards; the circuit directory shall accurately reflect the load description connected to each circuit.

3.05 CUTTING AND PATCHING

A. Lay out work carefully in advance. Do not cut, drill, or notch any structural member or building surface without the specific approval of the Engineer. Carefully carry out any 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 neatly to original condition.
3.06 LOAD BALANCE

A. The Contract Drawings and Specifications indicate circuiting to electrical loads and distribution equipment. Balance electrical load between phases as nearly as possible on panelboards.

3.07 PHASE ARRANGEMENT, MOTOR AND GENERATOR ROTATION

A. The phase arrangement on three phase buses in electrical equipment shall be A, B, C (1, 2, 3) from front-to-back, top-to-bottom, left-to-right as viewed from the front of equipment or Panelboard.

B. Coordinate with SMUD to insure clockwise rotation A, B, C (1, 2, 3) as verified by the Panelboard phase rotation relay.

C. After final service connections are made, check and correct the rotation of all motors and any fixed generator. Coordinate rotation checks with equipment preoperational testing. Correct any discrepancies by shifting motor or generator conductors.

3.08 CLEANING AND TOUCHUP PAINTING

A. Keep the premises free from an accumulation of waste material or rubbish. Upon completion of the work, remove all materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and surface of the original finish. If extensive damage is done to equipment paint surfaces, refinish the entire equipment in a manner that provides a finish equal to or better than the factory finish, that meets the requirements of the Specifications, and that is acceptable to the Engineer.

B. The interior of all electrical equipment and panels and enclosures, including windings of dry type transformers, shall be vacuumed and wiped free of dust just before final acceptance. Shutting off equipment to clean and wipe down shall be done at times as approved by the Engineer.

3.09 INSPECTION

A. Allow materials, equipment, and workmanship to be inspected at any time by the Engineer and City or their representatives. Any material not inspected and covered; such as in a trench or wall shall be exposed without any additional compensation.
B. Correct the work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a manner satisfactory to the Engineer.

3.10 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals in hard cover, 3-ring binders, bound volumes per each facility, number as required to accommodate material 8½-inch x 11-inch for text and 11-inch x 17-inch half-sized drawings and also in accordance with provisions of Section 01770. Provide the number of copies specified. Electrical and Instrumentation O&Ms shall include the following as a minimum:

1. Operation, maintenance, recommended spare parts, and renewal parts information for all equipment furnished under this Section.
2. Set of complete, final, as-reviewed and accepted manufacturer's or vendor's descriptive information.
3. As-built electric schematics, equipment, elevations, layouts, and installation drawings showing equipment as it was actually installed and connected. Provide PDF and AutoCAD formats on disk within O&Ms.
4. Index of all equipment suppliers with a list of current names, addresses, and telephone numbers of those who should be contacted for service, information, and assistance.
5. All factory and field test results.
6. Information listed under individual specification submittal requirements.
7. Complete facility Interconnection Diagrams for all equipment except lighting and receptacles. Show field wiring from equipment origin numbered terminal to destination numbered terminal in block diagram format. Include wire labels, cable labels, conduit numbers, handholes, junction boxes, etc.

3.11 RECORD DRAWINGS

A. Provide two sets of full-sized marked-up as-built Contract Drawings in accordance with specifications. Show all departures from original Drawings, underground cable, conduit, or duct runs dimensioned from established building lines, and all electrical work revisions. As-built drawings shall be initialed by the Engineer prior to submission for drafting. Obtain two new, clean sets of Contract Drawings for as-built production after each as-built submittal.

3.12 SERVICE CONTINUITY, START-UP AND SHUTDOWNS
A. Make no outages without the prior written authorization of the Engineer. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work. Shutdowns and startups shall be scheduled two weeks in advance, upon approval from the Engineer. Schedule of shutdowns and startups shall be limited between Tuesday and Thursday from 9:00 a.m. to 3:00 p.m., unless prior approval has been given from the Engineer.

3.13 TESTING

A. All testing shall be witnessed by the Engineer. All testing sheets shall be signed off by the Engineer to be considered valid. Refer to Sections 01650 and 16950 for further testing requirements.

B. Perform miscellaneous conductor testing and wiring device testing per Sections 16120 and 16140 during the Pre-Demonstration period.

C. Pre-Demonstration work under Division 16 and Division 17 includes: Factory Acceptance Testing, Manufacturer certification, Instrumentation Supplier certification, NETA Field Testing, equipment start-up, instrumentation simulation, PLC inputs/outputs and SCADA verification, approval of electrical and instrumentation O&M Manuals, and electrical and instrumentation training.

END OF SECTION
SECTION 16110 - ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide electrical raceway systems, complete and in place, in accordance with the Contract Documents.

B. All substructures utilized for Sacramento Municipal Utility District (SMUD) secondary service, including underground conduits, pole risers, and required substructures, shall be per SMUD standards.

1.02 SUBMITTALS

A. Submittals shall be furnished in accordance with General Requirements and Section 16050 – Electrical Work, General.

B. Submit shop drawings and catalog data sheets of all raceways, fittings, boxes, supports, handholes, manholes, and mounting hardware; marked where applicable to show proposed materials and finishes.

C. Manhole shop drawings showing dimensions, construction details, racks, materials, coatings and cover inscriptions.

D. Fire stop shop drawings showing wall or floor fire rating, materials, depth and penetration dimensions; firestop dimensions, materials, installation instructions and fire rating of the assembly. Manufacturer’s training certificates for all personnel installing fire stops.

E. Submit nameplate inscription schedules for approval.

F. Manufacturer’s training certificates for all personnel installing PVCRGS.

1.03 QUALITY ASSURANCE

A. Seismic Design Requirements: All raceway systems to be furnished under this Section shall be designed and constructed to meet the seismic requirements of Section 16050 – Electrical Work, General.

PART 2 - PRODUCTS

2.01 GENERAL

A. Pull and junction boxes, fittings, and other indicated enclosures which are dedicated to the raceway system, shall comply with the requirements of this Section.

B. Electrical metallic tubing, intermediate metallic conduit, set-screw type couplings or fittings are not allowed.
C. No conduit shall be smaller than ¾-inch. All underground conduits shall be a minimum of one inch.

D. Conduits containing manufacturer cables shall be sized based on approved manufacturer cable at minimum 40-percent fill, unless approved by the Engineer.

2.02 RIGID GALVANIZED STEEL (RGS) CONDUIT
A. Rigid steel conduit shall be mild steel, hot-dip galvanized inside and out.
B. Rigid steel conduit and all appurtenances shall be manufactured in accordance with ANSI C80.1 and UL-6.
C. Acceptable products include: Allied Tube & Conduit, or equal.

2.03 RIGID NON-METALLIC (PVC40 & PVC80) CONDUIT
A. Rigid non-metallic conduit shall be Schedule 40 PVC, sunlight resistant, UL listed for concrete encasement. Conduit shall have factory-formed bell on one end.
C. Conduit shall be marked for use with conductors having 90° C insulation.
D. Provide PVC Schedule 80 conduits for primary and secondary electrical service as required by the Sacramento Municipal Utility District.
E. Acceptable products include: Carlon Plus PVC, or equal.

2.04 RIGID PVC COATED GALVANIZED STEEL (PVCRGS) CONDUIT
A. The conduit, prior to PVC coating, shall meet the requirements for RGS conduit above.
B. PVC coating shall be manufactured in accordance with NEMA RN-1 and UL-6. The PVC coating shall be bonded to the outer surface of the galvanized conduit. The bond between the coating and the conduit surface shall be greater than the tensile strength of the coating.
C. PVC coating thickness shall be not less than 40 mils. Interior coating shall be minimum 2 mil urethane. All male threads on conduit, elbows and nipples shall be protected by urethane coating.
D. Acceptable products include: Robroy Plasti-Bond Red, T&B OCAL-Blue, or equal.

2.05 STAINLESS STEEL (SSC) CONDUIT
A. Stainless steel conduits, couplings, and fittings shall conform to UL-6A and manufactured with 316 grade stainless steel.

B. Acceptable products include: Calbrite Stainless Steel Conduit Systems, or equal

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Liquidtight flexible metal conduit shall be constructed of a flexible hot dipped galvanized steel core with a sunlight resistant thermoplastic outer jacket conforming to UL-360.

B. Acceptable products include: AFC Cable Systems Type LFMC or equal.

2.07 EXPLOSIONPROOF FLEXIBLE METAL CONDUIT

A. Explosionproof flexible conduit shall conform to requirements of Class I, Division 1 hazardous atmospheres per NEC Articles 500 series.

B. Flexible length shall consist of asphalt impregnated woven cloth duct, brass inner core, and bronze braid covering. End fittings shall be forged brass or cast bronze.

C. Provide special lengths and conduit size as noted on Contract Drawings. For example, gas analyzer cable shall be encased in ½” by 84” long explosionproof flexible metal conduit.

D. Acceptable products include: Crouse-Hinds #ECGJH series, or equal.

2.08 FITTINGS AND CONDUIT BODIES

A. General

1. All cast and malleable iron fittings for use with metallic conduit shall be the threaded type with five full threads.

2. All fittings and conduit bodies shall have neoprene gaskets and non-magnetic stainless steel screws. All covers shall be attached by means of holes tapped into the body of the fitting. Covers for fittings attached by means of clips or clamps will not be allowed.

3. Conduit, fittings, and conduit bodies in hazardous locations shall be suitable for the Class and Division indicated.

B. Fittings and Conduit Bodies for RGS Conduit

1. Use insulated throat grounding bushings for all rigid steel conduit ends. Bushings shall be threaded zinc-plated malleable iron grounding bushings with bonding screw and insulated throat rated for 150 degrees C. Acceptable products include: T&B Grounding and Bonding Bushings, OZ Gedney Type BLG, Appleton Threaded Grounding Bushings, or equal.
2. Watertight hubs for rigid steel conduit shall be male thread type zinc-plated malleable iron with recessed “O” ring sea, insulated throat and ground bonding locknut. Acceptable products include: OZ Gedney Type CHM-T, Myers STG series, or equal.

3. For conduits bodies for rigid steel conduit sized as required by the NEC, use cast iron conduit bodies and covers with captive stainless steel screws and neoprene gaskets. Acceptable products include: Crouse-Hinds Form 8 threaded condulets, OZ Gedney Form 8 threaded conduit bodies, or equal.

C. Fittings for Liquidtight Flexible Metal Conduit

1. Liquidtight flexible metal conduit fittings shall have cadmium-plated malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral and o-ring seals around the conduit and box connection and insulated throat. Only straight or 45° fittings shall be used, 90° or elbow fittings are not acceptable.

2. For areas designed as corrosive, use galvanized steel-insulated throat connectors for liquid-tight flexible metal conduit, suitable for use in wet locations, with a minimum 40 mil PVC exterior coating and pressure sealing sleeves. Acceptable products include: Robroy Plasti-Bond Red Liquid-tight Connectors, Occidental Coating Company OCAL-Blue Double-Coat Sealtight Connectors, Perma-Cote Industries Supreme Liquid-tight Connectors, or equal.

D. Fittings and Conduit Bodies for PVC conduit

1. All fittings for use with rigid non-metallic conduit shall be PVC, solvent welded type schedule 40 or 80 compatible with the conduit.

2. Provide standard and special radius 22.5°, 45° & 90° elbows, standard, long line, repair & 5° couplings, male & female terminal adaptors, end bells, expansion joints, and tapered conduit plugs. Acceptable products include: Kraloy special radius elbows, CPxx, 5ECxx, LLCxx, RECxx, TAxX, FAxx, MEBxx, UTPxx series, or equal.

E. Fittings and Conduit Bodies for PVCRGS conduit

1. Hubs for PVCRGS conduit shall have a minimum 40-mil PVC exterior coating, a urethane interior coating, and pressure sealing sleeves. Acceptable products include: Robroy Plasti-Bond Red Type ST Hub, Perma-Cote Industries Supreme Type ST Hub, T&B OCAL-Blue Double-Coat Type ST Hub, or equal.

2. Conduit bodies for use with PVCRGS conduit shall be cast iron conduit bodies and covers with captive stainless steel screws, 40-mil PVC exterior coating with 2-mil internal urethane coating, and pressure sealing sleeves on all conduit openings. Acceptable products include: Robroy Plasti-Bond Red Form 8 Conduit Bodies, T&B OCAL-Blue Double-Coat Form 8 Conduit Bodies, Perma-Cote Industries Supreme Form 8 Conduit Bodies, or equal.
2.09 JUNCTION AND PULL BOXES

A. Junction and pull boxes shall be provided as required to make the installation in accordance with NEC. Size junction and pull boxes in accordance with the NEC for the conduit sizes and number of conductors enclosed in the box. Enclosure NEMA rating shall be per Section 16050-1.09 Area Designations, Table 1 and Table 2.

B. Cast steel boxes shall be rated NEMA 3R, fabricated from cast ferrous alloy finished with zinc electroplate and aluminum polymer paint. Integrally cast threaded hubs or bosses shall be provided for conduit entrances and shall provide for full 5-thread contact on tightening. Drilling and threading shall be done before galvanizing. Cover plates shall be of similar hot-dip galvanized cast ferrous alloy material. A full body neoprene gasket shall be provided with the cover. Type 316 stainless steel screws shall be provided for covers. Exposed boxes requiring surface mounting shall have integrally cast mounting tables. Embedded boxes shall have a bonded PVC jacket. Acceptable products include: OZ Gedney FD Series, Crouse-Hinds FD Series, Appleton FD Series, Occidental Coating Company OCAL FD Series, or equal.

C. NEMA 4 rated enclosures shall be 14-gauge or 16-gauge with continuously welded seams, continuous door hinge, external operating clamp cover, external mounting feet, internal panel, ground stud on panel and door, oil-resistant gasket and a polyester powder coating inside and outside. Acceptable products include: Hoffman Bulletin A51NF Boxes, or equal.

D. NEMA 4X rated enclosures shall be 14-gauge or 16-gauge 304 stainless steel with continuously welded seams, continuous door hinge, external operating clamp cover, external mounting feet, internal panel, ground stud on panel and door, oil-resistant gasket. Acceptable products include: Hoffman Bulletin A51S Boxes, or equal.

E. NEMA 7 enclosures shall be rated for Class I, Division 1, Group D hazardous atmospheres, zinc electroplated cast ferrous alloy with external mounting tabs. Conduit hubs and covers shall provide 5-thread contact. Acceptable boxes include: Crouse-Hinds GUJ, EAB & GUB series, or equal. Acceptable larger enclosures include: Appleton AJBEWxxxxxx, or equal.

F. NEMA 12 rated enclosures shall be 14-gauge or 16-gauge steel with continuously welded seams, continuous door hinge, external operating clamp cover, external mounting feet, internal panel, ground stud on panel and door, oil-resistant gasket and a polyester powder coating inside and outside. Acceptable products include: Hoffman Bulletin A51CH, or equal.
2.10 HANDHOLES

A. Handholes and special marking covers shall be designed for AASHTO H-20 traffic loading. Boxes shall include extensions for interior dimension shown on Contract Drawings. Handhole covers shall be checker plate, hot-dip galvanized after fabrication and provided with security “Penta” style bolts.

B. Handholes shall be escribed “ELECTRIC” or “SIGNAL” along with the equipment number permanently identified on the cover.

C. Acceptable products include: Christy Concrete B1017, B1324, or B1730 with extensions, check plate hot dipped galvanized cover, and security bolts, or equal.

2.11 MANHOLES

A. Manholes shall be reinforced precast concrete designed to withstand AASHTO H-20 loading at the depth shown on the drawings. Cover, neck and extensions shall be 36-inch clearance. Top slab shall be grooved to accept extension rings. Manhole joints and extension rings shall be sealed with Henry Ram-Nek primer and joint sealer, or equal. Manhole exterior shall be coated with 2#/yd² crystalline waterproofing Xypex Concentrate, or equal.

B. Duct entries shall be Schedule 40 PVC endbells cast into the manhole walls minimum 14” above floor and below ceiling. Pulling eyes shall be #304 stainless steel located on each wall and rated for 10,000# pulling force. Ground pig tails #4/0 copper shall be stubbed out of each duct entrance window and exothermically welded to ground plate on the interior walls. Floors shall slope to drain into a 12” sump. Each manhole shall be supplied with 304 stainless steel access ladder.

C. Manhole covers shall be cast with embossing: “DANGER-CONFINED SPACE”. Manholes containing medium voltage conductors shall have the cover additionally embossed: “DANGER-HIGH VOLTAGE”. Manhole equipment number shall be permanently identified with welded inscription on the cover.

2.12 MANHOLE AND HANDHOLE CABLE RACKS

A. Cable racks shall consist of 50% glass-reinforced polymer nonmetallic material with nominal 250# load rating. Manhole cable racks shall be a 36” wall stanchion with slots accepting removable arms nominal size 4”W, 20”L. Handhole racks shall be one piece arms nominal size 3”W, with 5”H mounting surface. Acceptable products include: Underground Devices CR36B, RA20LP, HDL, MMxx series, or equal.
2.13 DUCTS AND SPACERS

A. Underground ducts shall be Schedule 40 PVC with non-reinforced concrete encasement for four or more ducts.

B. Underground ducts shall be Schedule 40 PVC with concrete cap for three or less ducts.

C. Concrete shall be per Section 03300 for duct banks, colored red.

D. Refer to Section 16110 – Electrical Raceway Systems for PVC conduit specification. Provide end bells on all conduit ends.

E. Acceptable products include: Carlon Snap-Loc Spacers, or equal, with minimum 2" duct separation.

2.14 WARNING TAPE

A. Provide heavy-gauge, red, non-adhesive polyethylene tape of six-inch minimum width, four-mil nominal thickness, with black lettering, for use in trenches containing electric circuits. Use tape with the following printed warning: “CAUTION-ELECTRIC LINE BURIED BELOW”.

B. Acceptable products include: Harris Industries, Inc. Underground Tape Catalog No. UT-29, or equal.

2.15 CABLE TRAYS

A. Cable trays shall be plain finish 6063-T6 aluminum alloy welded construction, NEMA VE1 load class 12C. Tray shall have 5” side rail height of I-beam configuration, 1” wide bottom rungs on 9” centers, 24” width, unless shown otherwise on the drawings. Nominal one-rail mechanical properties shall be $I_x = 2.28\text{-in}^4$ and $S_x = 0.859\text{-in}^3$.

B. Cable tray system mating fittings shall be the same material as the straight sections with 3” tangent overlap, 12” minimum radius and 304 stainless steel hardware. Fittings shall include: horizontal elbows, tees & reducers, vertical inside & outside elbows, covers, splices, fire wall penetration sleeves and compatible accessories.

C. Acceptable products include: Legrand Itray PW 5A12C series, or equal.

2.16 SEALING FITTINGS AND UNIONS

A. Conduit seals and unions shall conform to UL 886 and the requirements of Class 1, Division 1 and 2, Group D, hazardous atmospheres per NEC Article 500 series.
B. The seal fittings shall be fabricated from cast ferrous alloy finished with zinc electroplate and aluminum acrylic paint. All vertical fittings shall be provided with stainless steel drain fittings. Sealing compound used for seal fittings shall be rated for hazardous area. Unions shall be electrogalvanized ferrous alloy type.

C. Acceptable products include: Crouse-Hinds Type EYS & EYD series with Chico A&X, Appleton UNF & UNY, Crouse-Hinds UNF & UNY, or equal.

2.17 EXPANSION/DEFLECTION COUPLINGS

A. Provide expansion/deflection couplings for use wherever conduit crosses an expansion joint. The couplings shall alleviate longitudinal, angular, and shear conduit stress caused by differential settlement. Acceptable products include: Crouse-Hinds Type XD, Appleton Deflection and Expansion Couplings, or equal.

2.18 CONDUIT TAGS

A. Provide permanent, stainless steel conduit tags with conduit numbers as designated on the conduit schedule drawings, pressure stamped onto the tag. Tags relying on adhesives or taped-on markers are not acceptable. Attach tags to conduits with 316 stainless steel tie wire at each end of the conduit.

B. Conduit tags in underground installations shall be engraved phenolic tags and applied with epoxy to the wall of the manhole or handhole above the conduit entrance, or attached to conduit end bell with black nylon cable tie.

C. Conduit tags shall be provided for all conduits requiring new cables.

2.19 SUPPORTS AND FITTINGS

A. Strut and mounting hardware shall be per Table 1 in Section 16050 – Electrical Work, General.

B. Strut and mounting hardware shall be sized to meet seismic requirements.

C. Strut and mounting hardware shall be stainless steel. All conduit supports and conduit fittings shall be of same material as conduit, including pipe straps, clamp back spacers, beam clamps, and other supports and fittings. For example, if conduits are PVC coated galvanized rigid steel, all conduit clamp back spacers shall be PVC coated galvanized rigid steel.

2.20 CONDUIT PENETRATION SEALS AND SLEEVES

A. Conduit penetration seals shall be a modular, mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the opening. The elastomeric element
shall be sized and selected per the manufacturer’s recommendations and shall be suitable for use in standard service applications.

B. Sleeves shall be the thermoplastic type with water stops, suitable for poured wall construction.

C. Conduit penetration seals and sleeves shall be complete assemblies supplied by a single manufacturer.

D. Acceptable products include: Thunderline Corporation Link-Seal and Plastic Sleeves, Calpico Inc. Pipe Linx and Plastic Sleeves, or equal.

2.21 DUCT SEAL

A. Duct seal shall be a non-hardening compound designed as a waterstop and moisture barrier for sealing the annular space between conduit and electrical conductors and cables.

B. Acceptable products include: O-Z Gedney DUX, or equal.

2.22 PULL TAPE

A. Pull tape shall be minimum ½-inch in width, suitable for 1,250 pounds of pull strength.

B. Acceptable products include: Neptco Muletape WP1250P, or equal for non-detectable pull tape.

2.23 FIRESTOPS

A. Fire stop sealant/packing and pillow/putty systems shall have either intumescent, endothermic or ablative property with fire rating 1 through 4-hours in conformance with ASTM E814. Fire stop shall be equal to the wall or ceiling in which the penetration is located.

B. Fire stop sealant shall have intumescent expansion of up to 10 times original size when exposed to 300°F heat source, rated up to 4-hours. Packing material shall be asbestos-free, inorganic woven material Acceptable products include: 3M Fire Barrier Sealant and Packing CP25WB+, PM4 or equal.

C. Fire stop pillows shall be self-locking, graphite-free, intumescent material rated up to 3-hours. Pillow shall have a release feature for reuse or reconfiguration. Putty shall be moldable, self-adhering, intumescent material rated up to 4-hours. Acceptable products include: 3M Fire Barrier Self-Locking-Pillows and Moldable Putty+, or equal.

PART 3 - EXECUTION

3.01 GENERAL
A. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for this purpose. Factory elbows shall be utilized wherever possible.

B. Raceway sizes shown on Drawings are minimum dimensions based on designed equipment.

C. Conduits located underground shall be red colored concrete capped where three or less conduits in common trench, or encased in non-reinforced red colored concrete where duct banks contain four or more conduits. Duct bank conduits shall be supported with conduit spacers installed every five feet. Provide a minimum cover of two feet over the top of conduit for all underground raceways.

D. Underground raceways shall be inspected and approved prior backfill or concrete placement. Where raceways are indicated but routing is not shown, such as home runs or on conduit schedules; raceway routing shall be in accordance with the NEC.

E. Routings shall be adjusted to avoid obstructions. Coordinate with all other trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be at no extra cost to the City.

F. All exposed raceways shall be installed at least ½-inch from walls or ceilings by the use of clamp backs or struts.

G. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.

3.02 SUPPORT

A. Support raceways at intervals not exceeding NEC requirements unless otherwise indicated. Support all raceways from structural members only. Do not support from pipe hangers or rods or other conduit.

B. Support flexible metal conduit with conduit clamps, except where the flexible metal conduit is fished and where sections less than four feet in length are used in concealed areas and as approved by Engineer.

3.03 BENDS

A. Make changes in the direction of runs with symmetrical bends or cast metal fittings. Make bends and offsets of the longest practical radius. Avoid field-made bends and offsets where possible; but, where necessary, make with an acceptable hickey or conduit bending machine.
B. Make bends in parallel or banked runs of raceways from the same center or centerline so that bends are parallel and of neat appearance. Factory elbows may be used in parallel or banked raceways if there is a change in the plane of the run and the raceways are of the same size. Otherwise, make field bends in parallel runs.

C. For PVC Schedule 40 and Schedule 80 conduits, use factory made elbows for all bends 30 degrees or larger.

D. Make no bends in flexible conduit that exceed allowable bending radius of the cable to be installed or that significantly restricts the conduits flexibility.

### 3.04 CONDUIT TO ENCLOSURE CONNECTIONS

A. Where conduit enters metal enclosure within Interior General areas, install an insulated throat grounding bushing on the end of each conduit. For all other areas install insulated throat grounding hub. Install a bonding jumper from the bushing to equipment ground bus or ground pad. Interconnection of bonding jumpers from each conduit grounding bushing to the equipment ground bus or ground pad is acceptable. If neither a ground bus or ground pad exists, connect the bonding jumper to the metallic enclosure with a bolted-lug connection.

B. All NEMA 4 and 4X enclosures without integral watertight hubs shall be connected with insulated throat grounding hubs. The conduit connections shall maintain the integrity of the enclosure NEMA rating. Liquid-tight PVC jacketed flexible metal conduit connections shall be corrosive resistant, watertight hub.

### 3.05 TRENCHING

A. Verify the location of all existing cables, conduits, piping, and other equipment in or near the areas to be trenched, prior to starting trenching. Repair any equipment damaged during trenching. Call an Underground Service firm before trenching. Trenches shall not be left unattended unless the area is fenced or barricaded to restrict entry to the area.

### 3.06 DUCT BANKS

A. Support raceways installed in fill areas to prevent accidental bending until backfilling is complete. Tie raceways to supports, and raceways and supports to the ground, so that raceways will not be displaced when concrete encasement or earth backfill is placed.

B. Arrange multiple conduit runs substantially in accordance with any details shown on the drawings. Make minor changes in the location or cross-section as necessary to avoid obstructions or conflicts. Where raceway
runs cannot be installed substantially as shown on submitted and approved layout drawings because of conditions not discoverable prior to digging of trenches, refer the condition to the Engineer for instructions before further work is done. Determine exact alignment and depth as required to avoid other utilities.

C. Where other utility piping systems are encountered or being installed along a raceway route, maintain a 12-inch minimum vertical separation between raceways and other systems at crossings. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the Engineer for instructions before further work is done.

D. Duct bank and trenching alignments shown on Drawings are diagrammatic. Actual alignments shall contain no sharp bends and shall be installed with minimum radius bends as required in the NEC or installed cable, whichever requires a larger radius bend.

E. Provide bell-ends on all PVC conduits entering handholes, stubbing up into transformer precast pad, and under open bottom floor mounted panelboards.

3.07 CONCRETE ENCASEMENT AND CONCRETE CAP

A. Encase or cap all underground conduits with red colored concrete per Section 03300.

B. Hold conduits for concrete-encased raceways securely in place by conduit spacer supports.

C. Envelopes may be poured directly against the sides of trenches if the cut is clean, even, and free of loose material. Remove loose material from trenches before and during the pouring of concrete to ensure sound envelopes. Carefully spade concrete during pouring to eliminate all voids under and between raceways and honeycombing of the exterior surface.

D. Do not use power-driven tampers or agitators unless they are specifically designed for the application.

E. Backfill material or above concrete envelope of concrete-encased conduit or concrete cap, may be selected from the excavated material if it contains no particles larger than three inches in diameter and is free from roots or debris. Imported material meeting these same requirements may be used in lieu of material from the excavation. Compact backfill in maximum 12-inch layers to at least 95 percent of the maximum density at optimum moisture content as determined by AASHTO T180.

3.08 HANDHOLES AND MANHOLES
A. Provide excavation, backfilling, compaction and grading, etc., in accordance with requirements specified in Contract Documents.

B. Do not install handholes until final grading has been determined. Set frames just above final grade so that the site drains away from the handholes.

C. Make the installation so that raceways enter handholes at nearly right angles and as near as possible to one end of a wall, unless otherwise indicated.

D. Provide for over-excavation of the handhole foundation area and furnish minimum of one-foot depth of ¾-inch drain rock below the handhole.

E. Manhole and handhole racks shall be installed with 304 stainless steel chemical anchors with length sized for the cables. Secure cables in phase or control groups with tie wraps.

3.09 SMUD SUBSTRUCTURES
A. Install substructures including excavation, backfilling, compaction and grading, etc., in accordance with SMUD requirements. Install the grounding system for the Utility Meter in accordance with SMUD requirements. SMUD requires a pre-construction meeting with their field inspector prior to starting work and for approvals during installations involving SMUD infrastructure.

3.10 PREPARATION FOR PULLING IN CONDUCTORS
A. Ream all raceways, remove burrs, and clean raceway interiors. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals.

B. Pull a bristle brush and then a mandrel through each raceway to remove any debris and clean the raceway prior to pulling conductors. Mandrel diameter shall be approximately ¼-inch less than the raceway inside diameter, through each raceway. For conduits of one inch and less, pull a rag through to clean and remove debris prior to pulling the conductors.

C. For all raceways which contain less than 50 percent of the NEC-allowed fill, install a pull tape along with the conductors. Provide detectable pull tape in all fiber conduits.

D. Provide phenolic tags on cables, attached with nylon tie wires inside the handholes.

3.11 EMPTY RACEWAYS
A. Certain raceways will have no conductors pulled in as part of this Contract. Identify them with conduit tags at each end and at any intermediate pull point.
of each such empty raceway. Provide a removal cap over each end of empty raceways. Provide a pull tape in each empty raceway.

3.12 TRENCH SETTLING

A. If, at any time during a period of one year dating from the date of final acceptance of the project, there shall be any settlement of conduit trenches, provide additional fill and to make such repairs or replacements in paving, planting, or structures, as deemed necessary by the Engineer at no additional costs to the contract.

3.13 PVC CONDUIT

A. Solvent weld PVC conduit joints with solvent recommended by the conduit manufacturer. Follow manufacturer’s solvent welding instructions and provide watertight joints. Install PVC female adapters when joining PVC conduit to galvanized rigid metal conduit or PVC coated rigid steel conduit.

3.14 PVC COATED RIGID STEEL CONDUIT (PVCRGS)

A. Install in strict accordance with the manufacturer’s instructions by personnel certified by the manufacturer for installation of PVCRGS. Utilize manufacturer’s Spin-it and Z-wrench for tightening conduit. Install soft metallic jaws in pipe vises and half-shell clamps for chain vises. Utilize special shoes for conduit bending. Touch up any damage to the coating with conduit manufacturer acceptable patching compound. PVC boot shall cover all threads. Leave no metallic threads uncovered. Clean field threads with solvent and coat with urethane touch-up.

3.15 PENETRATIONS, FIRESTOPS AND CONDUIT SEALING

A. Conduits shall not be cast as part of cast-in-place structures. Cast-in-place structures shall include block-outs or sleeves to penetrate the structures. Coordinate sleeve installation with structural work.

B. Submit and obtain approval of fire stop prior to starting work. Install in accordance with the approved shop drawings and manufacturer’s instructions. Fire stops shall be installed by personnel certified as being trained for installation by the manufacturer. Prepare substrate and supporting members and mask adjacent areas as necessary. Install so that openings are completely filled, gaps sealed and material secured and adhered in place. Repair or replace defective installations in accordance with manufacturer’s recommendations.

C. All conduits leaving the Panelboard or an enclosure to an underground handhole shall be sealed with duct seal compound to prevent the entrance into or exit from the structure with gases, liquids, or rodents. At structure
penetrations, seal the interior of all raceways that enter above or below grade, with duct seal.

3.16 EXPOSED CONDUIT

A. All exposed conduit shall be as noted in Area Designations per Specification 16050.

B. PVC coated galvanized rigid steel factory elbows shall be utilized for transition from underground concrete duct bank to exposed conduit. Conduit shall emerge from the duct bank perpendicular to the surface whenever possible.

C. Exposed conduits shall be 3/4-inch minimum trade size. Below grade conduits shall one-inch minimum trade size, unless shown otherwise.

D. All threads shall be coated with a conductive lubricant before assembly. Acceptable products include: Appleton Type TLC, Thomas & Better KOPR-Shield, or equal.

E. Joints shall be tight, thoroughly grounded, secure, and free of obstructions in the pipe. All conduits shall be adequately reamed to prevent damage to the wires and cables inside. Strap wrenches and vises shall be used to install conduits to prevent wrench marks on the conduits. Conduits with wrench marks shall be replaced at no additional cost.

3.17 FLEXIBLE CONDUIT

A. Make final connection to motors, instrumentation and other equipment where flexible connection is required to facilitate removal or adjustment of equipment with liquid-tight flexible metal conduit. Liquidtight flexible metal conduit shall be of 12-inch minimum to 24-inch maximum lengths, unless otherwise shown on the drawings or approved by the Engineer.

3.18 PREPARATION FOR PULLING IN CONDUCTORS

A. Ream all raceways, remove burrs, and clean raceway interiors. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals.

B. Pull a bristle brush and then mandrel through each raceway to remove any debris and clean raceway prior to pulling conductors. The diameter of the mandrel shall be approximately ¼ inch less than the raceway inside diameter, through each raceway. For conduits one inch and less, pull a rag through to clean and remove debris prior to pulling conductors.

C. For all raceways which contain less than 50 percent of the NEC allowed fill, install a pull tape along with the conductors. Provide detectable pull tape in all fiber conduits.
3.19 EMPTY RACEWAYS

A. Certain raceways will have no conductors pulled in as part of this Contract. Identify with conduit tags at each end and at any intermediate pull point of each such empty raceway. Provide a removal cap over each end of empty raceways. Provide a pull tape in each empty raceway.

3.20 JUNCTION AND PULL BOXES

A. Where indicated on the Contract Drawings, and where necessary, redirect multiple conduit and cable runs and provide and install appropriately-sized junction boxes. Furnish and install pull boxes where necessary in the raceway system to facilitate conductor installation.

B. Make all boxes accessible. Do not install boxes in finished areas unless accepted in writing by the Engineer. Mount all boxes plumb and level.

C. Conduit bodies maybe used for junction or pull boxes as long as sized for installation.

3.21 ELECTRICAL CONTINUITY

A. The entire electrical raceway system shall form a continuous metallic electrical conductor from the service point to every outlet and shall be grounded by connection to the main service ground.

B. Rigid steel conduits shall have threads coated with conductive sealant before screwing into fittings.

C. A ground wire shall be installed in all conduits. Conduits shall not be substituted for the grounding wire. Bond together the conduit system, enclosures, grounding system, and equipment bus bars.

3.22 CONDUIT IDENTIFICATION

A. All conduits shall be identified with minimum of two labels, one at either end. Labels shall be stainless steel, permanent, waterproof, legible, and attached with stainless steel wire.

B. All conduit labels shall be provided with submitted and approved inscription or as shown on the conduit schedule. Conduits shall be labeled prior to pulling cables and prior to beginning Pre Demonstration period.

END OF SECTION
PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide conductors, cables, terminations, splices and markers used for low voltage power, control, lighting, receptacle and signal circuits.

B. Provide conductors, cables, terminations, splices, fire wrapping and markers used for medium voltage power circuits.

1.02 SUBMITTALS

A. General: Submit for review in accordance with Section 01105 and Section 16050 – Electrical Work, General.

B. Catalog data sheets of all low voltage cables, wires, lugs, terminations, splices, connectors, compression tools, color-coded heat-shrink tubing, cold-shrink tubing, markers, tapes and pulling compounds.

C. Medium voltage cable, terminations, splices, pulling compound, markers, fireproofing and splicers training certificate and resume.

D. Medium voltage cable manufacturer’s reel test results prior to shipment, pulling tension calculations and maximum dynamometer reading with tension conversion for each pull.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 16050 – Electrical Work, General.

B. Accept cable and accessories in manufacturer’s packaging, inspected for damage.

C. Store in accordance with manufacturer's instructions. Protect from weather, damage and off the ground. Provide adequate ventilation and heating above dew point to prevent condensation.

PART 2 - PRODUCTS

2.01 GENERAL

A. All conductors shall be stranded copper unless specified otherwise. Aluminum conductors are not permitted. Insulation shall bear the UL label and the manufacturer's trademark, and shall identify the type, voltage, and conductor size.

2.02 COLOR CODING
A. Power conductors shall have the following insulation (> #6 phase tape) colors. 208V & 240V three phase high-leg conductors shall be additionally phased taped orange per NEC requirements.

<table>
<thead>
<tr>
<th>120/208 or 240v</th>
<th>277/480V</th>
<th>5kV &amp; 15kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase A</td>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>Phase B</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>Phase C</td>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td>Ground</td>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

B. Individual control conductor field wiring shall have the following insulation colors.

- AC Control: Purple (except neutrals are white)
- AC DI/DO: Purple
- AC Ground: Green
- DC Control: Blue (except commons are gray)
- DC DI/DO: Blue
- 24VDC+: Blue
- 24VDC-: Gray

### 2.03 LOW VOLTAGE POWER, VFD CABLE, CONTROL AND LIGHTING CONDUCTORS (LVC)

A. Power, control and lighting conductors shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations. Acceptable products include: Okonite X-Olene XHHW-2, Southwire XHHW-2, or equal.

### 2.04 SIGNAL CABLES (SC)

A. Instrumentation cables shall be an assembly of individually insulated twisted pairs or triads with overall 100% shield coverage of aluminum polyester foil with tinned drain wire all inside a black PVC jacket. Cable shall be rated for 600 volts, 90°C wet or dry locations, suitable for
installation in cable trays, ducts or direct burial. Cable shall be listed under UL1277 and UL1581. Insulation shall be color-coded and numbered (pairs-black/white & triads-black/white/red). Acceptable products include: Okonite Okoseal-N Type P-OS Type TC Instrumentation Cable, Southwire Instrumentation Cable, or equal.

2.05 CONTROL CABLES (CC)

A. Control cables shall be an assembly of individual copper conductors with XHHW-2 insulation. Cable shall be rated for 600 volts, 90°C wet or dry locations and listed under UL83, UL1277 and UL1685. Cable shall be an assembly of conductors, fillers and tape, and ground wire with an overall black PVC jacket. Color coding for ≤ #10AWG shall follow ICEA Method 1, E-2 color sequence. Color coding for > #8AWG shall be black with surface printing of numbers and color designation per ICEA Method 3, E-2 color sequence. Acceptable products include: Okonite Type TC/TC-ER (XHHW-2), or equal.

2.06 CATEGORY 5E CABLES (C5EI, C5EO)

A. CAT5e cable type C5EI (indoor) shall be TIA-568-C2 rated CAT5e, 100BaseTX and EtherNet/IP. Cable shall consist of four color coded, twisted pairs #24AWG solid copper, polyolefin insulated, aluminum foil polyester tape and tinned copper braid shields. Jacket shall be PVC 600V AWM and riser flame rated per UL1666. Jacket shall be color coded with sequential distance marking system. Acceptable products include: Belden 7957A, or equal.

B. CAT5e cable type C5EO (outdoor) shall be TIA-568-C2 rated CAT5e, 1000Base-T and power over Ethernet rated per IEEE802.3. Cable shall consist of four color coded, twisted pairs #23AWG solid copper, polyolefin insulation, gel filled water repellent inner core, polyethylene inner jacket with dry water block under corrugated copper-clad steel armor. Cable shall include sunlight and weather resistant polyethylene outer jacket. Acceptable products include: Superior Essex 04-001-55, or equal.

2.07 CATEGORY 6 (C6IO) AND CATEGORY 6A (C6AIO) CABLES

A. CAT6 cable type C6IO (indoor/outdoor) shall be TIA-568-C2 rated CAT6 1000Base-T and power over Ethernet rated per IEEE802.3. Cable shall consist of four color coded, twisted pairs #23AWG solid copper, polyolefin insulated. Inner core shall be gel filled with water repellent SAP yarn. Shield shall be overlapped corrugated copper-clad steel. Outer jacket shall be halogen-free polyethylene riser flame rated per UL1685. Acceptable products include: Superior Essex 04-001-63, or equal.
B. CAT6A cable type C6AIO (indoor/outdoor) shall be TIA-568-C2 rated CAT6 10GBase-T and power over Ethernet rated per IEEE802.3. Cable shall consist of four color coded, twisted pairs #23AWG solid copper, polyolefin insulated. Inner core shall be gel filled with water repellent SAP yarn. Shield shall be overlapped corrugated copper-clad steel. Outer jacket shall be halogen-free polyethylene riser flame rated per UL1685. Acceptable products include: Superior Essex 04-001-A3.

2.08 GROUNDING CONDUCTORS (G)

A. Ground conductors in raceways shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations. Acceptable products include: Southwire XHHW-2, or equal.

B. Ground mat conductors shall be bare concentric stranded copper conductors conforming to ASTM B8 for the direct buried ground grid system, transformers, panelboards, and where indicated on the drawings. Acceptable products include: Southwire Bare Copper Wire, or equal.

2.09 600V CABLE TERMINATIONS AND INSULATION

A. Lugs and two-way connectors shall be tin-plated copper compression types conforming to UL486A. Both tool and connectors shall be from the same manufacturer with color-coded system for the cable size and compression tool die. Compression tool shall prevent reopening once started until the correct compression force is reached. Acceptable products include: Thomas & Betts TBM-series tools with matching lugs and connectors.

B. Crimp connectors for #10AWG and smaller conductors shall be plated electrolytic copper, color-coded nylon insulated locking forks and rings conforming to UL486A/B. Barrels shall be serrated brazed seam with wire range stamped on the tongue. Crimping tool shall be the same manufacturer as the connector. Acceptable products include: Thomas & Betts Sta-Kon series, or equal. Wire nuts for #8AWG and smaller lighting and receptacle conductors shall be color-coded winged nylon shell with steel spring conforming to UL 486D. Acceptable products include: 3M Scotchlok, Performance+, 312/512 series or equal. Waterproof wire nuts for #8AWG and smaller lighting and receptacle conductors shall be color-coded, silicone filled, winged nylon shell with steel spring conforming to UL486D. Acceptable products include: DryCon King 4, 5, 6 & 9 series, or equal.

C. Low voltage insulating tape shall be weather resistant, flame retardant, rated 80°C and 600V conforming to UL510. Electrical tape shall be 7mil vinyl plastic black or colored coded phase tape. Varnished cambic shall
be 9mil varnish impregnated cotton adhesive backed. Acceptable products include: 3M Scotch 33, 35 & 2520, or equal.

D. Heat shrinkable insulation shall be rated 90˚C and 600V conforming to UL486D. Heat shrinkable tubing, boots and end caps shall be heavy-wall, thermally stabilized cross-linked polyolefin with internal moisture sealant. Acceptable products include Thomas & Betts Shrink-Kon HS-series, or equal.

E. Insulated taps and splices shall be rated 90˚C and 600V conforming to UL486A/B. Insulated taps shall be aluminum alloy lugs, prefilled with oxide inhibitor rated for copper conductors. Encapsulation shall be UV rated, chemically resistant plastisol compound. Insulated taps shall have removable caps and panel mounting ears. Acceptable products include Polaris IT series, or equal.

2.10 CONDUCTOR AND CABLE MARKERS

A. Markers relying on adhesives or taped wrapped are not acceptable for conductor or cables. Markers shall be machine printed; hand printed markers are not acceptable.

B. Low voltage conductor markers shall be white 3-to-1 ratio heat-shrinkable, cross-linked polymer tubing flattened and mounted on a carrier for computer thermal transfer printing, and meet UL 224. Acceptable products include: TE Tyco RPS Marker System, or equal.

C. Low voltage cable markers shall be cross-linked flame retarded polymer cable tags mounted on a carrier for computer thermal transfer printing with holes for tie wrap installation. Acceptable products include: TE Tyco CM-SCE-TP Marker System, or equal.

D. Medium voltage cable markers shall consist of a polyethylene horizontal tie wrapped holder that accepts 1” high polyethylene black stamped numbers on yellow background. Acceptable products include: Almetek E-Z Tags TH-xP, H900, or equal.

2.11 COLORED HEATSHRINK TUBING

A. Heat shrinkable tubing shall be colored polyolefin, 1.5mm to 50mm unshrank diameter, 3:1 shrink ratio. Tubing shall be rated 500V/mil dielectric strength, 1500psi and VW-1 flammability per UL-224. Acceptable products include: Techflex Shrinkflex H3Nxxx series, or equal.

2.12 PULLING COMPOUND

A. Pulling compounds shall be compatible with the conductor insulation. Acceptable products include: Ideal Clear-Guide, Aqua-Gel-II, or equal.
PART 3 - EXECUTION

3.01 GENERAL

A. No conductors shall be installed until conduits have been cleaned and labeled, and Interconnect Drawings have been submitted and approved.

B. Raceway system shall be complete and protected from weather before prior to cable pulling. Pulling low voltage conductors shall include rollers or sheaves to protect wires entering and leaving raceways.

C. Tighten terminal bolts using torque type wrenches and/or drivers to tighten to the inch-pound requirements of the NEC and UL.

D. Signal wiring shall not be run in the same raceway with power and control wiring except where specifically indicated.

3.02 600V CONDUCTOR AND CABLE INSTALLATION

A. Conductors and cables leaving raceways shall be trained in place and supported such that cable weight is not transferred to the termination point while maintaining the manufacturer’s minimum bending radius.

B. Conductors in panels and electrical equipment #8AWG and smaller shall be bundled, tie-wrapped and fanned out onto terminals.

C. Conductors in junction and pull boxes shall be pulled with enough slack to be routed along the walls of the enclosure.

D. Install cable racks shall be installed at nominal 2-foot intervals in handholes and 3-foot intervals in manholes. Cables shall be routed along the outside walls and tie-wrapped to racks in three phase circuits or control groups.

E. Spare conductors and cables shall be labeled “spare”, insulated with half lapped vinyl plastic tape, coiled and tie wrapped in groups at each end.

3.03 LOW VOLTAGE TERMINATIONS AND SPLICES

A. All conductors shall be terminated on an individual terminal or lug, except for control and signal cables where no more than two conductors shall be inserted into a single terminal.

B. Indoor lighting & receptacle conductors and solenoid pigtails shall be connected with standard wire nuts. Outdoor below grade lighting and receptacle conductors shall be connected with waterproof wire nuts. Splices are not allowed in conduit bodies except for solenoid pigtails.
C. Terminations at panels and transformers shall be made up with compression connectors bolted to the terminals. Motor terminations and splices in manholes and handholes shall be made with Polaris IT style insulated taps with vinyl plastic tape overwrap.

D. Control and signal conductors shall not be spliced. Conductors shall be landed on numbered terminal blocks or lugs on vendor supplied equipment. For equipment without lugs, conductors shall be installed with crimp rings or locking forks.

E. Signal conductor shield and drain shall be grounded at only one end at the panel. Shields shall be neatly cut back with the end insulated under the wire marker when heat shrunk. Terminate the drain wire on a grounded terminal block directly adjacent to the signal conductors inside that cable.

F. Install antenna cable, connector cold-shrink weatherproofing and miscellaneous hardware for complete and operable radio system. Provide sealed fitting at top of antenna mast to prevent water entrance into the pole.

3.04 LOW VOLTAGE CONDUCTOR IDENTIFICATION

A. All cables and conductors shall be identified with markers at each terminal to which it is connected matching approved interconnection wiring diagrams. Installed and heat shrunk markers shall be positioned to be read without twisting the conductor or cable.

B. CAT5E/6 cables shall be additionally identified with color coded heat shrink below each marker indicating the system as follows; Administration-Blue, SCADA-Yellow and Video-Purple.

3.05 FIELD TESTING

A. Conductor and cable testing shall be done after cables are installed in the raceways and prior to energizing. Disconnect equipment that might be damaged by this test. Tests shall be documented on test sheets, witnessed and signed off by the Engineer. Cable field testing results shall be submitted to the Engineer for review and acceptance.

B. Power and Control Conductor Test – After installation, provide megger testing at 1000V for conductor to conductor, and conductor to ground.

C. Signal Conductor Test – After installation measure continuity between conductors with ohmmeter and megger at 500V conductor to conductor, conductor to shield, and conductor to ground.
D. CAT5E & CAT6 Cable Test – After installation measure with a CAT5E/6 tester the following: return and insertion loss, attenuation NEXT, PSNEXT, FEXT, ELFEXT, PSELFEXT, ACR and PSCAR.

END OF SECTION
SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Provide wiring devices, complete and operable, in accordance with the Contract Documents.

1.02 SUBMITTALS
A. General: Contract submittals shall be in accordance with Section 01105 and Section 16050.
B. Catalog data sheets of switches, receptacles, generator receptacle, covers and appurtenances, marked to identify proposed materials.

PART 2 - PRODUCTS

2.01 GENERAL
A. Like products shall be from one manufacturer for standardization, operation, maintenance, and spare parts.

2.02 NAMEPLATES
A. Nameplates shall be engraved black plastic with white characters. Stainless steel plates shall be engraved with black enamel filled characters on the device plate.

PART 3 - EXECUTION

3.01 NAMEPLATE ENGRAVING
A. Identify switch and receptacles with the panelboard and circuit number feeding that device. For example, a receptacle nameplate may be inscribed “LP1-12”. Install plastic nameplates with epoxy glue on or near the device box. Stainless steel covers shall be engraved.

3.02 FIELD TESTING
A. Provide checkout, field, and functional testing of wiring devices in accordance with Section 16050. Wiring Devices testing shall be completed during Pre-Demonstration period.
B. Test each receptacle for polarity, ground integrity and GFIC trip with a standard receptacle tester.
C. Coordinate generator rotation testing with City during the Pre-Demonstration period. Verify correct rotation at the Panelboard phase rotation relay. Correct any discrepancies by shifting conductors at the reverse service receptacle.

END OF SECTION
SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide the electrical grounding system, complete and operable, in accordance with the Contract Documents.

B. The grounding system is intended to provide a low resistance path to earth ground. Acceptable ground system resistance is 2 ohms or less.

C. Coordinate, provide and install grounding system at the Utility Meter per SMUD requirements.

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with the requirements of Section 01150 and Section 16050 – Electrical Work, General.

B. Catalog data sheets of exothermic connectors, molds/shots & instructions, compression connectors, ground rod/clamp, ground well/cover, fence ground connectors, marked to identify proposed materials.

PART 2 - PRODUCTS

2.01 GROUND GRID

A. Ground grid shall be bare annealed copper conductors suitable for direct burial per Section 16120. Conductors shall be #2/0 unless indicated otherwise.

2.02 GROUND RODS AND CLAMPS

A. Ground rods shall be copper-clad steel, 3/4-inch diameter and 10 feet long conforming to UL 467. Electrolyte copper 10 mils thick shall be mechanically bonded to the rigid steel core. Ground rod clamps shall be cast high strength copper alloy with hex-head screw. Furnish T&B Blackburn 7510 rod and, JAB34H clamp, or equal.

2.03 EXOTHERMIC CONNECTORS

A. Exothermic connections shall consist of a molecular weld utilizing the reaction of copper oxide and aluminum powder in a semi-permanent graphite mold. Connections include cable/cable, cable/rebar and cable/steel types. Acceptable products include: Cadweld-series, Thermoweld-series, BurndyWeld-series, or equal.
2.04 COMPRESSION CONNECTORS

A. Lugs and splices shall be tin-plated copper compression types conforming to UL486A. Both tool and connectors shall be from the same manufacturer with color-coded system for the cable size and compression tool die. Compression tool shall prevent reopening once started until the correct compression force is reached. Acceptable products include: Thomas & Betts TBM-series, Burndy Hydent-series compression tool with matching lugs and splices, or equal.

2.05 GROUND ROD BOXES

A. Boxes shall be precast, high density, reinforced concrete with cast iron ring and lid rated H/20 traffic, nominal 10-inch interior diameter and 12 inches deep. Covers shall be cast iron. All covers shall include special markings: “GROUND ROD”. Acceptable products include: Oldcastle Christy G03/G03C, or equal.

2.06 FENCE GROUND CONNECTORS

A. Fence fabric ground connectors shall be electroplated tinned brass body with stainless steel hardware conforming to UL467 and UL96. Cable/post and cable/braid connectors shall be high copper cast body with Durium U-bolts and hardware conforming to UL467. Flexible braid shall be flat-woven tinned copper with seamless copper ferrules on each end rated #2AWG. Acceptable products include: Burndy FFG, GAR, GG and Braid Type B series, or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Grounding electrode system shall consist of bonding together the ground mat, ground rods, duct bank ground conductors and connecting them to panelboard ground bus, utility meter, structural metal frame, flow meter, poles, fences, gates and other metal structures likely to become energized.

B. Ground continuity throughout the facility shall be maintained by means of a ground conductor run in all non-metallic conduits and in any conduit containing circuits operating over 50 volts. Grounding conductors which are run in conduit shall be insulated copper conductors per Section 16120.

C. All grounding shall be installed prior to start of Pre-Demonstration period.
3.02 GROUND MAT
A. Ground mat conductors shall be buried a minimum of 30-inches deep.
B. Grounding conductors that extend beyond concrete surfaces for connection to equipment shall be of sufficient length to reach final connection without splicing. Locate close as possible to the final connection point and protected from damage during construction.
C. Ground conductors embedded in duct banks shall be exothermically welded to manhole ground tails and compression spliced together inside handholes.
D. Within slab on grade the grounding cable shall be embedded in the bottom or installed beneath the slab. Provide exothermic weld between concrete encased grounding conductor and the slab on grade reinforcement bars.
E. If the resistance to ground exceeds 2-ohms, extra work will be directed by the Engineer. Extend the ground mat, install additional ground rods at least 10-feet apart and retest.

3.03 GROUND RODS
A. Ground rods shall be installed with bolted connections to allow removal from the ground mat for individual testing. Drive ground below grade and with one end exposed six inches above a sand backfill with bolted connection accessible. Install a ground well at each location flush with finished grade.
B. The location of ground rods shall be as indicated. The lengths of rods forming an individual ground array shall be equal and shall be of the quantity required to obtain a ground resistance of no less than 2-ohms.

3.04 EXOTHERMIC CONNECTIONS
A. All embedded or buried ground connections shall be made by exothermic weld type connectors. Conductors and mold shall be prepared in accordance with manufacturer’s instructions. Reusable molds shall be replaced at intervals in accordance with manufacturer’s instructions.

3.05 COMPRESSION CONNECTIONS
A. All exposed ground connections shall be made by compression connection lugs bolted to the surface or equipment. Building structural steel shall be connected to the ground mat where shown on the drawings. Completely remove all paint, dirt, or other surface coverings at connection points so that good metal-to-metal contact is made.
B. All motors 100HP and larger shall have supplemental grounding conductor from the ground mat tapped to the motor frame or equipment housing.

3.06 FENCE AND GATE GROUNDING

A. Fences enclosures shall be connected to the ground mat at fence posts forming corners and gate hinge posts with #2/0 copper and cable/post connectors buried below grade. Fence fabric shall be grounded with #4 copper cables and fabric connectors adjacent to each corner post. Gates shall be grounded with cable/post connectors and flexible braid.

3.07 INSPECTION

A. 24-hour notification for inspection is required prior to backfilling or encasing in concrete any portion of the ground system.

3.08 FIELD TESTS

A. Ground mat shall be NETA tested per Section 16950. Grounding tests shall be completed, submitted and approved prior to energizing electrical equipment.

END OF SECTION
PART 1 -- GENERAL

1.01 SCOPE

A. This Specification Section covers the furnishing, installing and testing of the Motor Control Center as specified herein, as shown on the Drawings, and as required for a complete electrical installation.

B. The provisions of Sections 16050 and 16120 of these specifications shall apply unless otherwise specified in this Section.

1.02 SUBMITTALS

A. Submittals for the Motor Control Center shall include, but shall not be limited to, the following:

1. Catalog cuts showing and identifying manufacturer, catalog numbers, dimensions, weights, nameplate data, and material of all components.

2. Assembly drawings with front, side, section views and uprights. Drawings to show location of all accessories.

3. Catalog cuts of specified components.

4. Operating and Maintenance Manuals as specified in Section 01105.

5. Dimensioned as-built drawings.

6. Certified test reports prepared by the manufacturer.

7. Control diagrams

1.03 QUALITY ASSURANCE

A. The manufacturer has been fabricating and assembling similar equipment for a minimum of five (5) years.

B. The MCC shall be built and labeled by a manufacturer with a UL file listing. The MCC shall meet UL 845 and bear a separate UL label on each individual MCC section prior to delivery from the factory. Field UL labeling will not be allowed.
PART 2 -- PRODUCTS

2.01 MATERIAL AND EQUIPMENT

A. The Motor Control Center shall be a 3 phase, 3 wire, 480 volt, free standing, dead front enclosure with either NEMA Class I or II designation and NEMA Type B or Type C-S wiring. For those enclosures containing across the line motor starters the enclosure shall be NEMA 12 construction and labeled as NEMA 12 with no vents. Those enclosures containing variable frequency drives and/or soft starters shall be NEMA 12 construction with filtered louvered vents and labeled as NEMA 1A. The center shall contain the proper clearances and space for safe operation of the equipment therein. Control voltage shall be 120 VAC.

Motor control centers shall be Allen-Bradley, Eaton “Freedom”, General Electric 8000 Line, Square D Model 6I, or approved equal.

A. Motor Circuit Protector (MCP) shall be molded case quick make quick break with adjustable instantaneous trip from 700 percent to 1300 percent of the motor full load amperes. The instantaneous trip setting shall also meet the requirements of the latest version of the NEC. The motor circuit protector shall be rated 600 volts with adjustable trip settings. MCP shall be the same as the MCC manufacturer. The operating handle shall close the MCP when placed in the upward position and open the MCP in the downward position. The handle shall accept multiple padlocks to lock the MCP in the open position. MCP shall be NEMA rated. Each MCP shall have an AIC rating greater than that shown on the single line diagram.

C. Circuit Breakers: Circuit Breaker shall be molded case and NEMA rated. The circuit breakers shall conform to the requirements of NEMA ABI and UL 489 and shall be trip-free, thermal magnetic bolt-on type; connect breakers in uniform phase sequence starting at the top left phase bus; provide full busing and all necessary mounting hardware; use common trip devices not handle ties. Two or three pole breakers shall be common trip units. Each breaker pole shall provide inverse time delay and instantaneous circuit protection for breakers rated under 100 A. Breakers shall have toggle, quick make, and quick break operating mechanisms. Trip position of the breakers shall be clearly indicated by movement of the operating handles to the center position. Circuit breakers rated to IEC standards shall not be acceptable.

D. Panelboard: Panelboard shall conform to the requirements of NEMA PB-12 and UL-67. Bus shall be copper. Provide quantity and size of branch breakers and spare spaces as shown on the Drawings.

E. Magnetic starters shall have auxiliary contacts as required by the Plans including N-O and N-C contacts as indicated on the Plans, plus one each spare N-O and N-C contact. The combination motor starters shall be drawout-type for size 5 and below.
The fixed-type unit assembly shall be constructed so that it can be easily removed from its panel using pull apart terminal strips to the terminal block and withdrawing from the primary bus. Removal of a unit assembly shall be possible without rear access and without disturbing any other unit in the motor control center.

F. Each starter unit shall have its own 480 V - 120 V AC control power transformer. It shall have a 120 volt grounded secondary. One secondary fuse and 2 primary fuses shall be provided. Control power transformers shall be sized to accommodate the control devices indicated or as shown on the Plans.

G. Full voltage motor starters shall be sized as indicated on the Plans. The starters shall have the same interrupting capacity as the circuit breakers and power busses.

H. Motor starters shall be designed to NEMA ratings only. Starters designed to IEC ratings shall not be acceptable.

I. Elapsed Time Meter: Elapsed time meter shall be large panel mounted, non-reset type, capable of reading 99,999.9 hours to the nearest 1/10 hour, rated 120 volts, 60 Hz. Elapsed time meter shall be mounted on the exterior of the section door between 40" and 60" from the bottom of the panel. Elapsed Time Meters shall be Eagle Signal Controls Model # HK410A6 or Engineer approved equal. Meters using push on retaining clips shall not be acceptable.

J. Indicating Lights and Lenses: Indicating lights shall be industrial, waterproof NEMA 4/4X, transformer type, with LED type lamps, and push to test. Lights shall be manufactured by Allen Bradley, Eaton, or approved equal. Mount all indicating lights on front panel of motor control center.

Unless otherwise specified, indicating lights shall be equipped with colored lenses in accordance with the following schedule:

<table>
<thead>
<tr>
<th>COLOR</th>
<th>FUNCTION</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>White or Clear</td>
<td>Normal Condition</td>
<td>Control power on, status OK</td>
</tr>
<tr>
<td>Red</td>
<td>Run, valve closed</td>
<td>Motor running, end of cycle</td>
</tr>
<tr>
<td>Green</td>
<td>Ready, valve open</td>
<td>Equipment ready, operating</td>
</tr>
<tr>
<td>Amber or Yellow</td>
<td>Abnormal condition</td>
<td>Failure of equipment or status abnormal, fault condition</td>
</tr>
</tbody>
</table>

K. Control and Protective Equipment: Control relays, timers, switches (including contactor auxiliary switches), indicating lights, push buttons, overload relays, fuses, control transformers, terminal blocks and wiring shall be furnished and installed as shown on the drawings. Overload relays shall be sized to trip according to NEC as per data on the motor nameplate and shall be NEMA style. Push buttons shall be NEMA style. Contractor shall test each back spin relay and set per Engineer=s
requirements.

L. Station Service Transformer: Transformer shall be dry type and sized per Plans. All windings of the transformer shall be copper. The transformer shall have NEMA energy efficiency rating.

M. Phase Failure and Reverse Phase (PFR) Relay: Relay shall have single pole-double throw (SPDT) contact which shall operate on power failure, phase loss, or reversal, providing a signal to the telemetry system. Reset shall be automatic. Nominal AC voltage shall be 480V, 3 phase. The phase failure and reverse phase relay for plant voltage monitoring shall be Time Mark Model No. A258B (258B for 240V service) or Diversified Electronics SLA Series, Catalog No. SLA 440 ASA (SLA 230 ASA for 240V service) or approved equal. Contractor shall adjust relay to lowest setting before installation.

N. Provide 150 W electric resistance type strip heater in each vertical section. Voltage shall be 120 V, single phase. Furnish thermostats to control heaters with one thermostat per heater located in its respective section. Thermostats shall have a range of 40 to 80 degrees F and shall have contacts rated 120 volts, 10 amperes continuous, 60 Hz. Provide expanded metal shield for each heater.

O. Busses:

1. The grounding bus shall be 1/4" by 1" copper, hard connected, running the full width of the MCC and located near bottom. Grounding bus shall be bolted to the frame of the MCC and include lugs for equipment grounding conductors.

2. The main horizontal bus shall be silver or tin plated copper located within an isolated compartment. The bus shall be rated as shown on the Plans.

3. The vertical bus in each section shall consist of a single silver or tin plated copper conductor per phase with a current capacity of not less than 600 amperes. The vertical bus shall be completely isolated and insulated with a labyrinth bus barrier, and shall extend the full height of the section wherever possible. The bus shall be rated as shown on the Plans.

P. Wireways: A separate vertical wireway shall be provided adjacent to each vertical unit, and shall be covered by a hinged door. Each individual unit compartment shall be provided with a side barrier to permit pulling wire in the vertical wireway without disturbing adjacent unit components.

Q. Buckets: Buckets shall be removable from the MCC as a unit and have pull apart terminal blocks to allow removal of individual buckets without disconnecting control and instrumentation wiring.

R. Provide and install high voltage switchgear rubber matting in from of the entire
length of the switchgear, ATS, MCC, and control panel plus 6” on both ends. Also, provide rubber matting in front of the triple switch and load bank control panel. Matting shall conform to ASTM D178-93 Type 1 Class 2, proof tested at 20,000 volts AC. The matting shall be black, ¼” thick and 48” wide. Rubber matting shall be manufactured by Mats, Inc. Model No. 0213 Corrugated Rubber Switchboard Matting, or equal.

PART 3 -- EXECUTION

3.01 FACTORY ACCEPTANCE TESTS

A. MCCs and their components shall be given Manufacturer's standard electrical and mechanical production tests and inspections. The tests shall include electrical continuity check, dielectric tests for each circuit, and inspection for proper functioning of all components including controls, protective devices, metering, and alarm devices. Test the current and ground functions of circuit breakers for proper operation. Factory Acceptance Testing procedures shall be submitted to the Engineer for approval. Factory Acceptance Testing shall be witnessed by the Engineer and City. The City will pay for the expenses to send a City representative to the Factory Acceptance Testing (FAT). The electrical manufacturer shall give the City three weeks’ notice prior to the FAT. Do not ship equipment until test reports have received written acceptance from the Engineer.

3.02 INSTALLATION

A. Contractor shall furnish all material and labor including, but not limited to, transportation, loading, lifting, jacking, wiring to completely install Motor Control Center as shown on the drawings and shall conform with the National Electrical Code (NEC).

B. Secure MCC to foundation per Section 16050.

3.03 SPARE PARTS

A. Provide spare parts per the manufacturer's recommendations.

END OF SECTION
SECTION 16482

LOW VOLTAGE SOFT STARTER

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall supply a Soft Starter along with complete startup and testing services as specified herein. All components and devices shall be furnished and installed as required to provide a complete system for accomplishing the functions and meeting the performance set forth hereinafter.

B. Furnish all required labor, materials, safety equipment, transportation, test equipment, incidentals and services to provide a complete and operational soft starter system as described in these Specifications.

C. The soft starter scope of work includes the following:
   1. Provide modular soft starters with full up to speed run bypass.
   2. Submittal data and drawings.
   3. Startup.
   4. Testing and 2 hours of training.
   5. Operation and maintenance manuals.

D. The soft starter shall be rated for continuous full load operation when powered from the normal Utility power and a generator standby power source. Soft starter supplier to provide any additional equipment necessary to be compatible with a City supplied generator.

1.02 RELATED SECTIONS

A. Section 16050 – Electrical Work

B. Section 16480 – Low Voltage Motor Control Center

1.03 REFERENCES

A. The soft starters shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA, ANSI, and UL.
1.04 SUBMITTALS

A. Provide submittals and drawings as specified in Section 01330.

B. The following information shall be submitted to the Engineer:

1. Dimensioned outline drawings
2. Conduit entry and exit locations.
3. Cable terminal sizes
4. Wiring diagrams
5. Nameplate schedule
6. Product data sheets
7. A list of all parameters used to program the soft starter

C. Provide operation and maintenance manuals as specified in Section 01330. Include manufacturer’s standard testing and parameter listing.

1.05 QUALIFICATIONS

A. All components within the MCC enclosure including the soft starter shall be from the same manufacturer as the MCC enclosure and shall be designed to meet applicable NEMA, UL, IEEE, CSA, IEC, and EN standards.

B. The soft starter manufacturer shall be ISO 9001 or 9002 certified.

C. Underwriters Laboratories (UL) listing is required for all soft starters.

D. The soft starter manufacturer shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided.

1.06 DELIVERY, STORAGE AND HANDLING

A. The soft starters shall be handled and stored in accordance with the manufacturer’s instructions.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Rockwell Automation Allen-Bradley – SMC Flex Smart Motor Controller
B. Siemens
C. Or Approved Equal

2.02 SOFT STARTER

A. The soft starter shall provide ramp starting and stopping of a three-phase induction
motor rated at 480 VAC, 250 HP, 325 FLA, 440 RPM and a 1.15 service factor. The soft starter shall be sized at 115% of the full load ampere rating.

B. The open-type controller device shall be modular, consisting of a power structure and a logic component.

1. Power Structure
   a. The power structure shall include an electro-mechanical SCR bypass device.
   b. The power structure shall include built-in 3-phase current monitoring and overload protection.
   c. The power structure shall consist of three power poles with integral heatsinks.
   d. The power poles are to be modular in design that each is easily replaceable
   e. Back-to-back SCR pairs shall be the only power switching semiconductor means acceptable. Diode-SCR (Silicon Controlled Rectifier) combinations shall not be acceptable.
   f. SCRs shall have the following minimum repetitive peak inverse voltage ratings.
      1) 1400V for units rated 200…480V
      2) 1600V for units rated 200…600V
      3) 1800V for units rated 230…690V
   g. SCRs shall have built in temperature monitoring sensors.
   h. Use of an External bypass must be an option
   i. The manufacture must supply guidance on obtaining SCR protection

2. Logic Component
   a. The logic component shall be a self-contained control module, compatible with the full range of power structures. The control module shall mount directly to the power structure.
   b. The control module shall provide digital microprocessor control and supervision of all controller operation, including pulse firing of the SCRs.
   c. The control module shall consist of the following.
      1) Self-tuning power supply accepting control power input from 100…240V AC or 24V AC/DC, 50/60 Hz.
      2) Logic control circuitry incorporating a latch circuit for three-wire control.
      3) SCR firing circuitry that incorporates an RC snubber network to prevent false firing.
      4) Input / output circuitry
      5) Digital programming keypad
      6) Backlit LCD display with multi-lingual capabilities
7) DPI communication port

d. The control terminals shall have the following characteristics
   1) The control terminal wiring connector shall be easily accessible and located on the front top of the device.
   2) The terminals shall be UL rated for 300V, 10 A maximum.
   3) The terminals are UL Recognized to accept a maximum of two (2) wires rated #8…#14 AWG.

e. The control module shall be easily removed from the power structure, without the need to disassemble associated printed circuit board assemblies.

C. Voltage Controller Unit Modes

1. Starting Modes
   a. Soft start with Selectable Kickstart
      1) Programmable initial torque value of 0…90% of locked rotor torque.
      2) Programmable acceleration ramp time from 0…30 seconds.
      3) A selectable kickstart, or boost, shall be provided at the beginning of the voltage ramp. The kickstart shall provide a current pulse of 550 percent of the full load current. The kickstart time shall be adjustable from 0…2 seconds.
      4) Current limit start
      5) Provides means of limiting the maximum starting current
      6) Adjustable from 50…600% of motor full load current.

   b. Full-voltage start
      1) Provides across the line starting.
      2) Ramp time shall be less than 0.25 seconds.

   c. Dual ramp start
      1) Provides two (2) separate start profiles with separately adjustable ramp times and initial torque, settings.
      2) Programmable acceleration times from 0… 30 seconds.
      3) Current limit level programmable from 50…600% full load current.
      4) Programmable initial torque values from 0…90% of locked rotor torque.

2. Stopping Modes
   a. Soft stop
1) The soft stop option shall provide a voltage ramp-down for an extended motor stopping time.
2) Soft stop shall be initiated by a dedicated Soft Stop input. A coast-to-rest stop shall still be possible with a separate stop input.
3) Programmable voltage ramp down time from 0…60 seconds.
4) The load shall stop when the motor voltage drops to a point where the load torque is greater than the motor torque.

b. Preset Slow Speed
1) Provides a slow speed for applications requiring a slow speed.
2) The Preset Slow Speed option shall provide two jog speeds in the forward direction: high (15% of base speed) and low (7% of base speed).
3) The Preset Slow Speed option shall provide two jog speeds in the reverse direction: high (20% of base speed) and low (10% of base speed). Reverse operation of the motor shall be available in the jog mode without the use of a reversing contactor.
4) The starting current for the slow speed operation shall be user adjustable from 0…450% of the motor's full load current rating.
5) The running current for the slow speed operation shall be user adjustable from 0…450% of the motor's full load current rating.

3. Mutually exclusive starting and stopping modes. Refer to the system specifications for the option (if any) required

a. Pump Control
1) The Pump Control option shall be available to provide closed loop control of a motor to match the specific torque requirements of centrifugal pumps for both starting and stopping. This shall aid in eliminating the phenomena commonly referred to as "water hammer." Methods utilizing Soft Start with Soft Stop shall not be acceptable.
2) Closed loop control shall be achieved without using external sensors or feedback devices.
3) Pump Stop shall be initiated by a dedicated Pump Stop input. A coast-to-rest stop shall still be possible with a separate stop input.
4) Programmable starting time from 0…30 seconds.
5) Programmable stopping time from 0…120 seconds.
D. Controller Unit Features

1. LCD Display
   a. An alphanumeric, backlit LCD display shall be provided for controller set-up, diagnostics, status and monitoring. The display shall be four-line, 16 characters minimum.
   b. Digital parameter adjustment shall be provided through a keypad. Analog potentiometer adjustments are not acceptable.

2. Overload Protection
   a. Shall meet applicable standards as a motor thermal protective device.
   b. Shall utilize three-phase current sensing. The use of two current transformers shall be unacceptable.
   c. Selectable trip classes of 10, 15, 20, and 30 shall be provided as standard.
   d. Electronic thermal memory shall provide enhanced motor protection.

3. Digital I/O
   a. A minimum of four (4) auxiliary contacts shall be provided for customer use.
   b. The contacts shall be rated for 240V AC maximum.
   c. Contact configuration shall be programmable and contain the following configurations:
      1) Normal Operation (N.O. or N.C.)
      2) Up-to-Speed indication (N.O. or N.C.)
      3) External bypass
      4) Fault indication (N.O. or N.C.)
      5) Alarm indication (N.O. or N.C.)
      6) Network controlled output (N.O. or N.C.)

4. DPI Serial Communication Port
   a. A DPI serial communication ports shall be provided as standard.
   b. Optional communication protocol interface modules that shall be available for connection to EtherNet/IP and Remote I/O.
   c. Refer to the system specification for the options (if any) required.

5. Monitoring – the controller shall provide the following motor and/or power system monitoring functions indicated through the optional LCD display.
   a. Three-phase current
   b. Three-phase voltage
   c. Power in kW
   d. Power usage in kWh or MWh
   e. Power factor
f. Motor thermal capacity usage
g. Elapsed time

6. Protection and Diagnostics

a. Pre-start line fault advising of shorted SCR or missing load connection with phase indication.
b. Running line fault advising power loss, shorted SCR, or missing load connection.
c. Pre-start power loss with phase indication.
d. Over temperature
e. Open gate with phase indication.
f. The following programmable protection shall be provided as standard with the controller.

1) Overload
2) Underload
3) Undervoltage
4) Overvoltage
5) Voltage unbalance
6) Phase reversal
7) Stall
8) Jam
9) Excessive starts per hour

g. When fault conditions are detected, the controller shall inhibit starting or shutting down SCR pulse firing.
h. Fault diagnostics shall be indicated in descriptive text on the LCD display. The exclusive use of fault codes is unacceptable.
i. An auxiliary contact that is user programmable for fault indication shall be provided for customer use.

2.03 SOFT STARTER ENCLOSURE

A. The front of the enclosure shall have a 2-position selector switch for “Normal Soft Start/Bypass” mode selection and one “Hands/Off/Auto” (H-O-A) 3-position Selector Switch for testing, maintenance and mode selection of the unit.

B. The soft starter enclosure shall be constructed as specified in Section 16480 - Low Voltage Motor Control Center. All components shall be accessible from the front of the enclosure. Rear or side access shall not be required in order to remove or service any component. The enclosure shall include the following in its construction:

1. Line and load lugs shall be provided and sized per the motor feeder conductors as shown on the Plans.
2. The soft starter enclosure shall incorporate fans for cooling. The air flow through the soft starter compartment shall provide proper cooling of the operating soft starter per the manufacturer’s recommendations.

3. The soft starter assembly shall be capable of either an electronic or mechanical reset after a fault. Mechanical reset shall be accomplished using reset push button mounted on the exterior of the enclosure per the soft starter manufacturer’s standards.

4. Protective modules for the soft starter shall be required on both the line side and the load side of the unit. The protective modules shall contain metal oxide varistors (MOVs) to protect the soft starter from electrical transients and/or electrical noise. The MOVs shall be rated for 600 VAC.

C. All control circuit voltages shall be physically and electrically isolated from the power circuit voltages to insure safety to maintenance personnel. A control compartment for all low voltage signals and circuit boards shall be provided which is physically separated from the power compartment and power wiring.

### 2.04 SPARE PARTS

A. Provide the following spare parts:

   A. Three spare current limiting fuses/power fuses
   B. Three spare control power fuses
   C. Two spare air filters
   D. One spare exhaust fan

The Contractor shall provide one set of three spare fuses for each soft starter.

**PART 3 - EXECUTION**

### 3.01 FACTORY TESTING

A. Standard factory tests shall be performed on the soft starter. All tests shall be in accordance with the latest version of UL and NEMA standards.

B. The manufacturer shall provide three (3) certified copies of the factory test reports.

### 3.02 FIELD TESTING & STARTUP

A. Testing, checkout and start-up of the Soft Starter shall be performed under the technical direction of the manufacturer's service engineer. Under no circumstances are any portions of the system to be energized without authorization from the manufacturer’s representative.
B. The Soft Starter manufacturer shall provide a start-up service which includes inspection, final adjustments, operational checks and a final report. The start-up service shall be provided by a factory service engineer experienced in the operations and principles of the hydraulics and control of large water pumps.

C. The setup and programming of the Soft Starter shall be provided by a field technician who is authorized by the Soft Starter manufacturer to perform the startup. This setup and programming shall be done prior to and during the first application of power to the motor.

D. The soft starter manufacturer shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

E. The soft starter manufacturer shall program the soft starter. A list of the soft starter parameters shall be given to the Engineer as a PDF file.

3.03 TRAINING

A. The Contractor shall provide a two (2) hour training session for up to ten (10) City personnel. The training session shall be conducted by the soft starter manufacturer. The training shall provide instruction on programming, HIM, proper maintenance, and operation of the soft starter.

3.03 WARRANTY

A. Each soft starter shall come with a one year manufacturer's warranty. This warranty shall cover all parts, travel costs, and labor. The system supplier shall have a staff of experienced personnel available to provide service on a 2 working days notice during the warranty period.

B. Prior to "final acceptance", the Contractor shall furnish to the Engineer a listing of the warranty information for each soft starter. The listing shall include the following:

1. Manufacturer's name, service contact person, phone number, and address.

2. Material and equipment description, equipment number, part number, serial number, and model number.

3. Manufacturer's warranty expiration date.

END OF SECTION
PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall supply a low voltage variable frequency (VFD) drive with an across the line bypass starter along with a complete startup and testing services as specified herein. An internal bypass shall not be permitted. This document describes the function and operation of the system and components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance, protection, and safety set forth hereinafter.

B. Furnish all required labor, materials, safety equipment, transportation, test equipment, incidentals and services to provide a complete and operational variable frequency drive system as described in these Specifications.

C. The scope of work includes the following:

1. Provide a modular 18-pulse variable frequency drive and NEMA rated FVNR contactors. The contactors shall be sized per the motor.

2. Submittal data and drawings.

3. Startup.

4. Testing and 4 hours of training.

5. Operation and maintenance manuals.

D. The variable frequency drive shall be rated for continuous full load operation when powered from the local utility power and a generator standby power source. The variable frequency drive supplier to provide any additional equipment necessary to be compatible with the existing generator.

1.02 RELATED SECTIONS

A. Section 16010 – Electrical Work

B. Section 16480 – Low Voltage Motor Control Center
1.03 SUBMITTALS

A. Provide submittals and drawings as specified in Section 01105.

B. VFD submittals shall include the following:

1. Elevation Drawings: Include dimensional information and conduit routing locations.
2. Unit Descriptions: Include amperage ratings, enclosure ratings, fault ratings, nameplate information, etc. as required for approval.
3. HMI Controller and pilot device description
4. Conduit entry and exit locations
5. Wiring Diagrams:
   a) Power Diagram: Include amperage ratings, circuit breaker frame sizes, circuit breaker continuous amp ratings, etc. as required for approval
   b) Control Diagram: Include disconnect devices, pilot devices, relays, etc.
   c) Provide a complete Motor Control Diagram showing all components within the VFD unit.
6. Nameplate schedule
7. Product data sheets and complete parts list
8. VFD and Operator Interface publications
9. Installation and startup instruction
10. Digital I/O list and Ethernet communication options
11. List of programmable setpoints and parameter with recommended and final input values
12. Recommended spare parts list
13. Standard production test results

1.04 QUALITY ASSURANCE

A. Each VFD shall meet the following requirements:

1. The VFD and all associated optional equipment shall be UL listed or recognized.
2. The VFD shall contain a UL label attached on the inside of the enclosure cabinet.
3. All inspection and testing procedures shall be developed and controlled under the guidelines of the Supplier’s quality system and must be registered to ISO 9001 and regularly reviewed and audited by a third-party registrar.
4. The VFD shall be factory pre-wired, assembled and tested as a complete package.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Allen-Bradley PowerFlex 750 Series
B. Siemens
C. Or approved equal.

2.02 VARIABLE FREQUENCY DRIVE

A. The variable frequency drive shall be capable of operating a 250 HP motor with the following characteristics: 480 VAC, 325 FLA, 440 RPM, 3 phase, 60 Hz, and a service factor of 1.15. The VFD shall be sized at 115% of the full load ampere (FLA) rating. The VFD shall be suitable to operate on a limited power generation source. Contractor shall coordinate the design and fabrication of the VFD equipment and components with the existing Generator and ensure compatibility and performance in accordance with this Specification. Regenerative drives are not acceptable.

B. Certifications

1. Listed to UL508C and CAN/CSA-C22.2 No. 14-05
3. Electric Power Research Institute. Certified compliant with standards SEMI F47 and IEC 61000-4-34
5. Lloyd’s Register Type Approval certificate 11/60009
6. RINA Certificate ELE349811CS

C. Hardware

1. Utilize diode bridge or SCR bridge on the input rectifier.
2. Utilize DC bus inductor on all six-pulse VFDs only.
2. Utilize a passive or active filter to filter up to and including the 50th harmonic to reduce EMI/RFI emissions. L-C-L filter assembly shall utilize Passive Dampening and work with the Pre-Charge System and AFE rectifier algorithm for Active Resonance Protection to avoid having to shut down from system resonances resulting when connected to a high impedance source such as a backup generator.
3. Utilize switching logic power supply operating from the DC bus.
4. Incorporate phase to phase and phase to ground MOV protection on the AC input line.
5. Utilize gold plated plug-in connections on printed circuit boards.
6. Microprocessor based inverter logic shall be isolated from power circuits.
7. Utilize latest generation IGBT inverter and converter sections that shall not require commutation capacitors.
8. Line and Load Inverter sections shall be completely interchangeable to reduce necessary spare parts.
9. Inverters and L-C-L filter modules shall be on roll-out chassis with front accessible connections for ease of repair or replacement and to provide access to Load Cables. Output inverter shall be removable without disturbing the load cables after installation.
10. Embedded dual Ethernet I/P ports for direct network cable connections.
11. Battery receptacle for Lithium battery power to the Real Time Clock.
12. Additional DPI port for handheld and remote HIM options.

D. Control Logic

1. Ability to operate with motor disconnected.
2. Provide a controlled shut down, when properly protected, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
4. Provide multiple acceleration and deceleration rates.
5. Adjustable output frequency up to 320 Hz.

E. Communication Control

1. Ability to control outputs and manage status information locally within the VFD.
2. Ability to function stand-alone or complimentary to supervisory control.
3. Ability to speed reaction time by processing in the VFD.
4. Ability to provide scaling, selector switches, or other data manipulations not already built into the VFD.
5. Ability to read inputs/write outputs and exclusively control the VFD.
6. Ability to provide an option for decision making if communication is lost with main controller.

F. Motor Control Modes

1. Selectable Sensorless Vector, Flux Vector, V/Hz, and Adjustable Voltage Control modes selectable through programming.
   a) Frame 8 to 10 drives requires encoder to operate a surface permanent magnet motor
2. The drive shall be supplied with a Start-up and Auto-tune mode.
3. The V/Hz mode shall be programmable for fan curve or full custom patterns.
4. Capable of Open Loop V/Hz.

G. Current Limit
1. Programmable current limit from 20 to 160% of rated output current.
2. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.
3. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.

H. Acceleration / Deceleration
1. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3000 seconds.
2. A second set of remotely selectable accel/decel settings shall be accessible through digital inputs.

I. Speed Profiles
1. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S Curve" profiles that provide changing accel/decel rates.
2. S Curve profiles shall be adjustable from 0 to 10 seconds for the "S" portion of the curve.

J. Adjustments
1. A digital interface can be used for all set-up, operation and adjustment settings.
2. All adjustments shall be stored in nonvolatile memory (EEPROM).
3. No potentiometer adjustments shall be required.
4. EEPROM memory for factory default values shall be provided.
5. Software shall be available for trending and diagnostics, as well as online and offline programming functionality.
K. Process PID Control

1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustment as well as error inversion and output clamping functions.
2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.
3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
4. Protection shall be provided for a loss of feedback or reference signal.

L. Skip Frequencies

1. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
2. The set points shall have a bandwidth adjustable from Maximum Reverse Speed to Maximum Forward Speed.

M. Fault Reset/Run

1. The drive shall provide up to nine automatic faults reset and restarts following a fault condition before locking out and requiring manual restart.
2. The automatic mode shall not be applicable to a ground fault, shorted output faults and other internal microprocessor faults.
3. The time between restarts shall be adjustable from 0.5 seconds to 30 seconds.

N. Run on Power Up

1. A user programmable restart function shall be provided to allow restart of the equipment after restoration of power after long duration power outages. Restart time dependent on presence of incoming signal.

O. Fault Memory

1. The last 32 fault codes shall be stored and time stamped in a fault buffer.
2. Information about the drive’s condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-seven other status conditions shall be stored.
3. A power-up marker shall be provided at each power-up time to aid in analyzing fault data.
4. The last 32 alarm codes shall be stored and time stamped for additional troubleshooting reference.

P. Overload Protection
1. The drive shall provide internal class 10 adjustable overload protection.
2. Overload protection shall be speed sensitive and adjustable.
3. A viewable parameter shall store the overload usage.

Q. Terminal Blocks
1. Separate terminal blocks shall be provided for control and power wiring.
2. I/O terminal blocks shall be removable with wiring in place.

R. Inputs and Outputs
1. The Input / Output modules shall consist of both analog and digital I/O.
2. All digital input and output functions shall be fully programmable.
3. The control terminal blocks shall be rated for 115V AC.
4. Inputs shall be optically isolated from the drive control logic.
5. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.
6. The VFD shall be capable of supporting up to 2 analog inputs, 1 analog output, 6 digital inputs, and 1 digital output.
7. The Input / Output option modules shall have the following features:
   a. Analog Inputs:
      1. Provide two (2) differentially isolated inputs.
   b. Analog Outputs:
      1. Provide one (1).
      2. The analog output shall be user programmable.
   c. Digital Inputs:
      1. Provide six (6) digital inputs rated at 24V DC
      2. All inputs shall be individually programmable for multiple functions including: Start, Run, Stop, Auxiliary Fault, Speed Select, Jog and Process PI functions.
   d. Digital Outputs:
      1. Provide one (3) relay output (N.O. or N.C.).
      2. For 240V AC or 24V DC, contact output ratings shall be 2-amp max, Inductive/Resistive.
      3. Relays shall be programmable to multiple conditions.
      4. Provide one (1) transistor output.

S. Reference Signals
1. The drive shall be capable of using the following input reference signals:
a. Analog inputs
b. Preset speeds
c. Remote potentiometer
d. Digital MOP
e. Human Interface Module
f. Communication modules

T. Loss of Reference

1. The drive shall be capable of sensing reference loss conditions.
2. In the event of loss of the reference signal, the drive shall be user programmable to the following:
   a. Fault the drive and coast to stop.
   b. Issue a minor fault - allows the drive to continue running while some types of faults are present.
   c. Alarm and maintain last reference.
3. When using a communications network to control the drive, the communications adapter shall have these configurable responses to network disruptions and controller idle (fault or program) conditions:
   a. Fault
   b. Stop
   c. Zero Data
   d. Hold Last State
   e. Send Fault Configuration

U. Metering

1. The Human Interface Module shall be capable of displaying the following monitoring functions at a minimum:
   a. Motor Current in Amps
   b. Motor Voltage in Volts
   c. Motor Power in kW
   d. Elapsed MWh
   e. DC Bus Voltage
   f. Output Frequency
   g. Heatsink Temperature
   h. Elapsed Run Time

V. Faults

1. At a minimum, the following faults shall be accessible through the Human Interface Module:
   a. Power Loss
   b. Undervoltage
c. Overvoltage  
d. Motor Overload  
e. Heat Sink Over-temperature  
f. Maximum Retries  
g. Phase to Phase and Phase to Ground Faults  

W. Auto Economizer  
1. An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operation in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.  
2. When the load increases, the drive shall automatically return to normal operation.  

X. Flying Start  
1. The Drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to “pick-up” the motor at the rotating speed. This feature is disabled by default.  

Y. Predictive maintenance Features:  
1. Drive shall provide on-board diagnostic information to predict and warn operators of impending end-of-life of drive mounted cooling fans and relay contacts, as well as annunciate blown fuses. In addition, user definable predictive maintenance alerts shall be available for motor bearing life and maintenance intervals, as well as machine (pump) bearing life and maintenance intervals. These alerts shall be programmable to notify operators via the HMI, the communications port, and/or output relays tied to the SCADA system.  

2.03 VFD PACKAGED SYSTEM  

A. Voltage  
1. The VFD shall be capable of accepting nominal plant power of 480V AC at 60Hz.  
2. The VFD supply input voltage tolerance shall be ± 10% of nominal line voltage.  

B. Displacement Power Factor for VFDs rated at 100hp or more.
Eighteen-pulse VFD shall be capable of maintaining a minimum true power factor (Displacement P.F. X Distortion P.F.) of 0.98 or better at rated load and nominal line voltage, over the entire speed range.

C. Efficiency

1. A minimum of 96.5% (+/- 1%) at 100% speed and 100% motor load at nominal line voltage.
2. Control power supplies, control circuits, and cooling fans shall be included in all loss calculations.
   a. Operating ambient temperature range without derating: 0 °C to 40 °C (32 °F to 104 °F)
   b. Operating relative humidity range shall be 5% to 95% non-condensing.
   c. Operating elevation shall be up to 1000 Meters (3,300 ft) without derating.

D. Sizing

1. Systems rated at Normal Duty loads shall provide 110% overload capability for up to one minute and 150% for up to 3 seconds.
2. Systems rated at Heavy Duty loads shall provide 150% overload capability for up to one minute and 180% for up to 3 seconds.
3. Systems rated at Light duty loads shall provide 110% overload capability for up to one minute with no 3 second overload.

E. Auto Reset/Run

For faults other than those caused by a loss of power or any other non-critical fault, the drive system shall provide a means to automatically clear the fault and resume operation.

F. Ride-Through

The VFD system shall attempt to ride through power dips up to 20% of nominal. The duration of ride-through shall be inversely proportional to load. For outages greater than 20%, the drive shall stop the motor and issue a power loss alarm signal to a process controller, which may be forwarded to an external alarm signaling device.

G. Run on Power Up

The VFD system shall provide circuitry to allow for remote restart of equipment after a power outage. Faults due to power outages shall be remotely resettable.

H. Communications
The VFD shall be capable of supporting the following network options:

1. EtherNet/IP
2. Modbus TCP/IP Ethernet

I. Enclosure Door Mounted Human Interface Module (HIM)
   1. Provide one HIM with integral LCD display, operating keys and programming keys for the VFD.
   2. The HIMs shall be rated NEMA Type 12.
   3. The HIMs shall have the following features:
      a. A character backlit LCD display with graphics capability.
      b. The HIMs shall be configured to display the following:
         1. The status of direction, drive condition, fault / alarm conditions and Auto / Manual mode.
         2. The drive output frequency.
         3. Programming menus / information or as a two-line user display for two additional values utilizing scaled units.
         4. Run status
         5. Output speed
   4. The HIM shall provide digital speed control.
   5. The HIM keypad shall include programming keys, drive operating keys (Start, Stop, Direction, and Speed Control), and numeric keys for direct entry.

J. Enclosure
   1. Shall be NEMA 12 construction with filtered louvered vents and fans.
   2. Shall be painted per the manufacturer's standard.
   3. Shall provide entry and exit locations for power cables and conduits
   4. Shall contain a UL508A label.
   5. The drive system nameplate shall be marked with system Short Circuit Current Rating (SCCR).
   6. See section 16480 for additional details.

K. Drive Enclosure Input Disconnect
   1. Provide an enclosure door that is interlocked with the motor circuit protector breaker.
   2. Operator Handles
      a. Provide externally operated main disconnect handle.
      b. Handles shall be lockable with up to three lockout / tagout padlock positions.

L. Branch Circuit Protection
Provide a motor circuit protector (MCP) as shown on the drawings. See section 16480 for additional details on the MCP.

M. Manual Bypass

1. Provide a means to manually switch from the drive control to the bypass contractor.
2. Provide NEMA rated contactors as shown on the plans. Provide barriers in front of the contactor to prevent accidentally electrocution.
3. Provide a VFD/Off/Bypass selector switch, mounted on the enclosure door, for selection of VFD and Bypass modes of operation.
4. The contractors shall be NEMA rated.

N. Control Power Transformer

1. Provide a control power transformer mounted and wired inside of the drive system enclosure.
2. The transformer shall be rated for the VFD power requirements.

O. Harmonic Mitigation Techniques

1. Utilize a Drive Input Line Reactor for VFDs rated less than 100 horsepower with the following specifications:
   a. The construction shall be iron core with an impedance of 5 percent.
   b. The winding shall be copper or aluminum wound.
   c. The insulation shall be Class H with a 115 °C rise over 50 °C ambient.
   d. The unit shall be rated for system voltage, ampacity, and frequency.
   e. The VFD system shall be compliant with IEEE 519 standards.

2. Utilize an 18-pulse converter with an Auto Transformer for VFDs rated at or more than 100 horsepower with the following specifications:
   a. The converter bridge shall be a parallel 18-pulse diode bridge assembly with DC snubber (board or assembly). Diodes shall be rated (devices) with a blocking voltage minimum of 1600V.
   b. The converter shall incorporate 1000V three phase block style MOV protection rated 85 °C.
   c. The drive system shall incorporate an 18-pulse phase shifting auto transformer with line reactor as an assembly. The 18-pulse assembly shall be wired into the VFD System enclosure where possible. The auto transformer shall have the following minimum features:
      i. Rated for input rectifier duty and matched to VFD overload capability.
ii. Copper or aluminum wound.
iii. Class 180 or 220 transformer insulation.
iv. Power factor of 0.98 or better at rated load and nominal line voltage.
v. Open core construction.
vi. One normally closed thermostatic contact in each coil wired into a VFD control circuit.

d. The drive system shall be compliant with IEEE 519-1992 standards at the input VFD terminals based upon the input power phase imbalance within 0.5% of nominal line voltage and under full VFD output current ratings.

P. Auxiliary Relays

1. Provide relays for Drive Alarm, Drive Fault, Drive Running, Ready Input, and Bypass Running.
2. The relays shall be rated for 115 VAC or 30 VDC, 2.0 amp resistive.

Q. Control Interface

1. The control terminals shall be rated for 24 VDC.
2. The control interface shall provide input terminals for access to VFD functions that include start, stop, external fault, speed select, and enable.

R. Hand/Off/Auto Selector Switch

1. Provide a "Hand/Off/Auto" selector switch, mounted on the enclosure door.
2. The "Hand/Off/Auto" selector switch shall start the drive in the “Hand” mode and stop the drive in the “Off” mode.
3. In the “Auto” mode the drive shall be started and stopped from a remote “RUN” contact.
4. When a HIM is present, the stop function shall always be available to stop the drive regardless of the selected mode (“Hand” or “Auto”). The HIM will be non-functional (except for the display and programming) when the switch is in “Off” mode. The HIM shall stop the drive if the switch is in the “Auto” mode with the remote start contact initiated.
5. The drive speed reference shall be controlled from the HIM when in the “Hand” mode.
6. The drive speed reference shall be controlled by a remote 4-20 mA input signal when in “Auto” mode.

S. Drive Disable Mushroom Push Button

1. Provide a maintained mushroom style push button, mounted on the enclosure door that when pushed, will open the drive enable input.
2. The device shall be an Allen-Bradley Bulletin 800T (30mm) NEMA Type 4/13, mounted on the drive system enclosure door.

T. Pilot Lights

Provide 30mm LED pilot lights, mounted on the enclosure door, for indication of the following status:

1. Run
2. Drive Fault
3. Control Power On

U. Motor Run Time Meter

1. Provide a digital, non-resettable, door-mounted elapsed time meter.
2. The meter shall be electrically interlocked with the Drive and bypass starter relays to indicate actual motor operating hours.
3. Elapsed time meter shall be large panel mounted, non-reset type, capable of reading 99,999.9 hours to the nearest 1/10 hour, rated 120 volts, 60 Hz.

PART 3 – EXECUTION

3.01 FACTORY TESTING & INSTALLATION

A. Standard factory tests shall be performed on the drive. All tests shall be in accordance with the latest version of UL and NEMA standards.

B. The manufacturer shall provide three (3) certified copies of the factory test reports.

C. Installation shall be in compliance with all the manufacturer requirements, instructions and drawings.

3.02 FIELD TESTING AND START-UP SERVICE

A. Testing, checkout and start-up of the drive shall be performed under the technical direction of the manufacturer's service engineer. Under no circumstances are any portions of the drive system to be energized without authorization from the manufacturer's representative. The drive manufacturer shall provide a start-up service which includes inspection, final adjustments, operational checks and a final report. The start-up service shall be provided by a factory service engineer experienced in the operations and principles of the hydraulics and control of large water pumps.

B. The setup and programming of the drive shall be provided by a field technician who is authorized by the drive manufacturer to perform the startup. This setup and programming shall be done prior to and during the first application of power.
to the motor. A list of the setup and programming parameter shall be included in the final O&M.

C. The drive manufacturer shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

D. At a minimum, the start-up service shall include:

1. Pre-Power Check
2. Megger Motor Resistances: Phase-to-Phase and Phase-to-Ground
3. Verify system grounding per manufacturer's specifications
4. Verify power and signal grounds
5. Check connections
6. Check environment

E. Drive Power-up and Commissioning:

1. Measure Incoming Power Phase-to-Phase and Phase-to-Ground
2. Measure DC Bus Voltage
3. Measure AC Current Unloaded and Loaded
4. Measure Output Voltage Phase-to-Phase and Phase-to-Ground
5. Verify input reference signal
6. All measurements shall be recorded.
7. Drive shall be tuned for system operation.
8. Drive parameter listing shall be provided.

3.03 TRAINING

A. Manufacturer to provide one 4-hour session of on-site instruction for up to 12 City staff. The instruction shall include the operational and maintenance requirements of the variable frequency drive. The basis of the training shall be the variable frequency drive, the engineered drawings and the user manual. At a minimum, the training shall:

1. Review the engineered drawings identifying the components shown on the drawings.
2. Review starting / stopping and speed control options for the drive.
3. Review operation of the Human Interface Module for programming and monitoring of the variable frequency drive.
4. Review the maintenance requirements of the variable frequency drive.
5. Review safety concerns with operating the variable frequency drive.

3.04 WARRANTY

A. The drive with the bypass contractor shall come with a one-year manufacturer's warranty. This warranty shall cover all parts, travel costs, and labor. The system
supplier shall have a staff of experienced personnel available to provide service on a 2 working days notice during the warranty period.

B. Prior to "final acceptance", the Contractor shall furnish to the Engineer a listing of the warranty information for each drive. The listing shall include the following:

1. Manufacturer's name, contact person, phone number, and address.
2. Material and equipment description, equipment number, part number, serial number, and model number.
3. Manufacturers warranty expiration date.

3.05 SPARE PARTS

A. Provide the following spare parts:

1. Three spare current limiting fuses/power fuses
2. Three spare control power fuses
3. Two spare air filters
4. One spare exhaust fan

END OF SECTION
PART 1 GENERAL

1.01 SCOPE
A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into the electrical distribution equipment as shown on the drawings.

1.02 RELATED SECTIONS
A. Section 16480 – Low Voltage Motor Control Centers

1.03 REFERENCES
A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

1.04 SUBMITTALS – FOR REVIEW/APPROVAL
A. The following information shall be submitted to the Engineer:
   1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL’s website or on any other NRTL’s website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (I_n).

   B. Where applicable the following additional information shall be submitted to the engineer:
      1. Descriptive bulletins
      2. Product sheets

1.05 QUALIFICATIONS
A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the
Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.06 DELIVERY, STORAGE AND HANDLING
A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.07 OPERATION AND MAINTENANCE MANUALS
A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Eaton SPD Series
B. Innovation Technology
C. Or approved equal

2.02 VOLTAGE SURGE SUPPRESSION – GENERAL
A. Electrical Requirements
   1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
   2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
   3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.

Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Protection Modes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L-N</td>
</tr>
<tr>
<td>Wye</td>
<td>●</td>
</tr>
<tr>
<td>Delta</td>
<td>N/A</td>
</tr>
</tbody>
</table>

4. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes
Types 1 and 2) or operating voltage. SPDs having an $I_n$ less than 20kA shall be rejected.

5. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

<table>
<thead>
<tr>
<th>Modes</th>
<th>208Y/120</th>
<th>480Y/277</th>
<th>600Y/347</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-N; L-G; N-G</td>
<td>700</td>
<td>1200</td>
<td>1500</td>
</tr>
<tr>
<td>L-L</td>
<td>1200</td>
<td>2000</td>
<td>3000</td>
</tr>
</tbody>
</table>

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.

3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.

4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
   a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
      i. For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
      ii. For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
iii. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.

c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

i. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter’s display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter’s memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection

a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD’s components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

8. Safety Requirements

a. The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring
any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.

c. Side-mounted units shall not be allowed or approved.

2.03 SYSTEM APPLICATION

A. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

<table>
<thead>
<tr>
<th>Category</th>
<th>Application</th>
<th>Per Phase</th>
<th>Per Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Service Entrance Locations</td>
<td>250 kA</td>
<td>125 kA</td>
</tr>
<tr>
<td></td>
<td>(Switchboards, Switchgear, MCC, Main Entrance)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>High Exposure Roof Top Locations</td>
<td>160 kA</td>
<td>80 kA</td>
</tr>
<tr>
<td></td>
<td>(Distribution Panelboards)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Branch Locations (Panelboards, MCCs, Busway)</td>
<td>120 kA</td>
<td>60 kA</td>
</tr>
</tbody>
</table>

C. SPD Type – All SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.04 MOTOR CONTROL CENTER REQUIREMENTS

A. MCC Requirements

1. The SPD application covered under this section is MCC locations. Service entrance located SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.

2. The SPD shall be of the same manufacturer as the MCC

3. The SPD shall be factory installed inside the switchgear, switchboard, MCC, and/or bus plug at the assembly point by the original equipment manufacturer.

4. Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.

5. The SPD shall be connected through a disconnect (30A circuit breaker). The disconnect shall be located in immediate proximity to the SPD. Connection shall be made via bus, conductors, or other connections originating in the SPD and shall be kept as short as possible.
6. The SPD shall be integral to switchgear, switchboard, MCC, and/or bus plug as a factory standardized design.

7. All monitoring and diagnostic features shall be visible from the front of the equipment.

PART 3  EXECUTION

3.01  FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.02  INSTALLATION

A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.03  WARRANTY

A. The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE

A. This Section covers the furnishing and installation of the following equipment: magnetic door switch. Contractor shall coordinate the installation of the antenna pole with the City.

1.02 REFERENCE PUBLICATIONS

A. The equipment covered under this contract shall be designed, manufactured, and tested in accordance with the latest version of the applicable industrial standards.

1.03 SUBMITTALS

A. Manufacturers Data:

1. Magnetic Door Switch

B. Shop Drawings.

C. Operations and Maintenance Manuals as specified in Section 01105.

1.04 QUALITY ASSURANCE

A. The manufacturer shall verify that they have been fabricating and assembling similar equipment for a minimum of five (5) years. Manufacturer shall be located in the United States.

PART 2 – PRODUCTS

2.02 MAGNETIC DOOR SWITCH (DS)

A. Magnetic door switch shall be Sentrol model number 1044TW or approved equal. Color shall be natural (off-white).

PART 3 - EXECUTION

3.01 INSTALLATION
A. The Contractor shall be responsible for the installation of the equipment specified and shall pull all the cables and wires and make all the connections as shown on the Plans. The City will conduct tests to determine its acceptability.

3.02 FIELD TESTING

A. After finishing all the connections, the Contractor shall cooperate with City during the testing.

END OF SECTION
SECTION 16950 - OPERATIONAL TESTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the work necessary to test, commission and demonstrate that the electrical work satisfies the criteria of these specification and functions as required by the Contract Documents.

B. Testing shall confirm the following:
   1. That equipment is operational within industry and manufacturer's tolerances.
   2. That equipment is installed in accordance with the Contract Documents.
   3. That equipment is suitable for energization and acceptance.

C. Testing results shall be submitted separately for each facility.

1.02 GENERAL

A. The work of this Section includes furnishing the labor, equipment, and power required to support the testing specified in this and other sections of the Specification. Electrical testing specified in Division 16 and functional testing of all power and controls not tested under Division 17 shall be completed before commencement of start-up testing. This scope of work may require the activation of circuits, shutdown circuits, run equipment, take electrical measurements, replace blown fuses, install temporary jumpers, etc.

B. Provide support to disconnect and reconnect cables, and perform any other functions required to test electrical equipment.

C. Electrical tests shall be performed by third party, NETA certified, testing agency. All electrical testing shall be witnessed by the City and Engineer to be considered valid.

D. All electrical testing performed per this Section shall be done prior to Functional testing. Refer to Section 01750 – Facility Startup, for further testing requirements.

1.03 SUBMITTALS

A. Testing company’s NETA certification.

B. Testing technician’s resume.

C. Submit testing forms for approval. Testing forms shall be based on InterNational Electric Testing Association’s (NETA) latest Acceptance Testing Specifications having a sign-off (tester and witness), pass/fail status, data filed...
for each line item covered by NETA’s Acceptance Testing Specifications latest edition.

D. Results of all testing shall be submitted to the Engineer prior to final project acceptance. Results to be included as part of final O&M Manuals. Results shall describe test conditions, weather (including temperature and humidity), test date, duration of test, test equipment, tested equipment, testing technician, “as found” and “as-left” results, expected results, actual results, pass/fail status based on listed testing standards.

E. Testing agency engineer to submit confirmation that “equipment is ready to be energized”. Confirmation shall be on company letterhead with name, signature and stamp of responsible Professional Engineer of Testing Agency.

1.04 TESTING AGENCY QUALIFICATION

A. NETA testing shall be performed by an independent third party testing organization who has been regularly engaged in the testing of equipment for a period of at least five (5) years and has full membership certification issued by NETA. All testing shall be conducted by technicians whom are regularly employed by the testing company who will prepare and sign test reports with values, recommendations, comments, pass/fail status, as well as ready for energization confirmation letter.

B. Testing equipment required to conduct the specified tests shall be furnished by the NETA testing organization. Testing equipment shall be in good working condition and comply with the requirements of this Specification and applicable industry standards.

C. Testing equipment shall have valid calibration sticker during testing.

D. Testing shall be done in accordance with the manufacturer’s instructions, these Specifications, and NETA Acceptance Testing Specifications (ATS), latest edition, NEMA, ANSI, NFPA, and ASTM Standards. All testing shall be done in the presence of the Engineer, and forms shall include space for Engineer sign-off at time of test.

E. Testing organization shall be Apparatus Testing and Engineering, or equal.

F. The testing organization shall be responsible for testing, and verification of results for equipment listed below:

1. Motor Control Centers, Low Voltage: Including bus, grounding, Torque test, breakers, manual transfer switch, panelboards, dry type transformer, starters and overloads.

2. Variable frequency drive systems – shall be tested per manufacturer’s standard by manufacturer’s representative and verify by testing agency. Testing organization is responsible to review results, provide pass/fail evaluation and include results submittal
3. Cables – shall be tested by Contractor after pulling and prior to termination. Refer to Section 16120. Testing organization is responsible to review results, provide pass/fail evaluation and include results submittal.

4. Grounding System. Test for ground system resistance at closest ground rod connected to neutral bonding location.

5. Motor Circuit Protector.


7. Miscellaneous Testing.

1.05 FIELD TESTING (NETA ATS)

A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere:

1. Motor Control Centers, Low-Voltage:
   a. Perform Field Testing per NETA Standards, section 7.16.1.1.
   b. Perform manufacturer recommended Field Testing on motor starters per section 7.16.1.1.

2. Variable Frequency Drive Systems:
   a. Perform Field Testing per NETA Standards, section 7.17.
   b. Perform manufacturer recommended Field Testing.

3. Cables – to be performed by Contractor:
   a. Perform Field Testing per NETA Standards, section 7.3.2.
   b. Refer to Section 16120 – Wires and Cables for additional testing.

4. Grounding System:

5. Motor Circuit Protector
   a. Perform Field Testing per NETA Standards, section 7.6.1.1.

6. Low Voltage Circuit Breaker
   a. Perform Field Testing per NETA Standards, section 7.6.1.1 or 7.6.1.2 as applicable.

7. Miscellaneous Testing– to be performed by Contractor:
   a. Refer to Section 16050 – Electrical Work, General.
3.01 TESTING

A. All testing shall be witnessed and signed-off by the City and the Engineer. Each test sheet must be signed-off prior to submittal.

B. After equipment is tested and approved, testing organization shall apply sticker on equipment noting date of test and initial of tester.

C. Function testing shall include all NETA Field Testing, and manufacturer recommended testing and testing requirements listed in equipment specification sections.

END OF SECTION
CITY OF SACRAMENTO

IMPROVEMENT PLANS FOR
SUMP 1A VFD REPLACEMENT PROJECT

APPROVED BY:

DATE

APPROVED BY:

DATE

VICINITY MAP

SHEET INDEX

E-1 COVER SHEET
E-2 ELECTRICAL SYMBOLS, ABBREVIATIONS AND GENERAL NOTES
E-3 SINGLE LINE DIAGRAM
E-4 EXISTING MCC ELEVATION
E-5 MCC ELEVATION
E-6 P-8103 VFD CONTROL DIAGRAM
E-7 P-8102 VFD CONTROL DIAGRAM
E-8 P-8101 SOFT-STARTER CONTROL DIAGRAM
E-9 ELECTRICAL POWER AND CONTROL SITE PLAN
E-10 EXISTING SITE POWER DISTRIBUTION PLAN
E-11 CONDUIT AND LIGHTING PANEL SCHEDULES
E-12 ELECTRICAL STANDARD DETAILS
EXISTING MOTOR CONTROL LINEUP

NOTES:
1. THE CONTRACTOR SHALL INTERCEPT AND EXTEND SHORTEN EXISTING CIRCUITS TO ITS RESPECTIVE FEEDER OR THE BOTTOM FEED. THE CONTRACTOR SHALL REMOVE THE EXISTING CONCRETE STONE REINFORCED FLOOR AS REQUIRED.
2. REUSE EXISTING SEISMIC BRACE AND SUPPORT FOR NEW GEAR. MODIFY AS REQUIRED. INSTALL NEW ANCHOR PER SEISMIC CALCULATIONS.
3. CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF EXISTING GEAR. THE BUILDING ROOF ACCESS IS AVAILABLE FOR USE. THE CONTRACTOR MAY CHOOSE TO USE A CRANE WITH A HYDRAULIC DRUM OPERATOR TO REMOVE THE EXISTING GEAR.
4. SEE SHEET 6-10 FOR DETAILS.
NEW MOTOR CONTROL LINEUP

NOTES:
1. THE ELECTRICAL GEAR LINE-UP SHALL FIT WITHIN THE EXISTING SPACE OF APPROXIMATELY 2'-0" X 4'-0". CONTRACTOR SHALL COORDINATE ACTUAL PLACEMENT OF GEAR WITH CITY STAFF.
2. PHENOLIC NAME PLATES SHALL BE PROVIDED FOR ALL ELEMENTS ON BOTH FRONT PANEL AND BACK PANEL. SECURE FRONT NAME PLATES WITH STAINLESS STEEL SCREWS.
3. ONLY MAJOR ELEMENTS ARE SHOWN ON THE DRAWING. CONTRACTOR SHALL BE RESPONSIBLE TO MAKE ALL ELEMENTS FIT INSIDE THE ELECTRICAL GEAR.
4. CONTRACTOR SHALL MOUNT TERMINAL, SWITCHES, DISPLAY PANELS AND ALL ITEMS ON THE CONTROL PANEL AT 45 TO 60" FROM THE BOTTOM OF ELECTRICAL GEAR OR AS DIRECTED BY THE ENGINEER.
5. INSTALL ANCHORS PER SEISMIC CALCULATIONS. USE EXISTING SEISMIC BRACE AND SUPPORT.
6. THE CONTRACTOR SHALL INTERPRET AND EXTEND/ADD/ REMAKE EXISTING CONDUIT TO ITS RESPECTIVE SECTION AND PROVIDE NEW CONDUIT PER THE CONSULT SCHEDULE. FOR THE BOTTOM FEED, THE CONTRACTOR SHALL CORE BORE THE EXISTING CONCRETE FLOOR AS REQUIRED. THE EXISTING CONCRETE SLAB IS 6 1/2" THICK.
7. SEE SWT. E-12 FOR DETAILS.
### POWER CIRCUITS

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### INSTRUMENTATION CABLES

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### SUMP 1A CONDUIT SCHEDULE

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### PANEL, LIGHTING PANEL 1

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### FEEDER EXTRUSION PANEL WOUND

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### MOUNTING MOTOR CONTROL LINEUP

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### CITY OF SACRAMENTO

#### DEPARTMENT OF UTILITIES

**SUMP 1A VFD REPLACEMENT PROJECT**

**CONDUIT AND LIGHTING PANEL SCHEDULES**

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**Figure:**

A diagram illustrating the conduit and lighting panel schedules for the City of Sacramento's Sump 1A VFD Replacement Project. The diagram includes detailed wiring and conduit layout plans for the power, control, instrumentation, and feeder extrusion panels. The schedule provides a comprehensive overview of the electrical connections and conduit placements necessary for the project's successful execution. The document is part of the city's utility infrastructure project documentation, aimed at ensuring safety and efficiency in the distribution and management of electrical services.
TYPICAL MOTOR CONNECTION DETAIL

WALL/FLOOR PENETRATION DETAIL