Meeting Date: 2/2/2016
Report Type: Consent
Report ID: 2016-00009

Title: Contract: Sump 40 & 146 Reconstruction Project

Location: Districts 2 and 5

Recommendation: Pass a Resolution awarding a contract for the Sump 40 & 146 Reconstruction Project to T&S Construction for an amount not-to-exceed $827,623, and approving related budget transfers.

Contact: Dan Sherry, Engineering & Water Resources Manager, (916) 808-1419; Brett Grant, Supervising Engineer, (916) 808-1413, Department of Utilities

Presenter: None

Department: Department Of Utilities
Division: Cip Engineering
Dept ID: 14001321

Attachments:
1-Description/Analysis
2-Background
3-Location Map
4-Resolution
5-Contract

City Attorney Review
Approved as to Form
Joe Robinson
1/20/2016 10:13:05 AM

Approvals/Acknowledgements
Department Director or Designee: Bill Busath - 1/13/2016 12:09:40 PM
Description/Analysis

**Issue Detail:** It is recommended that Council award a construction contract to T&S Construction to reconstruct Sumps 40 & 146. These aging sewer lift stations have nominal 30-year old electrical gear nearing the end of its useful service life and both stations are due for security upgrades.

**Policy Considerations:** This action is in conformance with City Code Chapter 3.60 Articles I and III, which provide that City Council may award competitively bid contracts to the lowest responsible bidder. Reconstructing these sumps is consistent with the criteria set forth in the Department of Utilities’ Capital Improvement Programming Guide.

**Economic Impacts:** This project is expected to create 3.3 total jobs (1.9 direct jobs and 1.4 jobs through indirect and induced activities) and create $511,003 in total economic output ($322,089 of direct output and another $188,914 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 Community Development Department, Environmental Planning Services Division reviewed the proposed project and determined that it is exempt from review under the California Environmental Quality Act (CEQA) under Section 15302(c) of the CEQA Guidelines. The project consists of reconstructing existing public utility facilities with negligible expansion of capacity, and thus will not result in a significant environmental impact.

**Sustainability:** The project is consistent with the City's Sustainability Master Plan and sustainability targets as it will facilitate reduced sanitary sewer outflows, improve service and reliability, and reduce energy-intensive maintenance.

**Commission/Committee Action:** Not Applicable.
Rationale for Recommendation: The project was formally advertised to solicit bids, and bids were opened by the City Clerk on January 6, 2016. Six responses were received, as follows:

<table>
<thead>
<tr>
<th>Bidders</th>
<th>Bid Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 T&amp;S Construction</td>
<td>$827,623</td>
</tr>
<tr>
<td>2 Clyde Stegall</td>
<td>$873,893</td>
</tr>
<tr>
<td>3 Koch &amp; Koch</td>
<td>$890,000</td>
</tr>
<tr>
<td>4 JJM Engineering, Inc.</td>
<td>$933,763</td>
</tr>
<tr>
<td>5 Sierra National</td>
<td>$1,045,000</td>
</tr>
<tr>
<td>6 McGuire &amp; Hester, Inc.</td>
<td>$1,074,900</td>
</tr>
</tbody>
</table>

The engineer’s estimate was $925,000. T&S Construction is the lowest responsive and responsible bidder.

Financial Considerations: This construction project is for both Wastewater Sump Rehabilitation (X14130900) and Facility Electric Rehabilitation (X14131500) projects.

Sufficient funding exists within Sump 40 Reconstruction (X14131500).

The total estimated project cost to complete Sump 146 Reconstruction (X14131900) is $705,000. To date, $58,262 has been expended. Staff anticipates an additional $563,262 is needed to complete the project and funds will be redirected to this project from the funds shown below:

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Project No.</th>
<th>Fund No.</th>
<th>Amount (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base CIP Contingency – Wastewater</td>
<td>X14000500</td>
<td>6320</td>
<td>$363,262</td>
</tr>
<tr>
<td>Base CIP Contingency – Wastewater</td>
<td>X14000500</td>
<td>6006</td>
<td>$200,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$563,262</td>
</tr>
</tbody>
</table>

Local Business Enterprise (LBE): T&S Construction is an LBE firm.
BACKGROUND

Sumps 40 & 146 were constructed or most recently upgraded in 1986 and 1983, respectively. The two pumps and mechanical equipment at Sump 146 are in a separate underground steel “pump room” that is corroding. The pump room is considered a hazardous confined space due to odor and related safety issues, which affects how pump maintenance is performed. Electrical equipment at both sites is at the end of its useful life; neither site has flow meters to monitor pump performance; and neither site conforms to DOU’s current security requirements.

Reconstruction at both sites will add flow meters; upgraded electrical equipment; protective electric equipment shelters; and new site security features. At Sump 40, the existing submersible pumps will remain. At Sump 146, the two fixed pumps will be replaced with new submersible pumps like those at Sump 40 that can be pulled to the surface for more efficient maintenance. Sump 146 will also receive a new SMUD power transformer.
LOCATION MAP

Reconstruction of Sumps 40 & 146
(PN:X14130903 & X14131502)

Sump 40 Project Location

Sump 146 Project Location
RESOLUTION NO. 2016-
Adopted by the Sacramento City Council

SUMP 40 & 146 RECONSTRUCTION PROJECT CONTRACT AWARD AND BUDGET ADJUSTMENTS

BACKGROUND

A. The Sump 40 & 146 Reconstruction Project will rehabilitate two aging sewer lift stations.

B. Six bids were received to construct the Projects, and the lowest responsive, responsible bidder is T&S Construction.

C. There is sufficient funding for Sump 40 Reconstruction in the Facility Electrical Rehabilitation Program (X14131500).

D. A budget augmentation of $563,262 is required to provide sufficient funds to complete construction and inspection services for the Sump 146 Reconstruction Project (X14130900).

BASED ON THE FACTS SET FORTH IN THE BACKGROUND, THE CITY COUNCIL RESOLVES AS FOLLOWS:

Section 1 The contract plans and specifications for the Reconstruction of Sumps 40 & 146 are approved, and the contract is awarded to T&S Construction, for an amount not-to-exceed $827,623.

Section 2 Budget transfers from Base CIP Contingency – Wastewater(X14000500) to the Wastewater Sump Rehabilitation (X14130900) are approved, in the amounts shown below.

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Project No.</th>
<th>Fund No.</th>
<th>Amount (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base CIP Contingency – Wastewater</td>
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<td>X14000500</td>
<td>6006</td>
<td>$200,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$563,262</td>
</tr>
</tbody>
</table>
CONTRACT DOCUMENTS
FOR
RECONSTRUCTION OF SUMPS 40 & 146
PN: X14130903 & X14131502
B16141321013
Engineer’s Estimate: $925,000

Non-Mandatory Pre-Bid Site Visit: Friday, December 4th @ 9:00 AM
Starting Location: Sump 146, 39 Twin Leaf Court, Sacramento 95838

For Pre-Bid Information Call: Stu Williams
Senior Engineer
(916) 808-1410
No Separate Plans
Bids to be received before 2:00 PM
December 16, 2015
City Hall, Office of the City Clerk
915 I Street, 5th Floor, Public Counter
Sacramento, CA 95814

LBE PROGRAM PARTICIPATION
This project has a required minimum LBE participation level of 5.0 percent. For information on meeting the City of Sacramento’s Local Business Enterprise (LBE) project goals, please contact City Procurement at (916) 808-6240, or visit the City of Sacramento’s web site at: http://www.cityofsacramento.org/Economic-Development/Grow-Here/Small-Business/LBE
RECONSTRUCTION OF SUMPS 40 & 146

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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, City Hall, located at 915 I Street, 5th Floor, Public Counter, up to the hour of 2:00 p.m. on December 16, 2015. Proposals will then be opened and read as soon thereafter as business allows, in the Hearing Room, 2nd Floor Room, in Historic City Hall, for:

RECONSTRUCTION OF SUMPS 40 & 146
(PN: X14130903 & X14131502) (B16141321013)

Construction at both sites includes, but is not limited to, sitework, new perimeter fencing, and new electrical switchgear/motor control cabinets; plus a new electrical equipment cover at Sump 40; and installation of new centrifugal pumps in a modified wet well with a new pre-fabricated electrical equipment building at Sump 146. The project requires at least 5.0 percent participation by Local Business Enterprise (LBE) firms.

Contract Documents are available for download from PlanetBids via the following website address:

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

On Friday December 4th, a non-mandatory pre-bid site visit will start at 9:00 AM at Sump 146 (39 Twin Leaf Court, Sacramento 95838) that will then move to and end at Sump 40. City staff will be available for questions and to open gates, manholes, and electrical cabinets for interested potential bidders. It will depend upon interest and the number of questions received, but the duration at each site is anticipated to be no more than a half-hour. Attendees must provide their own transportation.

Signed proposals shall be submitted on the contract document proposal form in a sealed envelope marked:

PROPOSAL FOR
RECONSTRUCTION OF SUMPS 40 & 146
(PN: X14130903 & X14131502) (B16141321013)

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.

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 upon request.

The City of Sacramento has a Labor Compliance Program, and electronic submission of Labor Compliance Reports is required. The contractor and every lower-tier subcontractor shall submit certified payrolls and labor compliance documentation electronically in the manner prescribed by the City of Sacramento. Each contractor and subcontractor shall receive a unique Log-On identification and password to access the City's reporting system. Use of the City's system may entail additional contractor time for data entry of weekly payroll information including employee identification, labor classification, total hours worked, hours worked on this project, and wage and benefit rates paid, etc. 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.

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 shall be rejected as non-responsive.
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 is subject to compliance monitoring and enforcement by the DIR. Per California Labor Code Section 1771.4 (enacted by SB 854), the contractor and all subcontractors shall furnish electronic payroll records directly to the Labor Commissioner (in addition to submittals made to City staff via the City’s electronic system).

A Fact Sheet summarizing the provisions of SB 854 is included in the Contract Documents following this Notice solely for informational purposes, and does not in any way affect the contractor’s and subcontractors’ obligations 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.

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 Notice to Contractors 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.

Contact information for the City’s manager of this project is:

Stu Williams, Department of Utilities, Engineering & Water Resource Division
1395 35th Avenue, Sacramento, CA 95822
Phone: (916) 808-1410 / Fax: (916) 808-1497/E-mail: SSWilliams@cityofsacramento.org

**********
NEW PUBLIC WORKS CONTRACTOR REGISTRATION LAW [SB 854]
FACT SHEET

SB 854, a budget trailer bill that was signed into law on June 20, 2014, and became effective immediately, made several significant changes to laws pertaining to the administration and enforcement of prevailing wage requirements by the Department of Industrial Relations (DIR). Among other things, SB 854 established a new public works contractor registration program to replace prior Compliance Monitoring Unit (CMU) and Labor Compliance Program (LCP) requirements for bond-funded and other specified public works projects. The fees collected through this new program will be used to fund all of DIR's public works activities, including compliance monitoring and enforcement, the determination of prevailing wage rates, public works coverage determinations, and hearing enforcement appeals.

Essentials of public works contractor registration program:

- Contractors will be subject to a registration and annual renewal fee that has been set initially at $300. The fee is non-refundable and applies to all contractors and subcontractors who intend to bid or perform work on public works projects (as defined under the Labor Code).

- Contractors will apply and pay the fee online and must meet minimum qualifications to be registered as eligible to bid and work on public works projects:
  - Must have workers' compensation coverage for any employees and only use subcontractors who are registered public works contractors.
  - Must have Contractors State License Board license if applicable to trade.
  - Must have no delinquent unpaid wage or penalty assessments owed to any employee or enforcement agency.
  - Must not be under federal or state debarment.
  - Must not be in prior violation of this registration requirement once it becomes effective. However, for the first violation in a 12 month period, a contractor may still qualify for registration by paying an additional penalty.

- The registration fee is not related to any project. It is more like a license that enables the registrant to bid on and perform public works.
- DIR will post a list of registered contractors and subcontractors on its website so that awarding bodies and contractors will be able to comply with requirements to only use registered contractors and subcontractors.

- Various protections are built in so that
  - A contractor won’t be in violation for working on a private job that is later determined to be public work;
  - The inadvertent listing of an unregistered subcontractor on a bid won’t necessarily invalidate that bid;
  - A contract with an unregistered contractor or subcontractor is subject to cancellation but is not void as to past work;
  - An unregistered contractor or subcontractor can be replaced with one who is registered;
  - A contractor whose registration lapses will have a 90 day grace period within which to pay a late fee and renew.

- Registrations will begin after July 1, 2014, once the registration system is ready to go online. The preferred method of payment will be by credit card.

- The requirement to list only registered contractors and subcontractors on bids becomes effective on March 1, 2015. The requirement to only use registered contractors and subcontractors on public works projects applies to all projects awarded on or after April 1, 2015.

**Essentials of Public Works Enforcement Fund:**

All contractor registration fees will go into the State Public Works Enforcement Fund and be used to fund the following items --

- administration of contractor registration requirement
- all DIR costs for administering and enforcing public works laws
- Labor Commissioner’s enforcement of other Labor Code violations on monitored public works projects.

DIR will no longer charge awarding bodies for prevailing wage compliance monitoring and enforcement by the CMU. *(Note: DIR will continue to bill and collect fees from awarding agencies for CMU services provided through June 20, 2014.)*
Related changes in DIR's administration and enforcement of public works requirements:

- Requirements to use CMU or specified alternative (labor compliance program or project labor agreement) for state bond-funded and other specified projects have been eliminated and replaced by requirements that apply to all public works projects (as defined under the Labor Code).

- Awarding bodies are now required to submit PWC-100 (contract award notice) for all public works projects. (This requirement previously applied to about 90% of all projects.)

- Contractors and subcontractors on all public works projects will be required to submit certified payroll records (CPRs) to the Labor Commissioner unless excused from this requirement.
  
  ○ This requirement will be phased in as follows:
    
    ▪ Applies immediately to public works projects that have already been under CMU monitoring, i.e. contractors on ongoing projects that have been submitting CPRs to the CMU will continue doing so
    
    ▪ Will apply to any new projects awarded on or after April 1, 2015
    
    ▪ May apply to other projects as determined by Labor Commissioner
    
    ▪ Will apply to all public works projects, new or ongoing, on and after January 1, 2016
  
  ○ The Labor Commissioner may make exception to this requirement for
    
    ▪ Projects covered by qualifying project labor agreement
    
    ▪ Projects undertaken by one of four remaining awarding bodies with legacy LCPs (Caltrans, City of Los Angeles, County of Sacramento, and Los Angeles Unified School District), so long as those LCPs remain approved by DIR
  
  ○ CPRs will be furnished online (as is done currently for CMU). DIR intends to continue making improvements to this process, including creating a means for general contractors to have online access to the CPRs submitted by their subcontractors.

- Requirements for awarding bodies to adopt and enforce a DIR-approved LCP are now limited to: (1) public works projects awarded prior to January 1, 2012 that were under a preexisting LCP requirement; and (2) projects funded in whole or in part by Proposition 84.
LBE INFORMATION

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 City Procurement at (916) 808-6240, or visit the City of Sacramento’s web site at: http://www.cityofsacramento.org/Economic-Development/Grow-Here/Small-Business/LBE

**********
THE FOLLOWING DOCUMENTS ARE TO BE COMPLETED AND SUBMITTED WITH THE BID PACKAGE
Contractor's Name: T&J Construction Co., Inc.

CITY OF SACRAMENTO

SEALED PROPOSAL

Sealed Proposals will be received not later than 2:00 PM on January 6, 2016, at the Office of the City Clerk, New City Hall, at 915 I Street, 5th Floor, Public Counter, Sacramento, California 95814, and will be opened as soon thereafter as business allows. PROPOSALS MUST BE SIGNED BY BIDDERS IN ORDER TO BE RESPONSIVE.

TO THE HONORABLE CITY COUNCIL:

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

RECONSTRUCTION OF SUMPS 40 & 146
(PN: X14130903 & X14131502) (B16141321013)

in the City and County of Sacramento, California.

The work is to be performed in strict conformity with the Plans, the City of Sacramento Standard Specifications for Public Construction, and these Contract Documents, 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>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sump 40 Reconstruction</td>
<td>1</td>
<td>LS</td>
<td>$356,345</td>
</tr>
<tr>
<td>2</td>
<td>Sump 146 Reconstruction</td>
<td>1</td>
<td>LS</td>
<td>$471,278</td>
</tr>
</tbody>
</table>

TOTAL BID: $827,623

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. The sum of individual unit prices shall prevail over the total bid amount.

It is understood that this bid is based upon completion of the work within a period of one hundred seventy-five (175) 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 ($700.00) 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.

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 forty-five (45) working days after opening of the Proposals. City reserves the right to reject any and all bids, and to waive any error or omission in any Proposal received.
Contractor’s Name: T&S Construction Co., Inc.
(Please print)  
CITY OF SACRAMENTO  
SEALED PROPOSAL

Sealed Proposals will be received not later than 2:00 PM on December 16, 2015, at the Office of the City Clerk, New City Hall, at 915 I Street, 5th Floor, Public Counter, Sacramento, California 95814, and will be opened as soon thereafter as business allows. PROPOSALS MUST BE SIGNED BY BIDDERS IN ORDER TO BE RESPONSIVE.

TO THE HONORABLE CITY COUNCIL:

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

RECONSTRUCTION OF SUMPS 40 & 146  
(PN: X14130903 & X14131502) (B16141321013)

in the City and County of Sacramento, California.

The work is to be performed in strict conformity with the Plans, the City of Sacramento Standard Specifications for Public Construction, and these Contract Documents, 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>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sump 40 Reconstruction</td>
<td>1</td>
<td>LS</td>
<td>$</td>
</tr>
<tr>
<td>2</td>
<td>Sump 146 Reconstruction</td>
<td>1</td>
<td>LS</td>
<td>$</td>
</tr>
</tbody>
</table>

TOTAL BID: $________________

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. The sum of individual unit prices shall prevail over the total bid amount.

It is understood that this bid is based upon completion of the work within a period of one hundred seventy-five (175) 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 ($700.00) 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.

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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 forty-five (45) working days after opening of the Proposals. City reserves the right to reject any and all bids, and to waive any error or omission in any Proposal received.
The undersigned agrees to execute the Agreement and to provide City with the executed Agreement, the required insurance certificates, endorsements, and waivers of subrogation, and the required surety bonds within ten (10) calendar days after receipt of the City's notice that the undersigned will be recommended for Contract award. The undersigned further agrees to begin work within fifteen (15) days after the City's Notice to Proceed is issued.

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.

BID DEPOSIT ENCLOSED IN THE FOLLOWING FORM:

$____10% not less than ten (10) percent of total amount bid.

____CERTIFIED CHECK

____MONEY ORDER

____ CASHIER'S CHECK

V BID BOND

Mark which, if any addendum have been issued and received: V #1; V #2; ___ #3; ___ #4; ___ #5.

Under penalty of perjury, I certify that the Taxpayer ID Number and all other information provided here are correct.

CONTRACTOR: T & S Construction Co., Inc.

By: Arthur J. Spindell

(Signature)

Title: Vice President

Address: 6108 Hedge Avenue

Sacramento, CA 95829

Physical Address ONLY. No PO Box

City STATE ZIP Code

Telephone No.: (916) 381-3052

Fax No.: (916) 387-1861

Email: Arttsconstruction@hughes.net

Federal Tax ID # or Social Security #: 88-0118410

DIR Registration #: 1000000972

Contractor's License No. 301528, Classification A, Expiration date 04/30/17 is held by the bidder.

***********
# SACRAMENTO

**Subcontractor and Local Business Enterprise Participation Form**

For Public Projects over $100,000 (use only base bid amount to estimate dollar value)

**THIS FORM MUST BE SUBMITTED WITH THE SEALED BID PROPOSAL**

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 other 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>T&amp;S Construction Co. Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime Contractor Address</td>
<td>6108 Hedge Avenue, Sacramento, CA 95829</td>
</tr>
<tr>
<td><strong>(REQUIRED) Prime Contractor DIR Registration #</strong></td>
<td>1000000972</td>
</tr>
<tr>
<td>Date</td>
<td>11/6/16</td>
</tr>
<tr>
<td>Bid Amount</td>
<td>$827,623</td>
</tr>
<tr>
<td>Is Prime LBE?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| Business Name | Mason Painting Inc. |
| License Number | 919987 |
| Address | P.O. Box 1115, Orangevale, CA 95662 |
| Contact Person | David Velasquez (916) 852-8061 |
| Phone | |
| Subcontractor DIR Registration # (subject to verification) | 10000008947 |
| LBE? | Yes |
| Type of Work, Services, or Supplies to be provided to complete contract | Coatings |
| Estimated Dollar Value of Work, Services, or Supplies to be Performed | $28,500 |

| Business Name | Central Fence Company |
| License Number | 281556 |
| Address | 148 040 Circle, Sacramento, CA 95827 |
| Contact Person | Gary Haddox (916) 474-5602 |
| Phone | |
| Subcontractor DIR Registration # (subject to verification) | 1000013202 |
| LBE? | Yes |
| Type of Work, Services, or Supplies to be provided to complete contract | Fencing |
| Estimated Dollar Value of Work, Services, or Supplies to be Performed | $24,500 |

| Business Name | Con S. Franke |
| License Number | 888366 |
| Address | 371 North Grant Street, Stockton, CA 95202 |
| Contact Person | Brenda Franke |
| Phone | 209-462-0711 |
| Subcontractor DIR Registration # (subject to verification) | 1000000355 |
| LBE? | No |
| Type of Work, Services, or Supplies to be provided to complete contract | Electrical |
| Estimated Dollar Value of Work, Services, or Supplies to be Performed | $314,000 |

---

**COPY AND ATTACH ADDITIONAL SHEETS AS NEEDED**

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:**

<table>
<thead>
<tr>
<th>Signature</th>
<th>Vice President</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11/6/16</td>
</tr>
</tbody>
</table>

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Form Revised 3/9/15

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20 of 392
DRUG-FREE WORKPLACE POLICY AND AFFIDAVIT

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 years of the date of my signature below.

EXCEPTION:

<table>
<thead>
<tr>
<th>Date</th>
<th>Violation Type</th>
<th>Place of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Handwritten: NO]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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: T & S Construction Co., Inc.

BY: [Signature] Vice President

Date: 1/6/16

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

*******

Drug Free Affidavit, Page 1 of 1
MINIMUM QUALIFICATIONS QUESTIONNAIRE

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.

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:
   "A" 04/30/17

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?
      □ 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?
      □ 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?
   □ 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?
   □ 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

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

☐ 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?

☐ 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?

☐ 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?

☐ 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?

☐ 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?

☐ 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 Sacramento, California, on 1/6/16.

(Location) (Date)

Signature: Arthur T. Spinella

Print name: Arthur T. Spinella

Title: Vice President

NOTE: If two or more entities submit a bid on a contract as a Joint Venture, each entity in 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 or 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 COMPLIANCE CERTIFICATE AND NOTICE REQUIREMENTS**

(a) All contractors seeking a Contract subject to the Ordinance shall submit a completed Declaration of Compliance Form (attachment “A”), signed by an authorized representative, with each proposal, bid or application. The Declaration of Compliance shall be made a part of the executed contract, and will be made available for public inspection and copying during regular business hours.

(b) 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 “B.”

(c) Contractor shall post, in a place visible to all employees, a copy of the notice provided as attachment “C.”

************
Attachment A
DECLARATION OF COMPLIANCE
Equal Benefits Ordinance

T&S Construction Co., Inc.

Name of Contractor
6108 Hedge Avenue, Sacramento, CA 95829

Address

The above named contractor ("Contractor") hereby declares and agrees as follows:

1. I have read and understand the Requirements of the Non-Discrimination In Employee Benefits Code (the "Requirements") provided to me by the City of Sacramento ("City") in connection with the City's request for proposals or other solicitations for the performance of services, or for the provision of commodities, under a City contract or agreement ("Contract").

2. As a condition of receiving the City Contract, I agree to fully comply with the Requirements, as well as any additional requirements that may be specified in the City's Non-Discrimination in Employee Benefits Code codified at Chapter 3.54 of the Sacramento City Code (the "Ordinance").

3. I understand, to the extent that such benefits are not preempted or prohibited by federal or state law, employee benefits covered by the Ordinance, are any of the following:

   a. Bereavement Leave
   b. Disability, life, and other types of insurance
   c. Family medical leave
   d. Health benefits
   e. Membership or membership discounts
   f. Moving expenses
   g. Pension and retirement benefits
   h. Vacation
   i. Travel benefits
   j. Any other benefit offered to employees

   I agree that should I offer any of the above listed employee benefits, that I will offer those benefits, without discrimination between employees with spouses and employees with domestic partners, and without discrimination between the spouses and domestic partners of such employees.

4. I understand that I will not be considered to be discriminating in the provision or application of employee benefits under the following conditions or circumstances:

   a. In the event that the actual cost of providing a benefit to a domestic partner or spouse, exceeds the cost of providing the same benefit to a spouse or domestic partner of an employee, I will not be required to provide the benefit, nor shall it be deemed discriminatory, if I require the employee to pay the monetary difference in order to provide the benefit to the domestic partner or to the spouse.

   b. In the event I am unable to provide a certain benefit, despite taking reasonable measures to do so, if I provide the employee with a cash equivalent, I will not be deemed to be discriminating in the application of that benefit.

   c. If I provide employee benefits neither to employee's spouses nor to employee's domestic partners.

   d. If I provide employee benefits to employees on a basis unrelated to marital or domestic partner status.

   e. If I submit, to the Program Coordinator, written evidence of making reasonable efforts to end discrimination in employee benefits by implementing policies which are to be enacted before the first effective date after the first open enrollment process following the date the Contract is executed with the City.

   I understand that any delay in the implementation of such policies may not exceed one (1) year from the date the Contract is executed with the City, and applies only to those employee benefits for which an open enrollment process is applicable.
f. Until administrative steps can be taken to incorporate, in the infrastructure, nondiscrimination in employee benefits, the time allotted for these administrative steps will apply only to those employee benefits for which administrative steps are necessary and may not exceed three (3) months from the date the Contract is executed with the City.

g. Until the expiration of a current collective bargaining agreement(s) where, in fact, employee benefits are governed by a collective bargaining agreement(s).

h. I take all reasonable measures to end discrimination in employee benefits by either requesting the union(s) involved agree to reopen the agreement(s) in order for me to take whatever steps are necessary to end discrimination in employee benefits or by my ending discrimination in employee benefits without reopening the collective bargaining agreement(s).

i. In the event I cannot end discrimination in employee benefits despite taking all reasonable measures to do so, I provide a cash equivalent to eligible employees for whom employee benefits (as listed previously), are not available.

Unless otherwise authorized in writing by the City Manager, I understand this cash equivalent must begin at the time the union(s) refuse to allow the collective bargaining agreement(s) to be reopened or no longer than three (3) months from the date the Contract is executed with the City.

5. I understand that failure to comply with the provisions of Section 4. (a) through 4. (i), above, will subject me to possible suspension and/or termination of this Contract for cause; repayment of any or all of the Contract amount disbursed by the City; debarment for future contracts until all penalties and restitution have been paid in full; deemed ineligible for future contracts for up to two (2) years; the imposition of a penalty, payable to the City, in the sum of $50.00 for each employee, for each calendar day during which the employee was discriminated against in violation of the provisions of the Ordinance.

6. I understand and do hereby agree to provide each current employee and, within ten (10) days of hire, each new employee, of their rights under the Ordinance. I further agree to maintain a copy of each such letter provided, in an appropriate file for possible inspection by an authorized representative of the City. I also agree to prominently display a poster informing each employee of these rights.

7. I understand that I have the right to request an exemption to the benefit provisions of the Ordinance when such a request is submitted to the Procurement Services Division, in writing with sufficient justification for resolution, prior to contract award.

I further understand that the City may request a waiver or exemption to the provisions or requirements of the Ordinance, when only one contractor is available to enter into a contract or agreement to occupy and use City property on terms and conditions established by the City; when sole source conditions exist for goods, services, public project or improvements and related construction services; when there are no responsive bidders to the Ordinance requirements and the contract is for essential goods or services; when emergency conditions with public health and safety implications exist; or when the contract is for specialized legal services if in the best interest of the City.

8. In consideration of the foregoing, I shall defend, indemnify and hold harmless, the City, its officers and employees, against any claims, actions, damages, costs (including reasonable attorney fees), or other liabilities of any kind arising from any violation of the Requirements or of the Ordinance by me.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I am authorized to bind the Contractor to the provisions of this Declaration.

Signature of Authorized Representative

Vice President

Print Name

Date

**********

Attachment A, Equal Benefits Ordinance Compliance Declaration
YOUR RIGHTS UNDER THE CITY OF SACRAMENTO’S NON-DISCRIMINATION IN EMPLOYEE BENEFITS BY CITY CONTRACTORS ORDINANCE

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 By City Contractors Ordinance (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, Contract Services Unit, 915 I St., 2nd 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 BY CITY CONTRACTORS ORDINANCE

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
  Contract Services Unit
  915 I St., 2nd 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 City Contracts without federal funds)

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 LBEs in the City's contracting and procurement activities. On November 19, 2013, City Council increased the LBE preference percentage from 2% to 5% 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 certain contracts of $100,000 or more as illustrated below.

When Does the LBE Program Apply?

<table>
<thead>
<tr>
<th></th>
<th>Contracts Under $100,000</th>
<th>Contracts $100,000 or More</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supplies / Non-Professional</td>
<td>Professional</td>
</tr>
<tr>
<td>5% LBE Preference Applies to Bid Evaluation?</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5% Minimum Participation Requirement? *</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

* Requirement may be waived by the City Manager or the City Manager’s designee (e.g. Department Directors)

II. LBE QUALIFICATION

A. To meet the LBE participation requirement, bidders must meet the requirements for an LBE prior to the deadline 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 areas of Sacramento County. Proof of legitimate business presence in the City or unincorporated areas of Sacramento County shall include:

1. Be an established business entity operating in the City or unincorporated County of Sacramento for at least twelve (12) consecutive months prior to submission of bid; and
2. Having either:
   a. a principal business office or workspace; or
   b. regional, branch, or satellite office with at least one full-time employee located and operating legally in the city or unincorporated county of Sacramento.

III. LBE PARTICIPATION LEVEL REQUIREMENTS

A. LBE Participation: The percentage of LBE participation is determined based on the dollar value of the work to be performed. LBE credit may be obtained by utilizing LBE qualified subcontractors or suppliers as outlined below.

B. Participation Credit: To receive credit for participation: (1) an 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) an LBE supplier must furnish materials or equipment 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 an LBE supplier of materials or equipment is counted as 100% of the amount paid to the supplier for the materials or equipment. 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 an LBE subcontractor, the subcontractor must be listed on the bidder’s Subcontractor and LBE Participation Verification Form.
   • Truckers: Credit for an LBE trucker is counted as 100% of the amount paid to the trucker for trucking services, not including any amount paid to the trucker for the cost of any materials or equipment 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 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 to each LBE subcontractor or supplier.

   No 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 the 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 or equipment 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 materials or equipment 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 or equipment 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 an LBE subcontractor shall be made at any time without compliance with the Subletting and Subcontracting Fair Practices Act. If an 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 the 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. A deduction may be made from the contract amount and the deduction shall be not more than 10% of the value of the work or materials or equipment that the subject LBE(s) were listed to perform or provide in the Contractor's bid, and shall also 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. The Contractor may, no later than five working days after receiving such notice, provide a written request to the 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 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 facsimile, by personal delivery, or by any other method that provides reliable evidence of the date of receipt. Written notice provided by facsimile 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 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.

G. Waiver: Request to department director to waive or reduce LBE participation requirement.
Addendum #1
December 10, 2015
RECONSTRUCTION OF SUMPS 40 & 146
PN: X14130903 & X14131502 (Bid Transaction #B16141321013)

To All Potential Bidders:

This addendum consists of 33 items as described on the following pages. The bid due date is changed to January 6, 2016.

The changes described in this addendum shall be incorporated into the Plans and Specifications for the subject project, and shall be considered part of the original documents, as if they were originally provided therein. All other terms, conditions, and specifications of the contract documents 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 or telegram which includes a reference to the Project Name and the Addendum Number.

Failure to cause acknowledgment of this addendum in one of the identified methods to be received at New City Hall, Office of the City Clerk, Public Counter, 5th Floor, 915 I Street, Sacramento CA 95814, prior to the hour and date specified for receipt of bids, may result in rejection of your offer. If by virtue of this addendum you decide to change an offer already submitted, such change may be made by telegram or letter, provided that such telegram or letter makes reference to the Project Name and the Addendum Number, and the change is received prior to the hour and date specified for bid opening.

For questions related to this addendum, contact the Project Manager, Stu Williams at (916) 808-1410, or e-mail: sswilliams@cityofsacramento.org.

Attachments follow and are part of this addendum.
Reconstruction of Sumps 40 & 146  
PN: X14130903 & X14131502 (Bid Transaction # B16141321013)

<table>
<thead>
<tr>
<th>Item</th>
<th>Ref. Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Bid Tour Notes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td>On the tour, a question was asked: “Would DOU accept equipment from integrators other than Tesco?” The answer is yes. City Approved Control System integrators include: KBL (Krug Bixby Long Associates; Saber Engineering; Tesco Controls, Inc.; Volo Technologies; Westin Engineering, Inc.; and ZSI, Inc.</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Also on the tour, a question was asked: “What’s the height of the wrought iron fence and gates?” The answer is six feet (6’). See Spec section 02820-1, ¶ 1.01.C.</td>
</tr>
<tr>
<td><strong>Bid Due Date</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Cover, &amp; Notice,</td>
<td>Change the end date when bids are to be received (the Bid Due Date) from “December 16, 2015” to “January 6, 2016”. The time &amp; location remain unchanged.</td>
</tr>
<tr>
<td>4.</td>
<td>Proposal, page 1of 2</td>
<td>The Bid Due Date is changed to January 6, 2016. Replace page 1 of the proposal with the revised page herewith with (Rev 1) in the footer.</td>
</tr>
<tr>
<td>5.</td>
<td>Bid Proposal Guarantee</td>
<td>The Bid Due Date is changed to January 6, 2016. Replace the Bid Proposal Guarantee with the revised page herewith with (Rev 1) in the footer.</td>
</tr>
<tr>
<td><strong>Technical Specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>02630-1, ¶ 1.03.A.</td>
<td>Delete from the end of this ¶, “the manhole steps, and the grab bars”.</td>
</tr>
<tr>
<td>7.</td>
<td>02630-2, ¶ 2.03 A &amp; B</td>
<td>Replace ¶ A with the following, and delete ¶B:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A. Manhole steps shall be installed in accordance with Section 05505.</td>
</tr>
<tr>
<td>8.</td>
<td>02820-2, ¶ 2.02.A.2.d(1)</td>
<td>Replace this line with the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1) Size: 27/8-inch outside diameter, except use 4-inch diameter hinge posts for 12-foot wide double leaf gates.</td>
</tr>
<tr>
<td>9.</td>
<td>02820-3, ¶ 2.02.B.</td>
<td>Add sub-paragraph 6 as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Furnish and install a lockable double gate latch, center drop latch assembly with a 1¾” drop rod and an embedded sleeve in the underlying concrete to hold both gate leafs in the closed position.</td>
</tr>
<tr>
<td>10.</td>
<td>02820-3, ¶ 2.02.C.1</td>
<td>Replace this one sentence ¶ with the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Unless otherwise approved, frames shall be 4-feet wide by 7-feet 8-inches tall.</td>
</tr>
<tr>
<td>11.</td>
<td>02820-4, ¶ 3.02.A.1(a)</td>
<td>Add the following sentence to the end of this sub-paragraph:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extend site concrete paving 6-inches beyond (outside) the fenced Sump areas, unless directed otherwise.</td>
</tr>
<tr>
<td>Item</td>
<td>Ref. Page</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
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<td>-------------</td>
</tr>
</tbody>
</table>
| 12.  | 02820-4, ¶ 3.02.A. 3(a) | Replace this one sentence ¶ with the following:  
1. After posts are installed and concrete has set firmly, place top wire, braces, and bottom rail approximately 4 inches above grade. |
| 13.  | 05505-1, ¶1.03.B. | Add sub-paragraph 5 as follows:  
5. Manhole steps. |
| 14.  | 05505-5 | Add new ¶ 2.05 as follows:  
**2.05 MANHOLE STEPS**  
A. Wetwell and valve vault manhole steps shall be press fit steps made of polypropylene plastic over a stainless steel reinforcing core. Manhole steps shall be ML-13-SSR as manufactured by American Step Company, Inc., Griffin, Georgia or approved equal. Steps shall be driven into specially sized holes drilled into the manhole and/or valve vault wall in accordance with the manufacturer’s depth and diameter recommendations. Seal or grout drilled holes if they protrude completely through the walls. |
| 15.  | 16480-5, ¶ 2.04.A | Replace the last sentence of this ¶ with: “MTS shall be Eaton MT-V-X-FD-D-3-0100-E-K-U, or approved equal, with approval by SMUD.” |
| 16.  | 16480-8, ¶ 3.01 | Add new sub-paragraph “D” as follows:  
D. SMUD requires new service conduit and wire to serve Sump 40. See the drawing immediately following this section for SMUD information. Read “Developer” to mean “Contractor”. |
| 17.  | 16480-10 | Insert the 8½x11” drawing included herewith with the clouded footer: “SMUD Service Drawing for Sump 40 (Addendum #1)” after this page. |

**Plans**

<table>
<thead>
<tr>
<th>Item</th>
<th>Ref. Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>Dwg G-3, Sht 3 of 39</td>
<td>In Booster Pump Enclosure Note 2, change the anchor type from “EXP” to “EPOXY”.</td>
</tr>
<tr>
<td>19.</td>
<td>Dwg G-4, Sht 4 of 39</td>
<td>Replace this sheet w/ the revised one herewith that increases the reactive air bell conduit bury depth to 24”, and the SCH 80 PVC wetwell conduit from 1” to 2”.</td>
</tr>
<tr>
<td>20.</td>
<td>Dwg C1.4, Sht 8 of 39</td>
<td>Delete the callout for “chain lockable” “enclosure doors w/ 3 hinges” on the north side of the equipment cover. Enclosure doors are not required.</td>
</tr>
<tr>
<td>21.</td>
<td>Dwg C1.5, Sht 9 of 39</td>
<td>Replace this sheet w/ the revised one herewith that adds a 6” OS&amp;Y gate valve and “Quick Connect w/ Cap” to the end of the new bypass riser.</td>
</tr>
<tr>
<td>Item</td>
<td>Ref. Page</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>22.</td>
<td>Dwg GE.1, Sht 15 of 39</td>
<td>Add the following two SMUD Notes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Sump 40 SMUD Service Notification is SN# 31512741 contact person is Ethan Halbert 732-7340</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Sump 146 SMUD Service Notification is SN# 31512716 contact person is Christopher Anderson 732-7304</td>
</tr>
<tr>
<td>23.</td>
<td>Dwg GE.3, Sht 17 of 39</td>
<td>Replace this sheet w/ the revised one herewith that revises the conduit and associated note on Detail FM.</td>
</tr>
<tr>
<td>24.</td>
<td>Dwg GE.4, Sht 18 of 39</td>
<td>Replace this sheet w/ the revised one herewith that revises the light pole and antenna pole base details.</td>
</tr>
</tbody>
</table>
| 25.  | Dwg GE.9, Sht 23 of 39 | Replace this sheet w/ the revised one herewith that changes line 6 in the Modicon from a “Spare” to “Panelboard Intrusion Switch”.
| 26.  | Dwg GE.10, Sht 24 of 39 | Replace this sheet w/ the revised one herewith that revises digital output lines 507 & 537 from “Spare” to “Strobe Cal”.
| 27.  | Dwg E1.2, Sht 27 of 39 | On the Nameplate Schedule, revise the inscription for tag #10 to read “BOOSTER PUMP” on nameplate and “0-30 MINUTES” on legend plate. |
| 28.  | Dwg E1.3, Sht 28 of 39 | Replace this sheet w/ the revised one herewith that adds control information for the motion activated site light. Also, see info added to specification section 16480 regarding new SMUD service to this Sump. |
| 29.  | Dwg E1.4, Sht 29 of 39 | Replace this sheet w/ the revised one herewith that adds conduits and cables to the schedule for the motion sensor and strobe lights. Disregard the swinging doors shown on the electrical enclosure plan detail. |
| 31.  | Dwg E2.2, Sht 34 of 39 | On the Nameplate Schedule, revise the inscription for tag #10 to read “BOOSTER PUMP” on nameplate and “0-30 MINUTES” on legend plate. |
| 32.  | Dwg E2.3, Sht 35 of 39 | Replace this sheet w/ the revised one herewith that adds control information for the motion activated site light. |
| 33.  | Dwg E2.4, Sht 36 of 39 | Replace this sheet w/ the revised one herewith that adds conduits and cables to the schedule for the motion sensor and strobe lights. |

**End of Addendum No. 1 Items**

(Three 8½ x 11” pages plus 10 drawings follow and are part of this addendum.)
Contractor's Name: ___________________________

(Please print)

CITY OF SACRAMENTO

SEALED PROPOSAL

Sealed Proposals will be received not later than 2:00 PM on January 6, 2016, at the Office of the City Clerk, New City Hall, at 915 I Street, 5th Floor, Public Counter, Sacramento, California 95814, and will be opened as soon thereafter as business allows. PROPOSALS MUST BE SIGNED BY BIDDERS IN ORDER TO BE RESPONSIVE.

TO THE HONORABLE CITY COUNCIL:

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

RECONSTRUCTION OF SUMPS 40 & 146
(PN: X14130903 & X14131502) (B16141321013)

in the City and County of Sacramento, California.

The work is to be performed in strict conformity with the Plans, the City of Sacramento Standard Specifications for Public Construction, and these Contract Documents, 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>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sump 40 Reconstruction</td>
<td>1</td>
<td>LS</td>
<td>$__________</td>
</tr>
<tr>
<td>2</td>
<td>Sump 146 Reconstruction</td>
<td>1</td>
<td>LS</td>
<td>$__________</td>
</tr>
</tbody>
</table>

TOTAL BID: $__________

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. The sum of individual unit prices shall prevail over the total bid amount.

It is understood that this bid is based upon completion of the work within a period of one hundred seventy-five (175) 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 ($700.00) 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.

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 forty-five (45) working days after opening of the Proposals. City reserves the right to reject any and all bids, and to waive any error or omission in any Proposal received.
KNOW ALL MEN BY THESE PRESENTS,

That we, ____________________________,

as Principal, and ____________________________,

a corporation duly organized under the laws of the State of ____________________________, 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 total amount bid in the Proposal by 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.

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 January 6, 2016, for the Work specifically described as follows:

RECONSTRUCTION OF SUMPS 40 & 146
(PN: X14130903 & X14131502) (B16141321013)

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 ________________, 2015.

PRINCIPAL Seal
By: ____________________________

Title ____________________________

SURETY Seal
By: ____________________________

Title ____________________________

Agent Name and Address ____________________________

Agent Phone # ____________________________

Surety Phone # ____________________________

California License # ____________________________

X14130903 & X14131502 (Rev 1) Bid Bond, Page 1 of 1 (B16141321013)
DEVELOPER TO CONTACT SMUD INSPECTOR AT LEAST 48 HOURS IN ADVANCE OF DIGGING TO SCHEDULE A PRE-CONSTRUCTION MEETING.

SMUD INSPECTOR: VAL LESLIE
INSPECTOR PHONE NUMBER: 916-402-2039

ETHAN HALBERT
(916)732-7340
NOTES:
1. FURNISH INSTALL AND CONNECT ALL WIRING TO THE PLC TERMINAL BLOCKS, RELAYS, CIRCUIT BREAKERS AND FUSE PANELS.
2. REPLACE "X" IN TAG HANGERS WITH SNAP ON HANGERS.
3. JUDGE AND INSTALL EATON 100A WIRE LABELS WITH THE NUMBER SHOWN ON THE PLC.
4. THE CITY WILL PROVIDE THE PLC PROGRAM.
5. PROLUX PLC CONTROL PANEL, SUPPLIED BY SUPPLIER.
<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data 1</td>
<td>Data 2</td>
<td>Data 3</td>
<td>Data 4</td>
</tr>
</tbody>
</table>

**Diagram:**

- Diagram showing electrical connections and symbols.
- Labels for equipment and connections.

**Legend:**

- Symbols represent electrical components.
- Colors indicate different types of connections.

**Notes:**

- Notes on the clarity and accuracy of the diagram.
- Instructions for installation and maintenance.

---

**City of Sacramento**

**Department of Utilities**

**Construction and Cable Schedule**

**Electrical Engineering**

---

**Page 50 of 392**
Attachments follow and are part of this addendum.

Williamson at (916) 808-1410, or e-mail: SWilliamson@cityofsacramento.org.

For questions related to this addendum, contact the Project Manager, Stu
Beach.

received prior to the hour and date specified for bid opening.

The change described in this addendum shall be incorporated into the plans and
specifications for the subject project, and shall be considered part of the original
specifications.

Due date remains January 6, 2016.

This addendum consists of 17 items as described on the following pages. The bid

To all potential bidders:

PN: X14130903 & X1413102 (Bid Transaction #B1614132103)
Reconstruction of SWPS 40 & 146
December 21, 2015
Addendum #2
Approved Equal

Doxy rather descriptive since HJ LF 200, Simpson Sel XP, or

Prior to inserting the steps, apply a Nip coating of water or superheated

Add the following sentence to the end of this appended:

Change "400 lbs" to "300 lbs".

Teachspec Specifications

Days

Change seven (70) working days to one hundred seventy-five working

Wednesday, February 3, 2012

Agreement page 3 of 12

Contract Forms

5. General

4. Sum up (ref side C.1.)

6. System Inferences

When finished on the concerns and as per the instructions to be removed (finish

When finished or if power to the pumps is lost and there is a requirement to

Extra work)

associate with responses to loss of SWM power will be considered as

no failure of connection is obligation to respond at specified costs

Generator on site. This will provide one repaired, but power loss does

have a standby generator on site. (Ans: Yes, there is a requirement to have a

(!!!) Which happens if the pumps is lost, and there is a requirement to

standing

will be no separate payment made for pump maintenance and/or

there are these two pumps)

a potential problem, but not considered unusually significant at this time.

(!!) Does City currently have the referred issues with the pumps? (Ans: False is

Section 1312.1.0 B & 1.02 4.3 requirements are satisfied)

Can the unit frame be bolted together rather than welded? (Ans: Yes, provided

Product will support the specified loading

(!!!) Can the cover be fabricated in two pieces? (Ans: Yes, provided insulated

i.e. doors need to be certain assisted. (Ans: spring assisted doors are not

per 30 foot back-up load)

and the shop does indicate where the product is required for 300 pounds

required if product is considered "or equal" to the named firm's product

recommend, I'm considering "or equal" to the named firm's product

Does each require efficient culminating calculations? (Ans: Calculations are not

Table Period Questions

Item

Repair

1. Sum up @ 300 lbs

2. Sum up 40 WPC cover

3. Temporary ByPass

4. Sum up 40 (ref side C.1)

5. General

6. System Inferences

Reconstructions of Sumps 40 & 146

Approval of

Reconstruction of Sumps 40 & 146

P/N: X14130093 X14130103 ( Bid Transaction # B1614312013)

Revision of Sump 40 & 146

Addendum No. 2 2012

PN: X14130093 X14130103 ( Bid Transaction # B1614312013)

December 21, 2012

54 of 392
TWO SWD drawings plus two project drawings follow and are part of this addendum.

End of Addendum No. 2 Items

---

17. DWG 6E2.3, SHE 35 of 39

---

10', from pole base, typical.

16. DWG 6E1.2 & DWG 6E2.2.

Revise the Lighting Fixtures Schedule Type I pole height from 10' to 14', and

---

Step.

---

Eliminate chameleonization cone below the receptacle. All bells and bottom

---

Add the following sentence to the end of Note 6:

---

Change the XWHR location will be considered extra work.

---

The transformer location shown on the revised sheet shows a revised one herewith. The revised sheet shows project work to be performed as part of this contract prior to SWD.

---

Replace this sheet with the revised one herewith.

---

T3MITS2007, of approved equal, with approval by SWD.

---

Replace the last two sentences with the following:

---

Refer to Section 09090.1, P&L 2008, for design.

---

Refer to Section 09090.2, P&L 2008, for design.
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.

T&S Construction Co., Inc.

Bidder

BY: Andre T. Lampa

Title: Vice President

Address: 6108 Hedge Ave

Sacramento, CA 95829

Date: 1/25/2016

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 ______________________________________ (“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:

   - The Notice to Contractors
   - The Proposal Form submitted by the Contractor
   - The Instructions to Bidders
   - The Local Business Enterprise (LBE) Requirements
   - The Requirements for the Non-Discrimination in Employee Benefits by City Contractors Ordinance and the Declaration of Compliance
   - The City’s Reference Guide for Construction Contracts
   - The Addenda, if any
   - This Agreement
   - The Standard Specifications
   - The Special Provisions
   - The 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:

   RECONSTRUCTION OF SUMPS 40 & 146 (PN: X14130903 & X14131502)

Contractor agrees to perform such Work in the manner designated in and in strict conformity with the Contract Documents.
AGREEMENT
(Construction Contract over $25,000)

THIS AGREEMENT, dated for identification February 2, 2016 is made and entered into between the CITY OF SACRAMENTO, a municipal corporation ("City"), and T&S Construction Co., Inc. 6108 Hedge Ave, Sacramento, CA 95829 ("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:

The Notice to Contractors
The Proposal Form submitted by the Contractor
The Instructions to Bidders
The Local Business Enterprise (LBE) Requirements
The Requirements for the Non-Discrimination in Employee Benefits by City Contractors Ordinance and the Declaration of Compliance
The City’s Reference Guide for Construction Contracts
The Addenda, if any
This Agreement
The Standard Specifications
The Special Provisions
The 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.
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 final 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 seventy (70) 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(jes) 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 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 ($700.00) 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) Workers’ Compensation Insurance with statutory limits, and Employers’ Liability Insurance with limits of not less than one million dollars ($1,000,000). The 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. The certificates and endorsements shall be forwarded to the City representative named in Exhibit A. 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 Ebix RCS  
Reference #: (This number will be provided by EBIX after Contract approval.)  
PO Box 257  
Portland, MI 48875-0257

Insurance certificates also may be faxed to (770) 325-3340, or e-mailed to:  
CertsOnly-Portland@ebix.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.
IN WITNESS WHEREOF, the parties hereto have signed this Agreement on the date set for opposite their names.

CONTRACTOR

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

DATE 11/3/2014

BY

Print Name

Title

BY

Print Name

Title

FIN# 88-0118410

Federal ID# 214-1038-6

State ID# 83401

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: John F. Shirey, City Manager

Original Approved As To Form: Attest:

City Attorney

City Clerk

Form approved by City Attorney 12-24-14

14
CITY OF SACRAMENTO
PERFORMANCE BOND
Department of Utilities

Executed in Duplicate

Premium is for Contract Term and is Subject to Adjustment Based on Final Contract Price

Bond No.: 106334637
Premium: $7,449.00

WHEREAS, the City of Sacramento, State of California, hereinafter called City, has conditionally awarded to

T&S Construction Co., Inc.
6108 Hegde Ave
Sacramento, CA 95829

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

Reconstruction of Sumps 40 & 146
(PN: X141391503 & X14131502) (B1616121013)

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):
Travelers Casualty and Surety Company of America, One Tower Square, Hartford, CT 06183

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 obligor, in the sum of eight hundred twenty-seven thousand six hundred twenty-three dollars ($827,623.00) 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 herein 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 February 2, 2016.

T & S Construction Co., Inc.

By: [Signature]
Title: Vice President

ORIGINAL APPROVED AS TO FORM:

City Attorney

Travelers Casualty and Surety Company of America

By: [Signature]
Title: Janis B. Pilgard, Attorney in Fact
Agent Name and Address: **See Below

Agent Phone #: 916-782-6637
Surety Phone #: 916-852-3267
California License #: 00313571
Surety Email: aoiliver@travelers.com

**Buschmann, Buschmann & Leux Surety Insurance Services LLC
300 Harding Blvd., Suite 209, Roseville, CA 95678
ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Placer

On January 21, 2016 before me, Kathy Rangel, Notary Public
(insert name and title of the officer)

personally appeared Jana B. Pilgard
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

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

WITNESS my hand and official seal.

Signature Kathy Rangel (Seal)
CITY OF SACRAMENTO
PAYMENT BOND
Department of Utilities

Executed in Duplicate

Bond No.: 106334637
Premium: Included

WHEREAS, the City of Sacramento, in the State of California, hereinafter called City, has conditionally awarded to:
T&S Construction Co., Inc.
6108 Hedge Ave
Sacramento, CA 95828

department of Utilities called Contractor, a contract for construction of:

Reconstruction of Sumpe 40 & 146
(PN: X14130903 & X14131502) (B16141321013)

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):
Travelers Casualty and Surety Company of America, One Tower Square, Hartford, CT 06183, 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 eight hundred twenty-seven thousand six hundred twenty-three
dollars ($827,623.00) 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 any 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, so 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 February 2, 2016.

T & S Construction Co., Inc.

By ________________

Title Vice President

ORIGINAL APPROVED AS TO FORM:

City Attorney

Effective 7-1-12

Travelers Casualty and Surety Company of America

By ________________

Title Jams B. Pilgild, Attorney in Fact

Agent Name and Address **See Below**

Agent Phone #: Joel Buschmann 916-782-6637
Surety Phone #: Art Oliver 916-852-5287
California License #: BB&L CA License #0G13571
Surety Email: aoliver@travelers.com

**Buschmann, Buschmann & Laux Surety Insurance Services LLC
300 Harding Blvd., Suite 209, Roseville, CA 95678

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ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Placer

On January 21, 2016 before me, Kathy Rangel, Notary Public
(insert name and title of the officer)

personally appeared Jana B. Pilgard,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

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

WITNESS my hand and official seal.

Signature Kathy Rangel (Seal)
POWER OF ATTORNEY

Farmington Casualty Company  
Fidelity and Guaranty Insurance Company  
Fidelity and Guaranty Insurance Underwriters, Inc.  
St. Paul Fire and Marine Insurance Company  
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company  
Travelers Casualty and Surety Company  
Travelers Casualty and Surety Company of America  
United States Fidelity and Guaranty Company

Attorney-In Fact No. 224023  
Certificate No. 006415506

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Robert D. Laux, Joel J. Buschmann, Dona Lisa Buschmann, Jana B. Pilgard, and Kathy Rangel

of the City of Roseville, State of California, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereunto affixed, this 19th day of June, 2015.

Farmington Casualty Company  
Fidelity and Guaranty Insurance Company  
Fidelity and Guaranty Insurance Underwriters, Inc.  
St. Paul Fire and Marine Insurance Company  
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company  
Travelers Casualty and Surety Company  
Travelers Casualty and Surety Company of America  
United States Fidelity and Guaranty Company

State of Connecticut  
City of Hartford ss.

By: ____________________________

Robert L. Raney, Senior Vice President

On this the 19th day of June, 2015, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.  
My Commission expires the 30th day of June, 2016.

Marie C. Tetreault, Notary Public

58440-8-12 Printed in U.S.A.
Request for Taxpayer Identification Number and Certification

1. Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.
   T&S Construction Co., Inc.

2. Business name/disregarded entity name. If different from above

3. Check appropriate box for federal tax classification; check only one of the following seven boxes:
   □ Individual/sole proprietor or 
   □ C Corporation 
   □ S Corporation 
   □ Partnership 
   □ Trust/estate 
   □ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership)
   For a single-member LLC that is disregarded, do not check LLC; check the appropriate box in the line above for the tax classification of the single-member owner.
   □ Other (see instructions)

4. Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3).
   Exempt payee code (if any)
   Exemption from FATCA reporting code (if any)
   (Applies to accounts maintained outside the U.S.)

5. Address (number, street, and apt. or suite no.).
   108 Hedge Avenue
   Sacramento, California 95829

6. City, state, and ZIP code

7. List account number(s) here (optional)

Part I - Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see How to get a TIN on page 3.

Note. If the account is in more than one name, see the instructions for line 1 and the chart on page 4 for guidelines on whose number to enter.

Part II - Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and

2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and

3. I am a U.S. citizen or other U.S. person (defined below); and

4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

Sign Here
Signature of U.S. person
Date

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. Information about developments affecting Form W-9 (such as legislation enacted after we release it) is at www.irs.gov/w9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following:

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)

Form W-9 (Rev. 12-2014)
2016 Withholding Exemption Certificate

The payee completes this form and submits it to the withholding agent. The withholding agent keeps this form with their records.

Withholding Agent

Name: City of Sacramento

Payee

Name: ITS Construction Co., Inc.

Address (apt/ste, room, PO box, or PMB no.): 8001 18th Avenue

City (if you have a foreign address, see instructions): SACRAMENTO

State: CA

ZIP code: 95829

Exemption Reason

Check only one reason box below that applies to the payee.

- Individuals — Certification of Residency:

  I am a resident of California and I reside at the address shown above. If I become a nonresident at any time, I will promptly notify the withholding agent. See instructions for General Information D, Definitions.

- Corporations:

  The corporation has a permanent place of business in California at the address shown above or is qualified through the California Secretary of State (SOS) to do business in California. The corporation will file a California tax return. If this corporation ceases to have a permanent place of business in California or ceases to do any of the above, I will promptly notify the withholding agent. See instructions for General Information D, Definitions.

- Partnerships or Limited Liability Companies (LLCs):

  The partnership or LLC has a permanent place of business in California at the address shown above or is registered with the California SOS, and is subject to the laws of California. The partnership or LLC will file a California tax return. If the partnership or LLC ceases to do any of the above, I will promptly inform the withholding agent. For withholding purposes, a limited liability partnership (LLP) is treated like any other partnership.

- Tax-Exempt Entities:

  The entity is exempt from tax under California Revenue and Taxation Code (R&T) Section 23701 (insert letter) or Internal Revenue Code Section 501(c)(insert number). If this entity ceases to be exempt from tax, I will promptly notify the withholding agent. Individuals cannot be tax-exempt entities.

- Insurance Companies, Individual Retirement Arrangements (IRAs), or Qualified Pension/Profit-Sharing Plans:

  The entity is an insurance company, IRA, or a federally qualified pension or profit-sharing plan.

- California Trusts:

  At least one trustee and one noncontingent beneficiary of the above-named trust is a California resident. The trust will file a California fiduciary tax return. If the trustee or noncontingent beneficiary becomes a nonresident at any time, I will promptly notify the withholding agent.

- Estates — Certification of Residency of Deceased Person:

  I am the executor of the above-named person's estate or trust. The decedent was a California resident at the time of death. The estate will file a California fiduciary tax return.

- NonMilitary Spouse of a Military Servicemember:

  I am a nonmilitary spouse of a military servicemember and I meet the Military Spouse Residency Relief Act (MSRRA) requirements. See instructions for General Information E, MSRRA.

CERTIFICATE OF PAYEE: Payee must complete and sign below.

To learn about your privacy rights, how we may use your information, and the consequences for not providing the requested information, go to bit.ca.gov and search for privacy notice. To request this notice by mail, call 800.652.5711.

Under penalties of perjury, I hereby certify that the information provided in this document is, to the best of my knowledge, true and correct. If conditions change, I will promptly notify the withholding agent.

Type or print payee's name and title: Arthur T. Spinella

Telephone: 916.381.3052

Payee's signature: [Signature]

Date: 11/25/2010

Form 590 2015
CERTIFICATE OF LIABILITY INSURANCE

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

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

PRODUCER
John O. Broson Co. A Division of HUB International/ #0757776
3636 American River Drive, Suite 200
Sacramento, CA 95864
916-974-7800

CONTACT NAME: Carol Dunn
PHONE: 914-480-4182
FAX: 916-993-7282
E-MAIL: Carol.Dunn@hubinternational.com
INSURER(S) AFFORDING COVERAGE NAIC #
INSURER A: Valley Forge Insurance Co (CNA, Maitland, FL)
INSURER B: Travelers Indemnity Company of Connecticut
INSURER C: American Casualty of Reading PA (CNA, Maitland)
INSURER D:
INSURER E:
INSURER F:

CERTIFICATE NUMBER: 21988

COVERAGE

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DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES
Re: Reconstruction of Stumps 40 & 146, PN: X14130903 & X14131502

CITY OF SACRAMENTO DEPARTMENT OF UTILITIES
ATTN RENEE GRAVES
1395 35TH AVE
SACRAMENTO, CA 95822-2911

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

© 1988-2010 ACORD CORPORATION. All rights reserved.
It is understood and agreed that this endorsement amends the **COMMERCIAL GENERAL LIABILITY COVERAGE PART** as follows. If any other endorsement attached to this policy amends any provision also amended by this endorsement, then that other endorsement controls with respect to such provision, and the changes made by this endorsement with respect to such provision do not apply.

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1. ADDITIONAL INSUREDs

a. WHO IS AN INSURED is amended to include as an Insured any person or organization described in paragraphs A. through H. below whom a Named Insured is required to add as an additional insured on this Coverage Part under a written contract or written agreement, provided such contract or agreement:

(1) is currently in effect or becomes effective during the term of this Coverage Part; and

(2) was executed prior to:

(a) the bodily injury or property damage; or

(b) the offense that caused the personal and advertising injury,

for which such additional insured seeks coverage.

b. However, subject always to the terms and conditions of this policy, including the limits of insurance, the Insurer will not provide such additional insured with:

(1) a higher limit of insurance than required by such contract or agreement; or

(2) coverage broader than required by such contract or agreement, and in no event broader than that described by the applicable paragraph A. through H. below.

Any coverage granted by this endorsement shall apply only to the extent permissible by law.

A. Controlling Interest

Any person or organization with a controlling interest in a Named Insured, but only with respect to such person or organization's liability for bodily injury, property damage or personal and advertising injury arising out of:

1. such person or organization's financial control of a Named Insured; or

2. premises such person or organization owns, maintains or controls while a Named Insured leases or occupies such premises;

provided that the coverage granted by this paragraph does not apply to structural alterations, new construction or demolition operations performed by, on behalf of, or for such additional insured.

B. Co-owner of Insured Premises

A co-owner of a premises co-owned by a Named Insured and covered under this insurance but only with respect to such co-owner's liability for bodily injury, property damage or personal and advertising injury as co-owner of such premises.

C. Lessor of Equipment

Any person or organization from whom a Named Insured leases equipment, but only with respect to liability for bodily injury, property damage or personal and advertising injury caused, in whole or in part, by the Named insured's maintenance, operation or use of such equipment, provided that the occurrence giving rise to such bodily injury, property damage or the offense giving rise to such personal and advertising injury takes place prior to the termination of such lease.

D. Lessor of Land

Any person or organization from whom a Named Insured leases land but only with respect to liability for bodily injury, property damage or personal and advertising injury arising out of the ownership, maintenance or use of such land, provided that the occurrence giving rise to such bodily injury, property damage or the offense giving rise to such personal and advertising injury takes place prior to the termination of such lease. The coverage granted by this paragraph does not apply to structural alterations, new construction or demolition operations performed by, on behalf of, or for such additional insured.
E. Lessor of Premises

An owner or lessor of premises leased to the Named Insured, or such owner or lessor's real estate manager, but only with respect to liability for bodily injury, property damage or personal and advertising injury arising out of the ownership, maintenance or use of such part of the premises leased to the Named Insured, and provided that the occurrence giving rise to such bodily injury or property damage, or the offense giving rise to such personal and advertising injury, takes place prior to the termination of such lease. The coverage granted by this paragraph does not apply to structural alterations, new construction or demolition operations performed by, on behalf of, or for such additional insured.

F. Mortgagee, Assignee or Receiver

A mortgagee, assignee or receiver of premises but only with respect to such mortgagee, assignee or receiver's liability for bodily injury, property damage or personal and advertising injury arising out of the Named Insured's ownership, maintenance, or use of a premises by a Named Insured.

The coverage granted by this paragraph does not apply to structural alterations, new construction or demolition operations performed by, on behalf of, or for such additional insured.

G. State or Governmental Agency or Subdivision or Political Subdivisions – Permits

A state or governmental agency or subdivision or political subdivision that has issued a permit or authorization but only with respect to such state or governmental agency or subdivision or political subdivision's liability for bodily injury, property damage or personal and advertising injury arising out of:

1. the following hazards in connection with premises a Named Insured owns, rents, or controls and to which this insurance applies:
   a. the existence, maintenance, repair, construction, erection, or removal of advertising signs, awnings, canopies, cellar entrances, coal holes, driveways, manholes, marquees, hoistaway openings, sidewalk vaults, street banners, or decorations and similar exposures; or
   b. the construction, erection, or removal of elevators; or
   c. the ownership, maintenance or use of any elevators covered by this insurance; or

2. the permitted or authorized operations performed by a Named Insured or on a Named Insured's behalf.

The coverage granted by this paragraph does not apply to:

a. Bodily injury, property damage or personal and advertising injury arising out of operations performed for the state or governmental agency or subdivision or political subdivision; or
b. Bodily injury or property damage included within the products-completed operations hazard.

With respect to this provision's requirement that additional insured status must be requested under a written contract or agreement, the Insurer will treat as a written contract any governmental permit that requires the Named Insured to add the governmental entity as an additional insured.

H. Trade Show Event Lessor

1. With respect to a Named Insured's participation in a trade show event as an exhibitor, presenter or display, any person or organization whom the Named Insured is required to include as an additional insured, but only with respect to such person or organization's liability for bodily injury, property damage or personal and advertising injury caused by:
   a. the Named Insured's acts or omissions; or
   b. the acts or omissions of those acting on the Named Insured's behalf;
in the performance of the Named Insured’s ongoing operations at the trade show event premises during the trade show event.

2. The coverage granted by this paragraph does not apply to bodily injury or property damage included within the products-completed operations hazard.

2. ADDITIONAL INSURED - PRIMARY AND NON-CONTRIBUTORY TO ADDITIONAL INSURED’S INSURANCE

The Other Insurance Condition in the COMMERCIAL GENERAL LIABILITY CONDITIONS Section is amended to add the following paragraph:

If the Named Insured has agreed in writing in a contract or agreement that this insurance is primary and non-contributory relative to an additional insured’s own insurance, then this insurance is primary, and the Insurer will not seek contribution from that other insurance. For the purpose of this Provision 2., the additional insured’s own insurance means insurance on which the additional insured is a named insured. Otherwise, and notwithstanding anything to the contrary elsewhere in this Condition, the insurance provided to such person or organization is excess of any other insurance available to such person or organization.

3. BODILY INJURY – EXPANDED DEFINITION

Under DEFINITIONS, the definition of bodily injury is deleted and replaced by the following:

Bodily injury means physical injury, sickness or disease sustained by a person, including death, humiliation, shock, mental anguish or mental injury sustained by that person at any time which results as a consequence of the physical injury, sickness or disease.

4. BROAD KNOWLEDGE OF OCCURRENCE/ NOTICE OF OCCURRENCE

Under CONDITIONS, the condition entitled Duties in The Event of Occurrence, Offense, Claim or Suit is amended to add the following provisions:

A. BROAD KNOWLEDGE OF OCCURRENCE

The Named Insured must give the Insurer or the Insurer’s authorized representative notice of an occurrence, offense or claim only when the occurrence, offense or claim is known to a natural person Named Insured, to a partner, executive officer, manager or member of a Named Insured, or an employee designated by any of the above to give such notice.

B. NOTICE OF OCCURRENCE

The Named Insured’s rights under this Coverage Part will not be prejudiced if the Named Insured fails to give the Insurer notice of an occurrence, offense or claim and that failure is solely due to the Named Insured’s reasonable belief that the bodily injury or property damage is not covered under this Coverage Part. However, the Named Insured shall give written notice of such occurrence, offense or claim to the Insurer as soon as the Named Insured is aware that this insurance may apply to such occurrence, offense or claim.

5. BROAD NAMED INSURED

WHO IS AN INSURED is amended to delete its Paragraph 3. in its entirety and replace it with the following:

3. Pursuant to the limitations described in Paragraph 4. below, any organization in which a Named Insured has management control:

a. on the effective date of this Coverage Part; or

b. by reason of a Named Insured creating or acquiring the organization during the policy period,

qualifies as a Named Insured, provided that there is no other similar liability insurance, whether primary, contributory, excess, contingent or otherwise, which provides coverage to such organization, or which would have provided coverage but for the exhaustion of its limit, and without regard to whether its coverage is broader or narrower than that provided by this insurance.
But this **BROAD NAMED INSURED** provision does not apply to:

(a) any partnership, limited liability company or joint venture; or

(b) any organization for which coverage is excluded by another endorsement attached to this **Coverage Part**.

For the purpose of this provision, management control means:

A. owning interests representing more than 50% of the voting, appointment or designation power for the selection of a majority of the Board of Directors of a corporation; or

B. having the right, pursuant to a written trust agreement, to protect, control the use of, encumber or transfer or sell property held by a trust.

4. With respect to organizations which qualify as **Named Insureds** by virtue of Paragraph 3. above, this insurance does not apply to:

a. **bodily injury** or **property damage** that first occurred prior to the date of management control, or that first occurs after management control ceases; nor

b. **personal or advertising injury** caused by an offense that first occurred prior to the date of management control or that first occurs after management control ceases.

5. The insurance provided by this **Coverage Part** applies to **Named Insureds** when trading under their own names or under such other trading names or doing-business-as names (dba) as any **Named Insured** should choose to employ.

6. **BROADENED LIABILITY COVERAGE FOR DAMAGE TO YOUR PRODUCT AND YOUR WORK**

A. Under **COVERAGES**, **Coverage A – Bodily Injury and Property Damage Liability**, the paragraph entitled **Exclusions** is amended to delete exclusions k. and l. and replace them with the following:

This insurance does not apply to:

k. **Damage to Your Product**

  **Property damage to your product** arising out of it, or any part of it except when caused by or resulting from:

  (1) fire;

  (2) smoke;

  (3) collapse; or

  (4) explosion.

l. **Damage to Your Work**

  **Property damage to your work** arising out of it, or any part of it and included in the **products-completed operations hazard**.

This exclusion does not apply:

(1) If the damaged work, or the work out of which the damage arises, was performed on the **Named Insured**'s behalf by a subcontractor; or

(2) If the cause of loss to the damaged work arises as a result of:

  (a) fire;

  (b) smoke;

  (c) collapse; or
(d) explosion.

B. The following paragraph is added to LIMITS OF INSURANCE:

Subject to 5. above, $100,000 is the most the Insurer will pay under Coverage A for the sum of damages arising out of any one occurrence because of property damage to your product and your work that is caused by fire, smoke, collapse or explosion and is included within the product-completed operations hazard. This sublimit does not apply to property damage to your work if the damaged work, or the work out of which the damage arises, was performed on the Named Insured’s behalf by a subcontractor.

C. This Broadened Liability Coverage For Damage To Your Product And Your Work Provision does not apply if an endorsement of the same name is attached to this policy.

7. CONTRACTUAL LIABILITY – RAILROADS

With respect to operations performed within 50 feet of railroad property, the definition of insured contract is replaced by the following:

Insured Contract means:

a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for damage by fire to premises while rented to a Named Insured or temporarily occupied by a Named Insured with permission of the owner is not an insured contract;

b. A sidetrack agreement;

c. Any easement or license agreement;

d. An obligation, as required by ordinance, to indemnify a municipality, except in connection with work for a municipality;

e. An elevator maintenance agreement;

f. That part of any other contract or agreement pertaining to the Named Insured's business (including an indemnification of a municipality in connection with work performed for a municipality) under which the Named Insured assumes the tort liability of another party to pay for bodily injury or property damage to a third person or organization. Tort liability means a liability that would be imposed by law in the absence of any contract or agreement.

Paragraph f. does not include that part of any contract or agreement:

(1) That indemnifies an architect, engineer or surveyor for injury or damage arising out of:

(a) Preparing, approving or failing to prepare or approve maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or

(b) Giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage;

(2) Under which the Insured, if an architect, engineer or surveyor, assumes liability for an injury or damage arising out of the insured’s rendering or failure to render professional services, including those listed in (1) above and supervisory, inspection, architectural or engineering activities.

8. ELECTRONIC DATA LIABILITY

A. Under COVERAGES, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended to delete exclusion p. Electronic Data and replace it with the following:

This insurance does not apply to:

p. Access Or Disclosure Of Confidential Or Personal Information And Data-related Liability

Damages arising out of:
(1) any access to or disclosure of any person’s or organization’s confidential or personal information, including patents, trade secrets, processing methods, customer lists, financial information, credit card information, health information or any other type of nonpublic information; or

(2) the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data that does not result from physical injury to tangible property.

However, unless Paragraph (1) above applies, this exclusion does not apply to damages because of bodily injury.

This exclusion applies even if damages are claimed for notification costs, credit monitoring expenses, forensic expenses, public relation expenses or any other loss, cost or expense incurred by the Named Insured or others arising out of that which is described in Paragraph (1) or (2) above.

B. The following paragraph is added to LIMITS OF INSURANCE:

Subject to 5. above, $100,000 is the most the Insurer will pay under Coverage A for all damages arising out of any one occurrence because of property damage that results from physical injury to tangible property and arises out of electronic data.

C. The following definition is added to DEFINITIONS:

Electronic data means information, facts or programs stored as or on, created or used on, or transmitted to or from computer software (including systems and applications software), hard or floppy disks, CD-ROMS, tapes, drives, cells, data processing devices or any other media which are used with electronically controlled equipment.

D. For the purpose of the coverage provided by this ELECTRONIC DATA LIABILITY Provision, the definition of property damage in DEFINITIONS is replaced by the following:

Property damage means:

a. Physical injury to tangible property, including all resulting loss of use of that property. All such loss of use shall be deemed to occur at the time of the physical injury that caused it;

b. Loss of use of tangible property that is not physically injured. All such loss of use shall be deemed to occur at the time of the occurrence that caused it; or

c. Loss of, loss of use of, damage to, corruption of, inability to access, or inability to properly manipulate electronic data, resulting from physical injury to tangible property. All such loss of electronic data shall be deemed to occur at the time of the occurrence that caused it.

For the purposes of this insurance, electronic data is not tangible property.

E. If Electronic Data Liability is provided at a higher limit by another endorsement attached to this policy, then the $100,000 limit provided by this ELECTRONIC DATA LIABILITY Provision is part of, and not in addition to, that higher limit.

9. ESTATES, LEGAL REPRESENTATIVES, AND SPOUSES

The estates, heirs, legal representatives and spouses of any natural person Insured shall also be insured under this policy; provided, however, coverage is afforded to such estates, heirs, legal representatives, and spouses only for claims arising solely out of their capacity or status as such and, in the case of a spouse, where such claim seeks damages from marital community property, jointly held property or property transferred from such natural person Insured to such spouse. No coverage is provided for any act, error or omission of an estate, heir, legal representative, or spouse outside the scope of such person’s capacity or status as such, provided however that the spouse of a natural person Named Insured and the spouses of members or partners of joint venture or partnership Named Insureds are Insureds with respect to such spouses’ acts, errors or omissions in the conduct of the Named Insured’s business.
10. EXPECTED OR INTENDED INJURY – EXCEPTION FOR REASONABLE FORCE

Under COVERAGES, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended to delete the exclusion entitled Expected or Intended Injury and replace it with the following:

This insurance does not apply to:

Expected or Intended Injury

Bodily injury or property damage expected or intended from the standpoint of the Insured. This exclusion does not apply to bodily injury or property damage resulting from the use of reasonable force to protect persons or property.

11. GENERAL AGGREGATE LIMITS OF INSURANCE - PER PROJECT

A. For each construction project away from premises the Named Insured owns or rents, a separate Construction Project General Aggregate Limit, equal to the amount of the General Aggregate Limit shown in the Declarations, is the most the Insurer will pay for the sum of:

1. All damages under Coverage A, except damages because of bodily injury or property damage included in the products-completed operations hazard; and

2. All medical expenses under Coverage C,

that arise from occurrences or accidents which can be attributed solely to ongoing operations at that construction project. Such payments shall not reduce the General Aggregate Limit shown in the Declarations, nor the Construction Project General Aggregate Limit of any other construction project.

B. All:

1. Damages under Coverage B, regardless of the number of locations or construction projects involved;

2. Damages under Coverage A, caused by occurrences which cannot be attributed solely to ongoing operations at a single construction project, except damages because of bodily injury or property damage included in the products-completed operations hazard; and

3. Medical expenses under Coverage C caused by accidents which cannot be attributed solely to ongoing operations at a single construction project,

will reduce the General Aggregate Limit shown in the Declarations.

C. The limits shown in the Declarations for Each Occurrence, for Damage To Premises Rented To You and for Medical Expense continue to apply, but will be subject to either the Construction Project General Aggregate Limit or the General Aggregate Limit shown in the Declarations, depending on whether the occurrence can be attributed solely to ongoing operations at a particular construction project.

D. When coverage for liability arising out of the products-completed operations hazard is provided, any payments for damages because of bodily injury or property damage included in the products-completed operations hazard will reduce the Products-Completed Operations Aggregate Limit shown in the Declarations, regardless of the number of projects involved.

E. If a single construction project away from premises owned by or rented to the Insured has been abandoned and then restarted, or if the authorized contracting parties deviate from plans, blueprints, designs, specifications or timetables, the project will still be deemed to be the same construction project.

F. The provisions of LIMITS OF INSURANCE not otherwise modified by this endorsement shall continue to apply as stipulated.
12. IN REM ACTIONS

A quasi in rem action against any vessel owned or operated by or for the Named Insured, or chartered by or for the Named Insured, will be treated in the same manner as though the action were in personam against the Named Insured.

13. INCIDENTAL HEALTH CARE MALPRACTICE COVERAGE

Solely with respect to bodily injury that arises out of a health care incident:

A. Under COVERAGEs, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Insuring Agreement is amended to replace Paragraphs 1.b.(1) and 1.b.(2) with the following:

b. This insurance applies to bodily injury provided that the professional health care services are incidental to the Named Insured’s primary business purpose, and only if:

(1) such bodily injury is caused by an occurrence that takes place in the coverage territory.

(2) the bodily injury first occurs during the policy period. All bodily injury arising from an occurrence will be deemed to have occurred at the time of the first act, error, or omission that is part of the occurrence; and

B. Under COVERAGEs, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended to:

i. add the following to the Employers Liability exclusion:

This exclusion applies only if the bodily injury arising from a health care incident is covered by other liability insurance available to the Insured (or which would have been available but for exhaustion of its limits).

ii. delete the exclusion entitled Contractual Liability and replace it with the following:

This insurance does not apply to:

Contractual Liability

the Insured’s actual or alleged liability under any oral or written contract or agreement, including but not limited to express warranties or guarantees.

iii. add the following additional exclusions:

This insurance does not apply to:

Discrimination

any actual or alleged discrimination, humiliation or harassment, including but not limited to claims based on an individual’s race, creed, color, age, gender, national origin, religion, disability, marital status or sexual orientation.

Dishonesty or Crime

Any actual or alleged dishonest, criminal or malicious act, error or omission.

Medicare/Medicaid Fraud

any actual or alleged violation of law with respect to Medicare, Medicaid, Tricare or any similar federal, state or local governmental program.

Services Excluded by Endorsement

Any health care incident for which coverage is excluded by endorsement.

C. DEFINITIONS is amended to:
i. add the following definitions:

**Health care incident** means an act, error or omission by the **Named Insured's employees** or **volunteer workers** in the rendering of:

a. **professional health care services** on behalf of the **Named Insured** or

b. Good Samaritan services rendered in an emergency and for which no payment is demanded or received.

**Professional health care services** means any health care services or the related furnishing of food, beverages, medical supplies or appliances by the following providers in their capacity as such but solely to the extent they are duly licensed as required:

a. Physician;

b. Nurse;

c. Nurse practitioner;

d. Emergency medical technician;

e. Paramedic;

f. Dentist;

g. Physical therapist;

h. Psychologist;

i. Speech therapist;

j. Other allied health professional; or

**Professional health care services** does not include any services rendered in connection with human clinical trials or product testing.

ii. delete the definition of **occurrence** and replace it with the following:

**Occurrence** means a **health care incident**. All acts, errors or omissions that are logically connected by any common fact, circumstance, situation, transaction, event, advice or decision will be considered to constitute a single **occurrence**;

iii. amend the definition of **Insured** to:

a. add the following:

- the **Named Insured's employees** are **Insureds** with respect to:

  1. **bodily injury** to a **co-employee** while in the course of the **co-employee's employment** by the **Named Insured** or while performing duties related to the conduct of the **Named Insured's business**; and

  2. **bodily injury** to a **volunteer worker** while performing duties related to the conduct of the **Named Insured's business**;

when such bodily injury arises out of a **health care incident**.

- the **Named Insured's volunteer workers** are **Insureds** with respect to:

  1. **bodily injury** to a **co-volunteer worker** while performing duties related to the conduct of the **Named Insured's business**; and
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(2) bodily injury to an employee while in the course of the employee's employment by the Named Insured or while performing duties related to the conduct of the Named Insured's business;

when such bodily injury arises out of a health care incident.

b. delete Subparagraphs (a), (b), (c) and (d) of Paragraph 2.a.(1) of WHO IS AN INSURED.

D. The Other Insurance condition is amended to delete Paragraph b.(1) in its entirety and replace it with the following:

Other Insurance

b. Excess Insurance

(1) To the extent this insurance applies, it is excess over any other insurance, self insurance or risk transfer instrument, whether primary, excess, contingent or on any other basis, except for insurance purchased specifically by the Named Insured to be excess of this coverage.

14. JOINT VENTURES / PARTNERSHIP / LIMITED LIABILITY COMPANIES

WHO IS AN INSURED is amended to delete its last paragraph and replace it with the following:

No person or organization is an Insured with respect to the conduct of any current or past partnership, joint venture or limited liability company that is not shown as a Named Insured in the Declarations, except that if the Named Insured was a joint venturer, partner, or member of a limited liability company and such joint venture, partnership or limited liability company terminated prior to or during the policy period, such Named Insured is an Insured with respect to its interest in such joint venture, partnership or limited liability company but only to the extent that:

a. any offense giving rise to personal and advertising injury occurred prior to such termination date, and the personal and advertising injury arising out of such offense first occurred after such termination date;

b. the bodily injury or property damage first occurred after such termination date; and

c. there is no other valid and collectible insurance purchased specifically to insure the partnership, joint venture or limited liability company; and

If the joint venture, partnership or limited liability company is or was insured under a consolidated (wrap-up) insurance program, then such insurance will always be considered valid and collectible for the purpose of paragraph c. above. But this provision will not serve to exclude bodily injury, property damage or personal and advertising injury that would otherwise be covered under the Contractors General Liability Extension Endorsement provision entitled WRAP-UP EXTENSION: OCIP, CCIP, OR CONSOLIDATED (WRAP-UP) INSURANCE PROGRAMS. Please see that provision for the definition of consolidated (wrap-up) insurance program.

15. LEGAL LIABILITY – DAMAGE TO PREMISES / ALIENATED PREMISES / PROPERTY IN THE NAMED INSURED'S CARE, CUSTODY OR CONTROL

A. Under COVERAGES, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended to delete exclusion j. Damage to Property in its entirety and replace it with the following:

This insurance does not apply to:

j. Damage to Property

Property damage to:

(1) Property the Named Insured owns, rents, or occupies, including any costs or expenses incurred by you, or any other person, organization or entity, for repair, replacement, enhancement, restoration or
maintenance of such property for any reason, including prevention of injury to a person or damage to another's property;

(2) Premises the Named Insured sells, gives away or abandons, if the property damage arises out of any part of those premises;

(3) Property loaned to the Named Insured;

(4) Personal property in the care, custody or control of the Insured;

(5) That particular part of real property on which the Named Insured or any contractors or subcontractors working directly or indirectly on the Named Insured's behalf are performing operations, if the property damage arises out of those operations; or

(6) That particular part of any property that must be restored, repaired or replaced because your work was incorrectly performed on it.

Paragraphs (1), (3) and (4) of this exclusion do not apply to property damage (other than damage by fire) to premises rented to the Named Insured or temporarily occupied by the Named Insured with the permission of the owner, nor to the contents of premises rented to the Named Insured for a period of 7 or fewer consecutive days. A separate limit of insurance applies to Damage To Premises Rented To You as described in LIMITS OF INSURANCE.

Paragraph (2) of this exclusion does not apply if the premises are your work.

Paragraphs (3), (4), (5) and (6) of this exclusion do not apply to liability assumed under a sidetrack agreement.

Paragraph (6) of this exclusion does not apply to property damage included in the products-completed operations hazard.

Paragraphs (3) and (4) of this exclusion do not apply to property damage to:

i. tools, or equipment the Named Insured borrows from others, nor

ii. other personal property of others in the Named Insured's care, custody or control while being used in the Named Insured's operations away from any Named Insured's premises.

However, the coverage granted by this exception to Paragraphs (3) and (4) does not apply to:

a. property at a job site awaiting or during such property's installation, fabrication, or erection;

b. property that is mobile equipment leased by an Insured;

c. property that is an auto, aircraft or watercraft;

d. property in transit; or

e. any portion of property damage for which the Insured has available other valid and collectible insurance, or would have such insurance but for exhaustion of its limits, or but for application of one of its exclusions.

A separate limit of insurance and deductible apply to such property of others. See LIMITS OF INSURANCE as amended below.

B. Under COVERAGES, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended to delete its last paragraph and replace it with the following:

Exclusions a. through n. do not apply to damage by fire to premises while rented to a Named Insured or temporarily occupied by a Named Insured with permission of the owner, nor to damage to the contents of premises rented to a Named Insured for a period of 7 or fewer consecutive days.

A separate limit of insurance applies to this coverage as described in LIMITS OF INSURANCE.
C. The following paragraph is added to LIMITS OF INSURANCE:

Subject to 5. above, $25,000 is the most the Insurer will pay under Coverage A for damages arising out of any one occurrence because of the sum of all property damage to borrowed tools or equipment, and to other personal property of others in the Named Insured's care, custody or control, while being used in the Named Insured's operations away from any Named Insured's premises. The Insurer's obligation to pay such property damage does not apply until the amount of such property damage exceeds $1,000. The Insurer has the right but not the duty to pay any portion of this $1,000 in order to effect settlement. If the Insurer exercises that right, the Named Insured will promptly reimburse the Insurer for any such amount.

D. Paragraph 6., Damage To Premises Rented To You Limit, of LIMITS OF INSURANCE is deleted and replaced by the following:

6. Subject to Paragraph 5. above, (the Each Occurrence Limit), the Damage To Premises Rented To You Limit is the most the Insurer will pay under Coverage A for damages because of property damage to any one premises while rented to the Named Insured or temporarily occupied by the Named Insured with the permission of the owner, including contents of such premises rented to the Named Insured for a period of 7 or fewer consecutive days. The Damage To Premises Rented To You Limit is the greater of:

   a. $500,000; or
   b. The Damage To Premises Rented To You Limit shown in the Declarations.

E. Paragraph 4.b.(1)(a)(ii) of the Other Insurance Condition is deleted and replaced by the following:

   (ii) That is property insurance for premises rented to the Named Insured, for premises temporarily occupied by the Named Insured with the permission of the owner; or for personal property of others in the Named Insured's care, custody or control;

16. LIQUOR LIABILITY

Under COVERAGEs, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended to delete the exclusion entitled Liquor Liability.

This LIQUOR LIABILITY provision does not apply to any person or organization who otherwise qualifies as an additional insured on this Coverage Part.

17. MEDICAL PAYMENTS

A. LIMITS OF INSURANCE is amended to delete Paragraph 7. (the Medical Expense Limit) and replace it with the following:

7. Subject to Paragraph 5. above (the Each Occurrence Limit), the Medical Expense Limit is the most the Insurer will pay under Coverage C – Medical Payments for all medical expenses because of bodily injury sustained by any one person. The Medical Expense Limit is the greater of:

   (1) $15,000 unless a different amount is shown here: @@@@@@@@@@@@@; or
   (2) the amount shown in the Declarations for Medical Expense Limit.

B. Under COVERAGEs, the Insuring Agreement of Coverage C – Medical Payments is amended to replace Paragraph 1.a.(3)(b) with the following:

   (b) The expenses are incurred and reported to the Insurer within three years of the date of the accident; and

   This Paragraph B. does not apply to medical expenses incurred in the state of Missouri.

18. NON-OWNED AIRCRAFT

Under COVERAGEs, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended as follows:
The exclusion entitled Aircraft, Auto or Watercraft is amended to add the following:

This exclusion does not apply to an aircraft not owned by any Named Insured, provided that:

1. the pilot in command holds a currently effective certificate issued by the duly constituted authority of the United States of America or Canada, designating that person as a commercial or airline transport pilot;

2. the aircraft is rented with a trained, paid crew to the Named Insured; and

3. the aircraft is not being used to carry persons or property for a charge.

19. NON-OWNED WATERCRAFT

Under COVERAGE, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended to delete subparagraph (2) of the exclusion entitled Aircraft, Auto or Watercraft, and replace it with the following.

This exclusion does not apply to:

(2) a watercraft that is not owned by any Named Insured, provided the watercraft is:

(a) less than 75 feet long; and

(b) not being used to carry persons or property for a charge.

20. PERSONAL AND ADVERTISING INJURY – DISCRIMINATION OR HUMILIATION

A. Under DEFINITIONS, the definition of personal and advertising injury is amended to add the following tort:

* Discrimination or humiliation that results in injury to the feelings or reputation of a natural person.

B. Under COVERAGE, Coverage B – Personal and Advertising Injury Liability, the paragraph entitled Exclusions is amended to:

1. delete the Exclusion entitled Knowing Violation Of Rights Of Another and replace it with the following:

   This insurance does not apply to:

   Knowing Violation of Rights of Another

   Personal and advertising injury caused by or at the direction of the Insured with the knowledge that the act would violate the rights of another and would inflict personal and advertising injury. This exclusion shall not apply to discrimination or humiliation that results in injury to the feelings or reputation of a natural person, but only if such discrimination or humiliation is not done intentionally by or at the direction of:

   (a) the Named Insured; or

   (b) any executive officer, director, stockholder, partner, member or manager (if the Named Insured is a limited liability company) of the Named Insured.

2. add the following exclusions:

   This insurance does not apply to:

   Employment Related Discrimination

   Discrimination or humiliation directly or indirectly related to the employment, prospective employment, past employment or termination of employment of any person by any Insured.

   Premises Related Discrimination

   discrimination or humiliation arising out of the sale, rental, lease or sub-lease or prospective sale, rental, lease or sub-lease of any room, dwelling or premises by or at the direction of any Insured.
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Notwithstanding the above, there is no coverage for fines or penalties levied or imposed by a governmental entity because of discrimination.

The coverage provided by this PERSONAL AND ADVERTISING INJURY - DISCRIMINATION OR HUMILIATION Provision does not apply to any person or organization whose status as an Insured derives solely from

- Provision 1. ADDITIONAL INSURED of this endorsement; or
- attachment of an additional insured endorsement to this Coverage Part.

This PERSONAL AND ADVERTISING INJURY - DISCRIMINATION OR HUMILIATION Provision does not apply to any person or organization who otherwise qualifies as an additional insured on this Coverage Part.

21. PERSONAL AND ADVERTISING INJURY - CONTRACTUAL LIABILITY

A. Under COVERAGES, Coverage B - Personal and Advertising Injury Liability, the paragraph entitled Exclusions is amended to delete the exclusion entitled Contractual Liability.

B. Solely for the purpose of the coverage provided by this PERSONAL AND ADVERTISING INJURY - CONTRACTUAL LIABILITY provision, the following changes are made to the section entitled SUPPLEMENTARY PAYMENTS - COVERAGES A AND B:

1. Paragraph 2.d. is replaced by the following:

   d. The allegations in the suit and the information the Insurer knows about the offense alleged in such suit are such that no conflict appears to exist between the interests of the Insured and the interests of the indemnitee;

2. The first unnumbered paragraph beneath Paragraph 2.f.(2)(b) is deleted and replaced by the following:

   So long as the above conditions are met, attorneys fees incurred by the Insurer in the defense of that indemnitee, necessary litigation expenses incurred by the Insurer, and necessary litigation expenses incurred by the indemnitee at the Insurer's request will be paid as defense costs. Such payments will not be deemed to be damages for personal and advertising injury and will not reduce the limits of insurance.

C. This PERSONAL AND ADVERTISING INJURY - CONTRACTUAL LIABILITY Provision does not apply if Coverage B - Personal and Advertising Injury Liability is excluded by another endorsement attached to this Coverage Part.

This PERSONAL AND ADVERTISING INJURY - CONTRACTUAL LIABILITY Provision does not apply to any person or organization who otherwise qualifies as an additional insured on this Coverage Part.

22. PROPERTY DAMAGE – ELEVATORS

A. Under COVERAGES, Coverage A – Bodily Injury and Property Damage Liability, the paragraph entitled Exclusions is amended such that the Damage to Your Product Exclusion and subparagraphs (3), (4) and (6) of the Damage to Property Exclusion do not apply to property damage that results from the use of elevators.

B. Solely for the purpose of the coverage provided by this PROPERTY DAMAGE – ELEVATORS Provision, the Other Insurance conditions is amended to add the following paragraph:

This insurance is excess over any of the other insurance, whether primary, excess, contingent or on any other basis that is Property insurance covering property of others damaged from the use of elevators.

23. SUPPLEMENTARY PAYMENTS

The section entitled SUPPLEMENTARY PAYMENTS – COVERAGES A AND B is amended as follows:
A. Paragraph 1.b. is amended to delete the $250 limit shown for the cost of bail bonds and replace it with a $5,000 limit; and

B. Paragraph 1.d. is amended to delete the limit of $250 shown for daily loss of earnings and replace it with a $1,000 limit.

24. UNINTENTIONAL FAILURE TO DISCLOSE HAZARDS

If the Named Insured unintentionally fails to disclose all existing hazards at the inception date of the Named Insured's Coverage Part, the Insurer will not deny coverage under this Coverage Part because of such failure.

25. WAIVER OF SUBROGATION - BLANKET

Under CONDITIONS, the condition entitled Transfer Of Rights Of Recovery Against Others To Us is amended to add the following:

The Insurer waives any right of recovery the Insurer may have against any person or organization because of payments the Insurer makes for injury or damage arising out of:

1. the Named Insured's ongoing operations; or

2. your work included in the products-completed operations hazard.

However, this waiver applies only when the Named Insured has agreed in writing to waive such rights of recovery in a written contract or written agreement, and only if such contract or agreement:

1. is in effect or becomes effective during the term of this Coverage Part; and

2. was executed prior to the bodily injury, property damage or personal and advertising injury giving rise to the claim.

26. WRAP-UP EXTENSION: OCIP, CCIP, OR CONSOLIDATED (WRAP-UP) INSURANCE PROGRAMS

Note: The following provision does not apply to any public construction project in the state of Oklahoma, nor to any construction project in the state of Alaska, that is not permitted to be insured under a consolidated (wrap-up) insurance program by applicable state statute or regulation.

If the endorsement EXCLUSION – CONSTRUCTION WRAP-UP is attached to this policy, or another exclusionary endorsement pertaining to Owner Controlled Insurance Programs (O.C.I.P.) or Contractor Controlled Insurance Programs (C.C.I.P.) is attached, then the following changes apply:

A. The following wording is added to the above-referenced endorsement:

   With respect to a consolidated (wrap-up) insurance program project in which the Named Insured is or was involved, this exclusion does not apply to those sums the Named Insured become legally obligated to pay as damages because of:

   1. Bodily injury, property damage, or personal or advertising injury that occurs during the Named Insured's ongoing operations at the project, or during such operations of anyone acting on the Named Insured's behalf, nor

   2. Bodily injury or property damage included within the products-completed operations hazard that arises out of those portions of the project that are not residential structures.

B. Condition 4. Other Insurance is amend to add the following subparagraph 4.b.(1)(c):

This insurance is excess over:

(c) Any of the other insurance whether primary, excess, contingent or any other basis that is insurance available to the Named Insured as a result of the Named Insured being a participant in a consolidated (wrap-up) insurance program, but only as respects the Named Insured's involvement in that consolidated (wrap-up) insurance program.
C. DEFINITIONS is amended to add the following definitions:

Consolidated (wrap-up) insurance program means a construction, erection or demolition project for which the prime contractor/project manager or owner of the construction project has secured general liability insurance covering some or all of the contractors or subcontractors involved in the project, such as an Owner Controlled Insurance Program (O.C.I.P.) or Contractor Controlled Insurance Program (C.C.I.P.).

Residential structure means any structure where 30% or more of the square foot area is used or is intended to be used for human residency, including but not limited to:

1. single or multifamily housing, apartments, condominiums, townhouses, co-operatives or planned unit developments; and
2. the common areas and structures appurtenant to the structures in paragraph 1. (including pools, hot tubs, detached garages, guest houses or any similar structures).

However, when there is no individual ownership of units, residential structure does not include military housing, college/university housing or dormitories, long term care facilities, hotels or motels. Residential structure also does not include hospitals or prisons.

This WRAP-UP EXTENSION: OCIP, CCIP, OR CONSOLIDATED (WRAP-UP) INSURANCE PROGRAMS Provision does not apply to any person or organization who otherwise qualifies as an additional insured on this Coverage Part.

All other terms and conditions of the Policy remain unchanged.

This endorsement, which forms a part of and is for attachment to the Policy issued by the designated Insurers, takes effect on the effective date of said Policy at the hour stated in said Policy, unless another effective date is shown below, and expires concurrently with said Policy.
This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

It is understood and agreed as follows:

I. The WHO IS AN INSURED section is amended to add as an Insured any person or organization whom the Named Insured is required by written contract to add as an additional insured on this coverage part, including any such person or organization, if any, specifically set forth on the Schedule attachment to this endorsement. However, such person or organization is an Insured only with respect to such person or organization’s liability for:

A. unless paragraph B. below applies,

1. bodily injury, property damage, or personal and advertising injury caused in whole or in part by the acts or omissions by or on behalf of the Named Insured and in the performance of such Named Insured’s ongoing operations as specified in such written contract; or

2. bodily injury or property damage caused in whole or in part by your work and included in the products-completed operations hazard, and only if

   a. the written contract requires the Named Insured to provide the additional insured such coverage; and

   b. this coverage part provides such coverage.

B. bodily injury, property damage, or personal and advertising injury arising out of your work described in such written contract, but only if:

   1. this coverage part provides coverage for bodily injury or property damage included within the products completed operations hazard; and

   2. the written contract specifically requires the Named Insured to provide additional insured coverage under the 11-85 or 10-01 edition of CG2010 or the 10-01 edition of CG2037.

II. Subject always to the terms and conditions of this policy, including the limits of insurance, the Insurer will not provide such additional insured with:

A. coverage broader than required by the written contract; or

B. a higher limit of insurance than required by the written contract.

III. The insurance granted by this endorsement to the additional insured does not apply to bodily injury, property damage, or personal and advertising injury arising out of:

A. the rendering of, or the failure to render, any professional architectural, engineering, or surveying services, including:

   1. the preparing, approving, or failing to prepare or approve maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; and

   2. supervisory, inspection, architectural or engineering activities; or

B. any premises or work for which the additional insured is specifically listed as an additional insured on another endorsement attached to this coverage part.

IV. Notwithstanding anything to the contrary in the section entitled COMMERCIAL GENERAL LIABILITY CONDITIONS, the Condition entitled Other Insurance, this insurance is excess of all other insurance available to the additional insured whether on a primary, excess, contingent or any other basis. However, if this insurance
is required by written contract to be primary and non-contributory, this insurance will be primary and non-contributory relative solely to insurance on which the additional insured is a named insured.

V. Solely with respect to the insurance granted by this endorsement, the section entitled COMMERCIAL GENERAL LIABILITY CONDITIONS is amended as follows:

The Condition entitled Duties In The Event of Occurrence, Offense, Claim or Suit is amended with the addition of the following:

Any additional insured pursuant to this endorsement will as soon as practicable:

1. give the Insurer written notice of any claim, or any occurrence or offense which may result in a claim;

2. except as provided in Paragraph IV. of this endorsement, agree to make available any other insurance the additional insured has for any loss covered under this coverage part;

3. send the Insurer copies of all legal papers received, and otherwise cooperate with the Insurer in the investigation, defense, or settlement of the claim; and

4. tender the defense and indemnity of any claim to any other insurer or self insurer whose policy or program applies to a loss that the Insurer covers under this coverage part. However, if the written contract requires this insurance to be primary and non-contributory, this paragraph (4) does not apply to insurance on which the additional insured is a named insured.

The Insurer has no duty to defend or indemnify an additional insured under this endorsement until the Insurer receives written notice of a claim from the additional insured.

VI. Solely with respect to the insurance granted by this endorsement, the section entitled DEFINITIONS is amended to add the following definition:

Written contract means a written contract or written agreement that requires the Named Insured to make a person or organization an additional insured on this coverage part, provided the contract or agreement:

A. is currently in effect or becomes effective during the term of this policy; and

B. was executed prior to:

1. the bodily injury or property damage; or

2. the offense that caused the personal and advertising injury

for which the additional insured seeks coverage.

Any coverage granted by this endorsement shall apply solely to the extent permissible by law.

All other terms and conditions of the Policy remain unchanged.

This endorsement, which forms a part of and is for attachment to the Policy issued by the designated Insurers, takes effect on the effective date of said Policy at the hour stated in said Policy, unless another effective date is shown below, and expires concurrently with said Policy.
THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

BUSINESS AUTO EXTENSION ENDORSEMENT

This endorsement modifies insurance provided under the following:

BUSINESS AUTO COVERAGE FORM

With respect to coverage provided by this endorsement, the provisions of the Coverage Form apply unless modified by the endorsement.

GENERAL DESCRIPTION OF COVERAGE – This endorsement broadens coverage. However, coverage for any injury, damage or medical expenses described in any of the provisions of this endorsement may be excluded or limited by another endorsement to the Coverage Part, and these coverage broadening provisions do not apply to the extent that coverage is excluded or limited by such an endorsement. The following listing is a general coverage description only. Limitations and exclusions may apply to these coverages. Read all the provisions of this endorsement and the rest of your policy carefully to determine rights, duties, and what is and is not covered.

A. BROAD FORM NAMED INSURED

B. BLANKET ADDITIONAL INSURED

C. EMPLOYEE HIRED AUTO

D. EMPLOYEES AS INSURED

E. SUPPLEMENTARY PAYMENTS – INCREASED LIMITS

F. HIRED AUTO – LIMITED WORLDWIDE COVERAGE – INDEMNITY BASIS

G. WAIVER OF DEDUCTIBLE – GLASS

PROVISIONS

A. BROAD FORM NAMED INSURED

The following is added to Paragraph A.1., Who Is An Insured, of SECTION II – LIABILITY COVERAGE:

Any organization you newly acquire or form during the policy period over which you maintain 50% or more ownership interest and that is not separately insured for Business Auto Coverage. Coverage under this provision is afforded only until the 180th day after you acquire or form the organization or the end of the policy period, whichever is earlier.

B. BLANKET ADDITIONAL INSURED

The following is added to Paragraph c. in A.1., Who Is An Insured, of SECTION II – LIABILITY COVERAGE:

Any person or organization who is required under a written contract or agreement between you and that person or organization, that is signed and

executed by you before the "bodily injury" or "property damage" occurs and that is in effect during the policy period, to be named as an additional insured is an "insured" for Liability Coverage, but only for damages to which this insurance applies and only to the extent that person or organization qualifies as an "insured" under the Who Is An Insured provision contained in Section II.

C. EMPLOYEE HIRED AUTO

1. The following is added to Paragraph A.1., Who Is An Insured, of SECTION II – LIABILITY COVERAGE:

An "employee" of yours is an "insured" while operating an "auto" hired or rented under a contract or agreement in that "employee's" name, with your permission, while performing duties related to the conduct of your business.

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2. The following replaces Paragraph b. in B.5., Other Insurance, of SECTION IV – BUSINESS AUTO CONDITIONS:

   b. For Hired Auto Physical Damage Coverage, the following are deemed to be covered "autos" you own:

   (1) Any covered "auto" you lease, hire, rent or borrow; and

   (2) Any covered "auto" hired or rented by your "employee" under a contract in that individual "employee's" name, with your permission, while performing duties related to the conduct of your business.

   However, any "auto" that is leased, hired, rented or borrowed with a driver is not a covered "auto".

D. EMPLOYEES AS INSURED

The following is added to Paragraph A.1., Who Is An Insured, of SECTION II – LIABILITY COVERAGE:

Any "employee" of yours is an "insured" while using a covered "auto" you don't own, hire or borrow in your business or your personal affairs.

E. SUPPLEMENTARY PAYMENTS – INCREASED LIMITS

1. The following replaces Paragraph A.2.a.(2), of SECTION II – LIABILITY COVERAGE:

   (2) Up to $3,000 for cost of bail bonds (including bonds for related traffic law violations) required because of an "accident" we cover. We do not have to furnish these bonds.

2. The following replaces Paragraph A.2.a.(4), of SECTION II – LIABILITY COVERAGE:

   (4) All reasonable expenses incurred by the "insured" at our request, including actual loss of earnings up to $500 a day because of time off from work.

F. HIRED AUTO – LIMITED WORLDWIDE COVERAGE – INDEMNITY BASIS

The following replaces Subparagraph (5) in Paragraph B.7., Policy Period, Coverage Territory, of SECTION IV – BUSINESS AUTO CONDITIONS:

(5) Anywhere in the world, except any country or jurisdiction while any trade sanction, embargo, or similar regulation imposed by the United States of America applies to and prohibits the transaction of business with or within such country or jurisdiction, for Liability Coverage for any covered "auto" that you lease, hire, rent or borrow without a driver for a period of 30 days or less and that is not an "auto" you lease, hire, rent or borrow from any of your "employees", partners (if you are a partnership), members (if you are a limited liability company) or members of their households.

(a) With respect to any claim made or "suit" brought outside the United States of America, the territories and possessions of the United States of America, Puerto Rico and Canada:

(i) You must arrange to defend the "insured" against, and investigate or settle any such claim or "suit" and keep us advised of all proceedings and actions.

(ii) Neither you nor any other involved "insured" will make any settlement without our consent.

(iii) We may, at our discretion, participate in defending the "insured" against, or in the settlement of, any claim or "suit".

(iv) We will reimburse the "insured" for sums that the "insured" legally must pay as damages because of "bodily injury" or "property damage" to which this insurance applies, that the "insured" pays with our consent, but only up to the limit described in Paragraph C., Limit Of Insurance, of SECTION II – LIABILITY COVERAGE.

(v) We will reimburse the "insured" for the reasonable expenses incurred with our consent for your investigation of such claims and your defense of the "insured" against any such "suit", but only up to and included within the limit described in Paragraph C., Limit Of Insurance, of SECTION II – LIABILITY COVERAGE, and not in addition to such limit. Our duty to make such payments ends when we have used up the applicable limit of insurance in payments for damages, settlements or defense expenses.

(b) This insurance is excess over any valid and collectible other insurance available

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to the "insured" whether primary, excess contingent or on any other basis.

(c) This insurance is not a substitute for required or compulsory insurance in any country outside the United States, its territories and possessions, Puerto Rico and Canada.

You agree to maintain all required or compulsory insurance in any such country up to the minimum limits required by local law. Your failure to comply with compulsory insurance requirements will not invalidate the coverage afforded by this policy, but we will only be liable to the same extent we would have been liable had you complied with the compulsory insurance requirements.

(d) It is understood that we are not an admitted or authorized insurer outside the United States of America, its territories and possessions, Puerto Rico and Canada. We assume no responsibility for the furnishing of certificates of insurance, or for compliance in any way with the laws of other countries relating to insurance.

G. WAIVER OF DEDUCTIBLE – GLASS

The following is added to Paragraph D., Deductible, of SECTION III – PHYSICAL DAMAGE COVERAGE:

No deductible for a covered "auto" will apply to glass damage if the glass is repaired rather than replaced.

H. HIRED AUTO PHYSICAL DAMAGE – LOSS OF USE – INCREASED LIMIT

The following replaces the last sentence of Paragraph A.4.b., Loss Of Use Expenses, of SECTION III – PHYSICAL DAMAGE COVERAGE:

However, the most we will pay for any expenses for loss of use is $65 per day, to a maximum of $750 for any one "accident".

I. PHYSICAL DAMAGE – TRANSPORTATION EXPENSES – INCREASED LIMIT

The following replaces the first sentence in Paragraph A.4.a., Transportation Expenses, of SECTION III – PHYSICAL DAMAGE COVERAGE:

We will pay up to $50 per day to a maximum of $1,500 for temporary transportation expense incurred by you because of the total theft of a covered "auto" of the private passenger type.

J. PERSONAL EFFECTS

The following is added to Paragraph A.4., Coverage Extensions, of SECTION III – PHYSICAL DAMAGE COVERAGE:

Personal Effects

We will pay up to $400 for "loss" to wearing apparel and other personal effects which are:

(1) Owned by an "insured"; and

(2) In or on your covered "auto".

This coverage applies only in the event of a total theft of your covered "auto".

No deductibles apply to this Personal Effects coverage.

K. AIRBAGS

The following is added to Paragraph B.3., Exclusions, of SECTION III – PHYSICAL DAMAGE COVERAGE:

Exclusion 3.a. does not apply to "loss" to one or more airbags in a covered "auto" you own that inflate due to a cause other than a cause of "loss" set forth in Paragraphs A.1.b. and A.1.c., but only:

a. If that "auto" is a covered "auto" for Comprehensive Coverage under this policy;

b. The airbags are not covered under any warranty; and

c. The airbags were not intentionally inflated.

We will pay up to a maximum of $1,000 for any one "loss".

L. NOTICE AND KNOWLEDGE OF ACCIDENT OR LOSS

The following is added to Paragraph A.2.a., of SECTION IV – BUSINESS AUTO CONDITIONS:

Your duty to give us or our authorized representative prompt notice of the "accident" or "loss" applies only when the "accident" or "loss" is known to:

(a) You (if you are an individual);

(b) A partner (if you are a partnership);

(c) A member (if you are a limited liability company);

(d) An executive officer, director or insurance manager (if you are a corporation or other organization); or

(e) Any "employee" authorized by you to give notice of the "accident" or "loss".
M. BLANKET WAIVER OF SUBROGATION

The following replaces Paragraph A.5., Transfer Of Rights Of Recovery Against Others To Us, of SECTION IV — BUSINESS AUTO CONDITIONS:

5. Transfer Of Rights Of Recovery Against Others To Us

We waive any right of recovery we may have against any person or organization to the extent required of you by a written contract signed and executed prior to any "accident" or "loss", provided that the "accident" or "loss" arises out of operations contemplated by such contract. The waiver applies only to the person or organization designated in such contract.

N. UNINTENTIONAL ERRORS OR OMISSIONS

The following is added to Paragraph B.2., Concealment, Misrepresentation, Or Fraud, of SECTION IV — BUSINESS AUTO CONDITIONS:

The unintentional omission of, or unintentional error in, any information given by you shall not prejudice your rights under this insurance. However this provision does not affect our right to collect additional premium or exercise our right of cancellation or non-renewal.
WAIVER OF OUR RIGHT TO RECOVER FROM OTHERS
ENDORSEMENT – CALIFORNIA
(BLANKET WAIVER)

We have the right to recover our payments from anyone liable for an injury covered by this policy. We will not
enforce our right against the person or organization named in the Schedule.
The additional premium for this endorsement shall be: % of the California workers' compensation pre-

Schedule

Person or Organization

ANY PERSON OR ORGANIZATION FOR
WHICH THE NAMED INSURED HAS
AGREED BY WRITTEN CONTRACT
EXECUTED PRIOR TO LOSS TO
FURNISH THIS WAIVER

This endorsement changes the policy to which it is attached and is effective on the date issued unless otherwise
stated.
(The Information below is required only when this endorsement is issued subsequent to preparation of
the policy.)
Endorsement Effective 01/22/16
Insured
Policy No.
Endorsement No.
Premium

Insurance Company American Casualty of Reading PA
Countersigned by

DATE OF ISSUE: ST ASSIGN:

Page 1 of 1
Construction and Demolition (C&D) Debris Recycling Requirements

As a condition of receiving this Contract, Contractor agrees to fully comply with the requirements specified herein for all demolition projects, as well as projects with a valuation of $250,000 or more:

1. **Definitions.** For purposes of this section, the following terms, words and phrases shall have the following meanings:

   “Certified C&D sorting facility” means a facility that receives C&D debris and/or processes C&D debris into its component material types for reuse, recycling, and disposal of residuals and possess a valid certificate as a C&D sorting facility from the Sacramento Regional County Solid Waste Authority.

   “Construction and demolition debris” or “C&D debris” means used or commonly discarded materials resulting from construction, repair, remodeling or demolition operations on any pavement, house, building, or other structure, or from landscaping that are not hazardous as defined in California Health and Safety Code section 25100 et seq. Such materials include, but are not limited to, concrete, asphalt, wood, metal, brick, dirt, sand, rock, gravel, plaster, glass, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, masonry, plastic pipe, trees, and other vegetative matter resulting from land clearing and landscaping.

   “Divert” or “diversion” means to use materials for any purpose other than disposal in a landfill or transformation facility. Methods to divert materials include on-site reuse of the materials, delivery of materials from the project site to a certified C&D sorting facility or a recycling facility, or other methods as approved in regulations promulgated by the City Department of Utilities.

   “Franchised waste hauler” means a person who possesses a valid commercial solid waste collection franchise issued by the Sacramento Regional County Solid Waste Authority.

   “Mixed C&D debris” means loads that include commingled recyclable and non-recyclable C&D debris generated at a project site.

   “Recyclable C&D debris” means C&D debris required to be diverted from landfills as specified in the Waste Management Plan and returned to the economic mainstream in the form of raw material for new, reused or reconstituted products that meet the quality standards necessary to be used in the marketplace.

   “Recycling facility” means a facility or operation that receives, processes, and transfers source-separated recyclable materials.

   “Source-separated C&D debris” means recyclable C&D debris that is separately sorted and containerized at the site of generation by individual material type and segregated from mixed C&D debris prior to collection and transporting.

   “Waste log” means a record detailing the management of C&D debris generated by the covered project, including the date and weight/volume of material by type that was salvaged, reused, recycled or disposed.

2. **Waste Management Plan.** A completed WMP (see Attachment 1) must be submitted to and approved by the City prior to commencing any work on the project. The WMP must specify the types of C&D debris that will be generated from the project; the manner in which C&D debris will be managed and/or stored on the project site; the manner in which recyclable C&D debris generated from the project will be recycled or reuse; the person who will haul, collect or transport the recyclable C&D debris from the project site; and the certified C&D sorting facility or recycling facility where recyclable C&D debris will be delivered. The WMP must be approved by the City prior to commencing any work on the project.

3. Contractor shall be solely responsible for diverting the recyclable C&D materials specified on the WMP. Mixed C&D debris shall be delivered to a SWA-certified C&D sorting facility only. Only the permit holder, the person who generates the waste, a franchised waste hauler, or the City of Sacramento can transport or haul mixed C&D debris. Source-separated C&D debris may be delivered by any person to any recycling facility that accepts such materials. (See Attachment 2 for list of C&D Debris Haulers and Facilities).
4. During the course of the project, Contractor shall maintain a waste log (see Attachment 3), and keep all weight tickets or weight receipts, for all C&D debris hauled away from the project. At a minimum, the waste log shall specify the C&D debris generated by the project; the manner in which C&D debris was recycled or re-used; and the facility where the C&D debris was delivered.

5. Within 30 days after submitting the project completion report, Contractor shall submit to the City a completed waste log, along with copies of supporting weight tickets. Contractor shall maintain and keep accurate and complete records of all bills, weight receipts or weight tickets that were issued for the collection, transport or disposal of C&D debris for a period of one-year after submittal of the waste log. The records shall be made available for inspection, examination and audit by the City during the one-year retention period to validate the information provided in the WMP and in the waste log. If the City determines noncompliance by the Contractor after an audit has been conducted, Contractor shall reimburse the City for all costs incurred in performing the audit.

6. Failure by Contractor to comply with any provisions specified herein will subject Contractor to possible suspension and/or termination of this Contract for cause; repayment of any or all of the Contract amount disbursed by the City; imposition of a penalty, payable to the City ($50-$250 for first offense, $251-$500 for second offense, and $501-$1500 for subsequent offenses); and/or submission of a performance security deposit fee when submitting a permit application to the City for a project within one year of imposition of the penalty.

For questions or to obtain more information about the Recycling Requirements for C&D debris, contact the City of Sacramento, Solid Waste Services Division, 2812 Meadowview Road, Building 1, Sacramento, CA 95832, or telephone (916) 808-4833, or email C&D@cityofsacramento.org
T & S CONSTRUCTION CO., INC. SACRAMENTO, CA 95829

Record#: 21299
Check#: 25158
Date: 01/25/2016
Description: C & D PLAN FOR SUMP40 & 146
Amount: 800.00
Vendor#: 1024
Payee: CITY OF SAC SOLID WASTE SERVIC
Address: 2812 MEADOWVIEW ROAD, BLDG 1
SACRAMENTO CA 95832

PAY EXACTLY EIGHT HUNDRED DOLLARS

TO THE ORDER OF

CITY OF SAC SOLID WASTE SERVIC
2812 MEADOWVIEW ROAD, BLDG 1
SACRAMENTO CA 95832

Memo: C & D PLAN FOR SUMP40 & 146

Date: 01/25/2016
Amount: $800.00

T & S CONSTRUCTION CO., INC. SACRAMENTO, CA 95829

Record#: 21299
Check#: 25158
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Address: 2812 MEADOWVIEW ROAD, BLDG 1
SACRAMENTO CA 95832

RECEIVED
25158
This Waste Management Plan (WMP) must be submitted and approved before work can begin. Only one WMP is required for each public construction project. The administration fee and, if applicable, a security deposit must be submitted with this form to be approved. Administration fee is 0.04% of project bid amount (min $40, max $800); security deposit, if applicable, is 1% of bid amount (max $10,000). The accompanying Waste Log must be submitted within 30 days of the project completion report, or a penalty may be imposed.

**A. Building Project Information:**

Job Address: 39 Twin Leaf Court
Contractor: TJS Construction Co., Inc.
Address: 6088 Hedge Avenue
SACRAMENTO, CALIFORNIA 95838

Engineering Estimate: 925,000
Phone: 916-381-3052
Email: art@tjsconstruction.com

**B. Briefly describe the project:**

Rehabilitating sewage lift stations

**C. Materials Required to be Recycled**

50% of all debris must be recycled if generated during the course of your project. You can either source-separate them, which may be hauled by anyone, or mix them in one container and send the mixed C&D debris load to a Certified Mixed C&D Sorting Facility. Mixed C&D loads can only be hauled by a franchised hauler or self-hauled. Please see the Definitions section, on the next page, for more information.

**D. Material Management.**

1. How will C&D debris will be stored on the project site: [ ] Mixed C&D [x] Source-Separated
2. Company to haul away debris: [ ] Sacramento Transfer Inc.
3. Facilities to receive debris: [ ] L & D Landfill
E. Definitions.
Please read and understand these terms. Call Solid Waste at (916) 808-4833 if these terms are not clear to you. More information is also available online at http://www.cityofsacramento.org/utilities/.

1. **Self-haul or self-hauling**: This is when the general contractor or a subcontractor who is doing work on the project hauls their own waste materials for recycling or disposal. Note that a jobsite cleanup crew is not doing other work on the project and is not self-hauling. Jobsite cleanup crews need to be franchised in order to haul mixed C&D debris away.

2. **Franchised hauler**: Check the Department of Utilities (DOU) website for a list of these haulers. Only these companies and the City of Sacramento can collect and haul mixed C&D debris generated within the City for a fee.

3. **Source separation**: This means keeping wood, metal, cardboard, or other recyclables in separate containers, and sending the materials to an authorized recycler. A list of authorized recyclers can be found on the DOU web site. Source-separated materials may be hauled by anyone.

4. **Mixed C&D debris**: This means putting all recyclable debris into one container. Mixed materials must be sent to a certified mixed C&D sorting facility. Mixed materials may be either self-hauled or hauled by a franchised hauler. If your job site is crowded, this option saves the most space.

5. **Certified Mixed C&D Sorting Facility**: See the DOU web site for a list. These facilities have been certified by the Sacramento Regional Solid Waste Authority (SWA) to extract recyclable materials from mixed C&D debris.

F. Terms and Conditions

- Your approved Waste Management Plan and Waste Log must be kept on the job site for the duration of the project.

- City of Sacramento Solid Waste Services staff may enter the jobsite to inspect waste collection areas.

- ALL Clean Wood Waste (unpainted, untreated lumber, plywood and OSB), Inert Materials (concrete, asphalt paving, brick, block, and dirt), Wooden Pallets, Scrap Metal, and Corrugated Cardboard must be recycled.

- Only SWA-Certified Mixed C&D Sorting Facilities may be used to recycle these materials if mixed with other materials.

- Only the City of Sacramento, SWA-Franchised Haulers, or self-haulers (as defined above) may collect and transport mixed C&D material from the jobsite.

- C&D Debris may not be burned or dumped illegally.

- Your Waste Log must be completed and submitted, with supporting weight tickets, within 30 days of submitting your project completion report. All waste hauling and disposal or recycling activity must be entered on the Waste Log, including information from any subcontractors who self-hauled their own debris off-site.

- You must keep all receipts or weight-tickets from your project for a period of one year from the submittal of your waste log.

- Failure to comply with these terms and conditions may result in a fine and payment of a security deposit on future projects.
# C&D Debris Haulers & Facilities

## Certified Mixed C&D Facilities

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Phone</th>
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</thead>
<tbody>
<tr>
<td>Allied Waste / Elder Creek Transfer and Recovery</td>
<td>(916) 387-8425</td>
</tr>
<tr>
<td>Florin-Perkins Public Disposal</td>
<td>(916) 443-5120</td>
</tr>
<tr>
<td>L&amp;D Landfill</td>
<td>(916) 737-8640</td>
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<tr>
<td>Waste Management / K&amp;M Recycle America</td>
<td>(916) 452-0142</td>
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## Franchised Haulers

<table>
<thead>
<tr>
<th>Company Name</th>
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<tbody>
<tr>
<td>ACES Waste Services, Inc.</td>
<td>(866) 488-8837</td>
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<tr>
<td>Allied Waste Services</td>
<td>(916) 631-0600</td>
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<tr>
<td>All Waste Systems, Inc.</td>
<td>(916) 456-1555</td>
</tr>
<tr>
<td>Atlas Disposal Industries, LLC</td>
<td>(916) 455-2800</td>
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<tr>
<td>California Waste Recovery Systems</td>
<td>(916) 441-1985</td>
</tr>
<tr>
<td>Central Valley Waste Services, Inc.</td>
<td>(209) 369-8274</td>
</tr>
<tr>
<td>City of Sacramento Solid Waste</td>
<td>(916) 808-4839</td>
</tr>
<tr>
<td>Elk Grove Waste Management, LLC</td>
<td>(916) 689-4052</td>
</tr>
<tr>
<td>Mini Drops, Inc.</td>
<td>(916) 686-8765</td>
</tr>
<tr>
<td>Norcal Waste Services of Sacramento</td>
<td>(916) 381-5300</td>
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<tr>
<td>North West Recyclers</td>
<td>(916) 686-8575</td>
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<tr>
<td>Waste Management of Sacramento</td>
<td>(916) 387-1400</td>
</tr>
<tr>
<td>Waste Removal &amp; Recycling</td>
<td>(916) 453-1400</td>
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<tr>
<td>Western Strategic Materials, Inc.</td>
<td>(916) 388-1076</td>
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## Recyclers*  

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Bell Marine</td>
<td>(916) 442-9089</td>
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<tr>
<td>C &amp; C Paper Recycling</td>
<td>(916) 920-2673</td>
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<tr>
<td>EBI Aggregates</td>
<td>(916) 372-7580</td>
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<tr>
<td>International Paper</td>
<td>(916) 371-4634</td>
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<tr>
<td>Modern Waste Solutions</td>
<td>(916) 447-6800</td>
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<tr>
<td>PRIDE Industries, Inc.</td>
<td>(916) 640-1300</td>
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<tr>
<td>Recycling Industries, Inc.</td>
<td>(916) 452-3961</td>
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<tr>
<td>Sacramento Local Conservation Corps</td>
<td>(916) 386-8394</td>
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<tr>
<td>Smurfit-Stone Container Corporation</td>
<td>(916) 381-3340</td>
</tr>
<tr>
<td>Southside Art Center</td>
<td>(916) 387-8080</td>
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<tr>
<td>Spencer Building Maintenance, Inc.</td>
<td>(916) 922-1900</td>
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## Recovery Stations & Landfills

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<tr>
<th>Landfill</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Elder Creek Recovery &amp; Transfer Station</td>
<td>(916) 387-8425</td>
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<tr>
<td>Kiefer Landfill</td>
<td>(916) 875-5555</td>
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<td>L &amp; D Landfill</td>
<td>(916) 383-9420</td>
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<tr>
<td>North Area Recovery Station</td>
<td>(916) 875-5555</td>
</tr>
<tr>
<td>Sacramento Recycling &amp; Transfer Station</td>
<td>(916) 379-0500</td>
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<tr>
<td>Waste Management Recycle America</td>
<td>(916) 452-0142</td>
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More updated information can be found online at:  

* Please note that any facility may receive source-separated recyclable materials as long as it is authorized to do so by the State of California. This is not meant to be a complete list.
C&D Debris Waste Log

Project address: 39 Twin Leaf Court SAC CA 95838

This waste log, and copies of supporting weight tickets, must be submitted to Solid Waste within 30 days of submitting the project completion report. The waste log and weight tickets must also be kept on file for one year after project completion.

<table>
<thead>
<tr>
<th>Date</th>
<th>Hauler</th>
<th>Material</th>
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</tr>
</tbody>
</table>

Hauler: Indicate the Franchisee, Self-Hauler, City of Sacramento, or other hauler who removed the material offsite.


Destination: Indicate the facility that received the material for disposal or recycling

Amount: Indicate the weight. If weight is not known, put volume.
CALIFORNIA LABOR CODES RELATING TO APPRENTICES ON PUBLIC WORKS PROJECTS

See info at these webpages: www.dir.ca.gov and/or www.leginfo.ca.gov

**********
TECHNICAL SPECIFICATIONS
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This project will modify two existing City sewage lift stations (Sumps). At Sump 40, the electrical control equipment, the discharge piping, and the perimeter fencing is to be upgraded. At Sump 146, the electrical control equipment and the perimeter fencing is to be upgraded, and the existing wet pit/dry pit pump configuration is to be converted to a single wetwell with new submersible pumps. Work includes, but is not limited to, installing one or more temporary bypass pumping systems; removal and salvage of selected equipment; modifying site piping and appurtenances; pavement restoration; fencing; recycling construction debris; removal of temporary facilities; site cleanup; and construction of all the associated appurtenances as shown on the plans and/or as indicated in these Contract Documents, including all material, labor, plant, tools, equipment, and services necessary for a complete, in-place operational project.

B. Contractor may opt to work both sumps separately or concurrently.

C. All equipment and materials furnished that are to remain a part of the facilities shall be new, except where re-use is specifically called for.

D. Work shall be confined to existing City owned property unless Contractor makes alternative arrangements w/ adjacent private property owners.

1.02 GOVERNING DOCUMENTS

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

B. In the event of a conflict in the Contract Documents, priorities as set forth in CSSS Section 5-3 shall govern.

C. Except for items of work specifically identified for payment in the proposal, no compensation will be paid to the Contractor for performance of these or any other general Contract requirements. Include the cost of all general Contract performance requirements in whatever proposal item is considered appropriate.
1.03 BID ITEMS
A. Payment for Contract work will be made on a lump sum basis, as indicated in the proposal.

C. Progress Payments shall be made as provided for in the Agreement, and in CSSS, Section 8.

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

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

C. “Drawings” shall mean the “Plans”.

D. “Provide” shall mean furnish and install, in accordance with the drawings.

1.05 CITY FURNISHED PLANS AND SPECIFICATIONS
A. Per CSSS Section 5-4, City will provide Contractor with 5 sets of the Contract Documents, and 5 sets of the plans on 22”x34” bond paper. City will not be responsible for incomplete information in the event partial sets are ordered.

1.06 REFERENCE STANDARDS
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.

B. Reference organization addresses included at the end of this section are for informational purposes only.

1.07 SUBMITTALS
A. Conform to CSSS Section 5-7, and the requirements herein. Provide an electronic e-mailed pdf copy (Adobe’s Portable Document Format) of all submittals. Hard copies are required for the as-built Record Drawings, O&M Manual submittals, and all letter correspondence. Electronic copies larger than 8 megabytes shall be submitted on a CD.

B. Submittals shall include, but not be limited to the following:
   2. The Schedule of Values. Include an electronic file version compatible with Microsoft Office Excel.
4. Shutdown requests.

PART 2 - PRODUCTS

2.01 CONSTRUCTION SCHEDULE

A. Submit a Construction Schedule in general conformance with CSSS Section 7-2. Schedule shall indicate the chronological sequence in which Contractor proposes to carry out each aspect of the work, the calendar dates on which the Contractor will begin the several salient elements of the work (procurement and delivery of materials, posting of “No Parking” signs, notification of property owners, scheduling of equipment, excavation of trenches, placement of pipe, etc), and the contemplated dates for completing salient elements.

B. Schedule shall use the critical path method displayed in the form of a bar chart.

C. Contractor shall contact the Engineer at least forty-eight (48) hours in advance of any change in the schedule. If the Contractor desires to make a major change in his method or operations after commencing construction, or if the activity time schedule fails to reflect the actual progress of the work, Contractor shall submit a revised schedule to the Engineer in advance of beginning revised operations.

D. At the very minimum, Contractor shall update the construction activity time schedule every thirty (30) calendar days throughout the duration of the project. Contractor shall also provide additional updates of the activity time schedule upon request by the Engineer within five (5) working days of such request.

E. Schedule shall be consistent in all respects with the Contract time of completion and order of work requirements. No progress payments will be made until a suitable schedule has been submitted to and approved by the Engineer.

2.02 SCHEDULE OF VALUES

A. For Progress Payments, submit a Schedule of Values for approval by the Engineer. Submit the first draft of the schedule at least three (3) working days prior to the pre-construction conference. Contractor's standard forms will be considered for approval upon request.

B. General Requirements:

1. In addition to the number of hardcopies specified in CSSS Section 5-7, include an electronic copy compatible with Microsoft Office 2000 Excel.

2. Identify the project name, project number, Contractor's name and address, submission date, and Contract number on the Schedule of Values.

3. Separate the component parts of the Work into sufficient detail to serve as a basis for computing progress payments. The sum of the component parts shall equal the Contract total amount. An unbalanced (front-end loaded) Schedule of Values will not be accepted.

4. For the various portions of the Work:
   a. Identify labor, equipment, overhead, and material costs separately for items of work in excess of ten thousand dollars ($10,000).
b. Schedule of Values may include a separate line item for Mobilization. The following table shows the maximum progress payment amounts that the City will make for mobilization. In the event the Contractor’s schedule identifies a mobilization value in excess of 3% of the total contract value, the City shall pay the excess amount with the final payment.

<table>
<thead>
<tr>
<th>Work Completed, not including mobilization, as a % of Contract total.</th>
<th>Total % of mobilization value earned.</th>
<th>Total of progress payments for mobilization, as a % of the total Contract value.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>5% to 9.9%</td>
<td>50%</td>
<td>1.5%</td>
</tr>
<tr>
<td>10% to 19.9%</td>
<td>70%</td>
<td>2.0%</td>
</tr>
<tr>
<td>20% to 49.9%</td>
<td>90%</td>
<td>2.7%</td>
</tr>
<tr>
<td>50% to 99.9%</td>
<td>100%</td>
<td>3.0%</td>
</tr>
<tr>
<td>100%</td>
<td>100%</td>
<td>No Maximum.</td>
</tr>
</tbody>
</table>

C. Unless otherwise approved, update the Schedule of Values monthly to reflect all Contract change orders.

PART 3 - EXECUTION

3.01 CONTRACTOR COMMUNICATIONS

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

B. Contractor shall be responsible for scheduling existing sump and equipment shutdowns necessary to complete the work. Obtain approval from the Engineer at least two (2) days prior to any proposed shutdown. Contractor shall submit to the Engineer the following information in order to schedule a shutdown:
   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
   5. 24-hour contact information for appropriate Contractor personnel

3.02 MECHANICAL AND ELECTRICAL COORDINATION

A. Contractor’s superintendent or a specially assigned assistant shall be designated the Mechanical/Electrical Coordinator and shall coordinate the exact location, space priorities, and sequence of installation of all mechanical and electrical work with each other and with all other trades.

B. Mechanical and electrical items may be located diagrammatically on the Drawings. Actual locations shall follow locations shown on the Drawings as closely as practicable, but shall be altered or adjusted in the field by the mechanical/electrical coordinator as required by the following:
1. In finished spaces, install mechanical and electrical work concealed within the space available.

2. Organize mechanical and electrical work to make efficient use of space. Combine similar items into groups; make all runs parallel to or at right angles with building lines where practical.

3. Layout and install work to provide adequate space and access for adjustment, servicing, and maintenance and maximize space available for future replacement or installation of additional services.

4. Coordinate location of switches, panelboards, pullboxes, and other exposed mechanical and electrical items with functional and visual elements. Verify location of questionable items with the Engineer before proceeding.

C. Verify that required services such as electrical power, control wiring, and utility requirements of items and equipment submitted and furnished are compatible with services provided. Notify the Engineer of potential problems prior to ordering items or equipment and prior to installing services or completing construction in areas where services would have to be installed or modified later.

3.03 CONSTRUCTION SURVEYS

A. CSSS Section 5-5 does not apply to this project. City will only provide reference bench mark and control point info for layout. Contractor shall develop and make such additional surveys as are needed for construction, such as control lines, slope stakes, batter boards, offset stakes for pipe and structure location, and other working points, lines, and elevations as required for construction.

B. Contractor shall be responsible to layout all work in advance of fabrication and to coordinate with all related work. Layout all new facilities and relocations based on the information provided and shown on the plans.

C. On request of Engineer, submit documentation to verify accuracy of field surveys. Maintain a complete log of all control and survey work as it progresses.

3.04 PERMITS

A. The City has obtained no permits for this project.

B. Contractor shall obtain a Trench Safety permit from the Division of Industrial Safety per CSSS Section 6-8 (ref Calif. Labor Code Sections 6500 thru 6502.)

3.05 PUBLIC SAFETY, CONVENIENCE, AND MAINTENANCE OF TRAFFIC

A. Contractor’s attention is directed to CSSS Sections 6-6, 6-7, 6-8, 6-9 & 7-4.

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, Public Works Agency, Traffic Engineering Division, located at 927 10th 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. 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 conform 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.

3.06 PROJECT SIGNS AND PUBLIC NOTIFICATION

A. Prior to beginning any onsite work, Contractor shall install one project sign at each Sump. City will supply the sign panels, which are approximately thirty (30) inches tall by fifty-four (54) inches wide. Location and height of sign installation shall be as directed by the Engineer. In general, signs on posts shall be installed a minimum seven (7) feet above adjacent grade. Unless otherwise approved, Contractor shall 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. At the end of the project, Contractor shall remove the sign posts and return the signs to the City.

B. Contractor shall notify all residents and businesses adjacent to the work and those otherwise affected by the construction. Notifications, which shall include the name and telephone number of the Contractor’s representative that can be reached 24 hours a day, seven days a week, shall be in a format approved by the Engineer, and shall be made at least 2 days prior to commencing work. Prior to issuing notifications, submit the notification form for approval with a map of the areas proposed to receive notification.
3.07 EXISTING UTILITIES

A. Refer to CSSS Section 6-19. The location, alignment, and depth of existing underground utilities as shown on the Plans is taken from public records and no responsibility is assumed for the accuracy thereof. For the most part, underground utility services are not shown on the Plans. Contractor shall be responsible for maintaining the continued operation of all existing utilities that cross through, under, immediately adjacent to, and/or over the project work sites until the project work is completed and accepted.

B. Contractor's attention is directed to the provisions of Chapter 3.1 "PROTECTION OF PUBLIC UTILITIES IN PUBLIC CONTRACTS" of the California Government Code concerning protecting existing overhead and underground utilities. In particular, Section 4216 "Subsurface Installations; Membership of Owners in Regional Notification Center; Notice of Excavation; Inquiry Identification Number; Marking Locations; Application of Section; Violations; Penalties" and Section 4217 "Permit to Excavate; Necessity of Inquiry Identification Number; Operative Date of Section".

C. Contractor will insure that utility services to customers in the project are maintained.

D. Contractor is responsible for the protection of and for damage to existing overhead and underground utility lines and services encountered during the course of construction. Contractor shall notify the respective utility owner prior to any interruption of service.

E. Contractor is expected to "pothole" existing underground utilities a minimum of ten (10) working days in advance at any location where an existing utility may be in conflict with the proposed work.

F. Contractor shall bear the full cost of relocating existing overhead or underground utilities not specified on plans to be relocated, but which the Contractor elects to relocate or cut and reconnect for his/her own convenience.

3.08 CONSTRUCTION INSPECTIONS

A. Conform to CSSS, Sections 5-19 and 5-20.

3.09 TESTING

A. Contractor's attention is directed to CSSS Sections 5-22 thru 5-24. City will retain an independent testing firm to perform initial soil/aggregate/asphalt compaction tests; cast-in-place concrete slump and strength tests; and grout strength tests. Contractor shall perform all other required testing, and submit written test results to the Engineer.

B. Engineer shall be given two (2) working days notice prior to each test performed by Contractor.
C. Any system material or workmanship found defective on the basis of acceptance tests shall be reported to the Engineer. Contractor shall replace the defective material or equipment and have testing repeated without additional cost to the City, until test results are satisfactory to the Engineer. The City will only pay for initial testing services for concrete strength and slump, soil compaction, and grout strength.

D. 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 due the Contractor.

3.10 EROSION, SEDIMENT, AND POLLUTION CONTROL

A. Conform to CSSS, Section 16-3.

** END OF SECTION **

The following reference organization addresses are for Informational purposes only.
## REFERENCE ORGANIZATION ADDRESSES

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Organization Name</th>
<th>Address</th>
<th>City, State, ZIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
<td>Box 19150, Reford Station</td>
<td>Detroit, MI 48219</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
<td>1430 Broadway</td>
<td>New York, NY 10018</td>
</tr>
<tr>
<td>APA</td>
<td>American Plywood Association</td>
<td>PO Box 11700</td>
<td>Tacoma, WA 98411</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Material</td>
<td>1916 Race Street</td>
<td>Philadelphia, PA 19103</td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society</td>
<td>2501 NW 7th Street</td>
<td>Miami, FL 33125</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
<td>345 East 47th Street</td>
<td>New York, NY 10017</td>
</tr>
<tr>
<td>ISA</td>
<td>International Society for Measurement and Control</td>
<td>PO Box 12277</td>
<td>Research Triangle Park, NC 27709</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers' Association</td>
<td>1300 North 17th Street, Suite 900</td>
<td>Arlington, VA 22209</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters' Laboratories, Inc.</td>
<td>333 Pfingston Road</td>
<td>Northbrook, IL 60062</td>
</tr>
<tr>
<td>PCA</td>
<td>Portland Cement Association</td>
<td>5420 Old Orchard Road</td>
<td>Skokie, IL 60077</td>
</tr>
</tbody>
</table>
PART 1 - GENERAL

1.01 SUMMARY

A. Description of Work: Conduct and attend all project conferences and meetings for the purposes of addressing issues related to the Work, reviewing and coordinating progress of the Work, and other matters of common interest, as required.

PART 2 - PRODUCTS

2.01 PRECONSTRUCTION MEETING

A. Purpose

1. To designate responsible personnel, establish working understanding between parties, and confirm Notice-to-Proceed date
2. Status of insurance and bonds
3. Construction schedule and critical work sequences
4. Shop drawings and other submittals
5. Cost breakdown of major lump sum items
6. Field decisions and change orders
7. Maintaining record documents
8. Processing of submittals and applications for payment
9. Scope of work
10. Existing conditions
11. Equipment deliveries and priorities
12. All other essential matters pertaining to the satisfactory completion of the Project as required.

B. Attendance

1. The contractor’s representatives at this conference shall include all major superintendents for the work and may include major subcontractors. Other attendees shall be:

   a. Representatives of the City
   b. Utility company representatives, as appropriate
   c. Others as requested by the Contractor or City

2. The Engineer will preside at the pre-construction conference and will arrange for keeping and distributing the minutes to all persons in attendance. Contractor shall plan on the conference taking no less than one hour.
C. Requirements

1. Once a fully executed contract is received and prior to the commencement of work, the Engineer will schedule and chair a pre-construction conference to be held at the office of the Engineer.

2. Prior to the pre-construction conference, the Engineer will develop the agenda for the meeting and meet with the project manager to review the agenda.

3. Notes of the conference will be maintained by the Engineer. After the meeting, the Engineer will transcribe the minutes of the meeting and discuss any issues that were raised.

4. Contractor shall submit the following items to the Engineer at the preconstruction conference:
   
   a. A preliminary schedule of shop drawings, samples and proposed substitutes (“or equal”)
   b. A list of all permits the Contractor shall obtain indicating the agency required to grant the permit, the expected date of submittal for the permit, and the required date for receipt of the permit
   c. A 60-day plan of operation
   d. A project overview schedule

2.02 DAILY COORDINATION MEETING

A. Purpose:

1. In addition to other responsibilities of the Contractor and the Contractor's Superintendent as detailed in Section 5-4 of the Standard Specifications, the Contractor’s Superintendent or other Contractor representative as approved by City shall meet with the City’s Resident Construction Inspector (RCI) at the job site each working day, once each morning and once each afternoon, for a total of approximately one (1) hour per working day. The purpose of such meetings shall be to maintain close coordination between City and Contractor throughout performance of the Contract, and to address matters including, but not limited to: reviewing the current work day’s schedule, updating the City representative on completed work, identify and rectify anomalies, and identify work scheduled for the next day.

B. Attendance: The Contractor's Superintendent, or approved representative, and the City’s RCI.

2.03 MONTHLY PROGRESS MEETINGS

A. Purpose

1. To review progress of subcontractors or other organizations that are not meeting scheduled progress, resolve conflicts, and coordinate and
expedite execution of the Work. Additionally, to review the progress of the Work Progress Schedule, narrative report, Project Partial Payment Form, record documents, and additional items pertinent to execution of the Work.

B. Attendance

1. The attendance of Contractor’s superintendent and subcontractors who are actively involved in the work is required, as well as all others who are necessary to agenda. Additionally, the Engineer will invite the utility companies when the work affects their interests, and others necessary to agenda. The Engineer will preside at the meetings.

2.04 WEEKLY TAILGATE SAFETY MEETINGS

A. Purpose

1. Unless otherwise approved by the Engineer, Contractor shall hold weekly safety meetings with the Contractor’s and Subcontractor’s employees to discuss safety on the job. Contractor’s safety plan shall identify who shall attend these meetings. City attendance is not required.

2.05 OTHER MEETINGS

A. The City and/or Contractor may request attendance at other at meetings as considered appropriate.

PART 3 - EXECUTION

NOT USED

** END OF SECTION **
SECTION 01511
TEMPORARY ELECTRICITY

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. There will be no charge for use of available on-site power where available. Contractor shall make arrangements and pay associated costs for all other power and lighting required for construction.

B. Provide power centers, as required, for miscellaneous tools, bypass pumps, and equipment used.

1.02 RELATED REQUIREMENTS

A. Section 16050: Electrical Work

B. Comply with Federal, State and local codes and regulations and with utility company requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with applicable requirements specified in sections of Division 16 - Electrical.

B. Maintain system to provide service as required.

3.02 CLOSEOUT

A. Completely remove temporary materials and equipment when construction needs can be met by the permanent installation, and/or at project completion.

B. Restore existing and/or permanent facilities used for temporary services to original or better condition.

** 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 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 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 the City to witness the initial startup of each system.
         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 17 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.
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 01770

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Requirements Include:
   2. Final Cleaning.
   3. Record Drawings.
   4. Spare Parts.
   5. O&M Manuals.
   6. Warranty.

1.02 SUBMITTALS

A. Submittals shall include the following:
   1. Record Drawings
   2. Spare parts as indicated in the individual sections.
   3. O&M Manuals (draft and final versions).

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

A. When Contractor notifies the Engineer that the project has been completed, the Engineer shall perform a walk through and develop a list of deficient work items.

B. After Contractor completes correction of the deficiencies to the satisfaction of the Engineer, a final walk through will be scheduled with the City Operation and Maintenance personnel. At the final walk through, a punchlist will be developed and submitted to the Contractor.

C. Contractor shall notify the Engineer when all punchlist items, including submittal of Record Drawings, have been completed. Engineer will then inspect the work. If the work is completed to the satisfaction of the Engineer, and if as-built drawings & O&M manuals are satisfactorily completed and submitted, a completion report will be prepared.

3.02 FINAL CLEANING

A. Execute prior to final walk through.

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 and drainage systems of any debris. Vacuum inside switchgear.

C. Clean site; sweep paved areas, rake clean other surfaces.
D. Remove surplus materials, rubbish, and temporary construction facilities.

3.03 RECORD DRAWINGS
A. Conform to CSSS Section 5-8.
B. Provide complete as-built record drawings. City inspection staff will have one week to field verify accuracy of each submitted as-built record drawing set, including all factory and project drawings. Correct all record drawing deficiencies noted by inspection staff, and then resubmit them. City inspection staff will again have one week to field verify each submittal until the record drawings are considered accurate and complete. A project completion report will not be issued until City inspection staff has approved the as-built record drawings.

3.04 SPARE PARTS
A. Provide spare parts and maintenance materials in quantities specified in each section. Coordinate delivery with the Engineer, and obtain receipt prior to final payment.

3.05 OPERATION AND MAINTENANCE (O&M) MANUALS
A. Prior to facility startup tests, submit for review one (1) draft bound copy of an O&M manual for each Sump. Each manual shall cover all new equipment, including pumps, the level indication systems, the high level float alarm systems, all new PLC and switchgear equipment; and the flow meters.

B. Following approval of the ‘draft’ manual and satisfactory operational testing, AND BEFORE CONTRACT COMPLETION, submit three (3) final copies of each O&M manual bound in Avery D - Ring binder model number AVY79-799 or approved equal. One (1) of the three copies shall contain original documentation manuals, not photocopies. Also provide an electronic copy of each O&M manual on a CD. Electronic copies shall be in Adobe format (Portable Document Format). Contractor shall use the latest version of Adobe.

C. Each binder shall be no more than 75% full.
D. Provide the following information on the cover and spine of each binder:

   Operation and Maintenance Manual
   Project: Sump No._____ * Reconstruction   (Fill in actual Sump No.)
   Contractor:____________________
   Contract No.:___________
   Date:____________________
E. 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. Cross out info that does not apply to the equipment furnished.

F. Operating and maintenance instructions shall include, as a minimum, the following for each new mechanical and electrical equipment item:

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 functional description of each principal system component.
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) S-20 forms for all instrumentation devices.
16. Calibration set-points and corresponding measurements for all monitoring and/or metering devices.

3.06 WARRANTY
A. Contractor’s warranty term shall begin the date the job is accepted by the City.

** END OF SECTION **
SECTION 01920
TEMPORARY BYPASS PUMPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Plug upstream inlet pipes that discharge into the Sump wetwells, and furnish all labor, materials, equipment, and incidentals necessary to bypass and monitor all sewage flows around Sump 40 & Sump 146 as required for construction.

B. Refer to the “Sump 40 & 146 Concept Bypass Plan” drawings following this section. Tap power from the existing Panelboards’ main buses. Install pumps, piping, breakers, starters, controls and wiring as appropriate for the bypass equipment provided, and consistent with available onsite electrical power.

C. Install Hi-Hi (high level alarm) float switches in upstream manholes wired to the existing Panelboards’ PLC. City will program the existing PLC and SCADA system to transmit high level float alarms to the Utility Dept.’s operations center. Provide separate alarm dialers as appropriate for alerting the Contractor’s response team.

D. Respond to pump trouble alarm and high float alarm calls with personnel onsite within 30 minutes of being called, 24 hours a day, throughout the duration of the bypass pumping. Contractor will be charged for City labor and materials for failure to respond within 30 minutes or failure to remedy Contractor equipment malfunctions.

1.02 SUBMITTALS

A. Submit the following for approval, in accordance with CSSS Section 5-7:

1. Sump 40 discharge piping modification and construction description
2. Bypass pumping facilities plan and schematic drawings.
3. Pump catalog data, ratings, model number, power/control cable & pump curve
4. Starter catalog data, ratings and controls
5. Piping catalog data, type, fittings & supports
6. Conduit, wiring and circuit breaker catalog data
7. Float switch and intrinsic barrier catalog data
8. Bypass pumping system Operational Test sheet
9. Contractor’s response personnel (primary & backup) name & contact numbers

PART 2 - PRODUCTS

2.01 MATERIALS

A. Furnish and install all equipment and materials necessary to keep bypass system operating, with sewage flows contained in manholes and pipes adjacent to the sumps as shown, and or as approved. Rental equipment shall be in good working order.

B. Equipment installed in sewer manholes shall be explosion proof rated.
C. Unless otherwise approved, bypass pumps shall be submersible sewage pumps capable of passing a minimum 3-inch diameter solid sphere. Dewatering or storm drainage pumps will not be acceptable.

PART 3 - EXECUTION

3.01 PRE-SUBMITTAL MEETING

A. Attend a pre-submittal meeting with City representatives prior to preparing Bypass Pumping submittal. Review Concept Bypass Plan & Schematic, preliminary CPM schedule of bypass installation, quantities of flow, level controls, “Hi-Hi” float switch levels, pump data, communication protocols, and Operational Test sheet.

3.02 EXISTING CONDITIONS

A. Depending upon weather and the time of day, estimated flows thru each manhole adjacent to the sumps are in the range of 30 to 250 gpm.

B. Sewage manhole atmosphere per NEC Article 500 is considered a hazardous Class I, Division 1, Group D location.

3.03 TEMPORARY PUMPING SYSTEM REQUIREMENTS

A. To expedite repairs and/or cleaning clogged pumps, furnish and store onsite one spare pump with cord at each Sump identical to the pumps in use throughout the bypass duration.

B. Bypass pumps shall have their own pump controllers and floats for starting and stopping. Install Hi-Hi alarm float in each bypass manhole along with the pump.

C. Outside the existing or temporary construction site perimeter fences, install all temporary conduits and piping underground, unless otherwise approved.

D. Unless otherwise approved for the Sump 146 bypass, temporarily remove manhole covers & cones and install steel traffic plates to facilitate access to bypass pumps.

3.04 WORKMANSHIP

A. Installation shall be consistent with industry standards, and in accordance with the latest version of the NEC.

3.05 BYPASS PUMPING OPERATIONAL TEST

A. Obtain Operational Test sheet approval prior to starting operational testing.

B. Conduct a six (6) hour demonstration period at each Sump to verify that all pumps and alarms are operational.

C. No work requiring bypass pumping shall be started until bypass pumping system is functional and Operational Test is approved.
3.06 RESTORATION OF TEMPORARY INSTALLATION

A. Restore manholes and surfacing as required when the bypass system is removed. Buried discharge piping and conduits can be left in-place by capping below grade.

3.07 SUMP 40 & 146 CONCEPT BYPASS PLANS

A. Sump 40 & 146 Concept Bypass Plans are attached to this section for use by the Contractor. The concept plans will be used by the City as a guide for reviewing the bypass submittals.

**END OF SECTION**
SECTION 02220
DESTRUCTION AND SALVAGE OF MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION
A. The work includes demolition, removal, and salvage of existing equipment.
B. All material resulting from demolition and/or removal, except items indicated to be salvaged, shall be disposed of off-site by the Contractor.
C. In general, items to remain are not specifically identified. Unless otherwise directed, limit demolition, removal, and salvage activities to those items shown, specified, or physically necessary in order for the new facilities to be installed and made operational. If damage results from the Contractor’s operations, Contractor shall repair at his/her expense, all damage to existing facilities not designated for removal or demolition. Erect barriers, fences, guard rails, enclosures, and shoring to protect personnel, structures, and facilities that are to remain. Protect trees and plants from damage.

1.02 AVAILABILITY OF WORK AREAS
A. Unless there are specific Contract stipulations or conditions to the contrary, the project sites will be released to the Contractor at one time, upon issuance of the Notice-to-Proceed. Unless otherwise directed, Contractor shall maintain access to and shall not begin demolition of any existing site facilities until temporary site bypass pumping has been installed and is operating to the satisfaction of the Engineer.

1.03 SAFETY PROCEDURES AND WORKER PROTECTION
A. Take all precautions and measures required to protect employees, City employees, residents, and the general public.
   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 disconnected from any power source prior to commencing any work on that equipment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 INSPECTION
A. Verify that areas to be demolished are no longer 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 each site prior to beginning demolition work at that site. Meeting shall cover the Contractor's procedures for removal and transportation of salvaged items. Attendees shall include as a minimum: Tim Giffin (916) 808-7997 and Vern Fields (916) 808-5542 from the Department of Utilities. Contractor shall give attendees forty-eight (48) hours notice in advance of meeting.

3.03 DEMOLITION

A. Remove existing paving as indicated or as approved.

B. If a portion of the existing paving is to remain, make neat saw cuts a minimum of two inches (2") in depth, around the perimeter of Portland cement concrete or asphaltic concrete to be removed. Exact limits of the pavement removal shall be approved in the field by the Resident Engineer. Unless otherwise approved, curb, gutter, or sidewalk removal shall extend to the first existing expansion/ score line in the part to remain.

3.04 SALVAGE

A. Items to be salvaged shall be carefully disconnected and removed intact for potential re-use elsewhere at some other City facility. Keep unique items associated with each salvaged item intact with that item.

B. Contractor shall deliver salvaged items to the City's Facility Services yard at 1391 35th Avenue. Contact Vern Fields (916) 808-5542 to coordinate delivery and unloading of salvaged items.

3.05 CLEAN-UP

A. Debris and rubbish shall be removed daily from the limits of work. Do not allow to accumulate on-site.

B. Debris shall be removed and transported in a manner so as to prevent spillage onto streets or adjacent areas.

** END OF SECTION **
SECTION 02240
CONTROL OF WATER

PART 1 - GENERAL

1.01 DESCRIPTION
A. Contractor shall furnish, install, operate, and maintain equipment to maintain excavations free of water, regardless of source, until backfilled to final grade.
B. Comply with all federal, state, and local regulations concerning discharge of water from construction sites.

1.02 SUBMITTALS
A. Before any diversion and/or dewatering is commenced; submit details of the proposed system(s) for review and approval.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL
A. Contractor shall furnish, install, operate, and maintain all machinery, appliances, and equipment to maintain all excavations free from water during construction, and shall dispose of the water collected so as not to cause injury to public or private property, or to cause a nuisance or menace to the public.
B. Control shall be such that softening of the bottom of excavations, or formation of “quick” conditions or “boils,” does not occur. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils.
C. Dewatering systems shall operate continuously until backfill has been completed to one foot (1’) above the normal groundwater level and all sources of water entering the excavation have stopped and all water has been removed.

3.02 DISPOSAL OF WATER
A. Conform to CSSS Section 16-1. Dispose of water resulting from dewatering operations in a suitable manner without damage to adjacent property. Only clean, uncontaminated water shall be pumped into any existing waterway or City Storm Drain.

** END OF SECTION **
SECTION 02315

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Except as otherwise modified herein, earthwork shall comply with the applicable portions of CSSS Sections 10, 14, 26, and 34. Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, grading, and compaction required to complete the work shown on the drawings and specified herein. No separate measurement or payment will be made for any required earthwork.

B. Related Work:
   1. Section 02240 - Control of Water
   2. Section 02740 - Surface Restoration

1.02 SUBMITTALS:

A. For each import material proposed, submit Index property test results to verify conformance with the specifications. Notify the Engineer of the source of the material at least 10 calendar days prior to the date of anticipated use of such material.

PART 2 - PRODUCTS

2.01 AGGREGATE BASE

A. Conform to CSSS Section 10-7.

2.02 TRENCH BACKFILL

A. Excavated material that can be compacted as specified may be placed as backfill above the initial backfill zone. Except for the top 18-inches in landscape areas, anticipate using aggregate base for trench backfill. There will be no payment made for unsuitable material/import associated with trench backfill.

2.03 CLSM

A. Conform to CSSS Section 10-16.

PART 3 - EXECUTION

3.01 GENERAL EARTHWORK REQUIREMENTS

A. Excavate to the lines and grades shown or required to complete the construction.
Make allowance for forms, supports, etc.

B. If over-excavation occurs due to Contractor error, over-excavated areas will be backfilled to the correct grade with compacted aggregate base.

C. If in the opinion of the Engineer, any subgrade surface is not in suitable condition due to failure of the Contractor to properly care for, dewater, or otherwise conduct earthwork operations properly, then remove the unsuitable material and replace it with material compacted to at least 90 percent relative compaction. The condition of any prepared subgrade shall comply with CSSS Section 14-7 before any work is placed thereon.

D. As much as practicable, maintain work area subgrades such that they will surface drain by gravity at all times. Temporary drains and/or drainage ditches shall be installed to divert surface water which may affect the prosecution of the work.

E. Where trenching across landscaped areas, remove existing plants with approved equipment. Cut to the lines shown or as directed, and if practical, store and maintain removed plants for later replacement. If any relocated plant deteriorates within three months of being planted, replace in kind with new plant of same variety and equal or better quality and size.

3.02 DISPOSAL

A. All excavated and/or imported material not utilized shall be disposed of offsite.

3.03 DUST CONTROL

A. Conform to CSSS Section 6-2.h.

**END OF SECTION**
SECTION 02630
MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION
A. This section describes work associated with raising wet well manhole rims, and placing invert channelization.

B. Related Work Specified In Other Sections
   1. Section 02730 Wet Well Lining
   2. Section 05505 Miscellaneous Metals

1.03 SUBMITTALS
A. Submit catalog cuts or shop drawings per CSSS Section 5-7 showing construction details of the precast manhole sections, including sealants, the manhole steps, and the grab bars.

PART 2 - PRODUCTS

2.01 MANHOLE SECTIONS
A. Unless otherwise approved, manhole sections shall be precast conforming to CSSS Section 25-3.1. Each wet well riser section top shall be level so as to provide full support to the new hatch.

B. Wet well riser sections shall be furnished with integral mating joints and wall thicknesses that conform to the existing sections.

C. Existing plan dimensions shown are for bidding purposes only. Contractor shall verify all required dimensions and joint requirements prior to ordering precast sections, so that internal and external diameters are uniform, top to bottom.

D. Unless otherwise approved, joint sealant compound shall conform to CSSS Section 25-3.7.

2.02 CHANNELIZATION CONCRETE
A. Except as modified herein, provide low slump Class D concrete conforming to CSSS Section 10-5.

B. Up to 20 percent fly ash may be substituted for the required Portland cement. Contractor may propose a combined aggregate grading with 90-100 percent passing the ½-inch sieve size.
2.03 MANHOLE STEPS

A. Manhole steps shall be press fit steps made of polypropylene plastic over stainless steel reinforcing core. Manhole steps shall be ML-13-SSR as manufactured by American Step Company, Inc., Griffin, Georgia or approved equal. Steps shall be driven into specially sized holes drilled into the manhole wall. Seal or grout drilled holes if they protrude completely through the manhole wall.

B. Wherever Manhole Steps are installed, furnish and install a pair of 1½-inch diameter vertical grab bars, spaced 18-24 inches apart, bolted to the outside manhole wall, that extend 42-inches above the top of the vault or manhole rim. Grab bars shall be as specified for handrail and grab bars in Section 05505.

PART 3 - EXECUTION

3.01 GENERAL

A. Set manhole sections in accordance with CSSS Section 25-3.

B. Place channelization as shown and or as directed. Internal surfaces shall be constructed with a smooth and uniform finish.

C. No Manhole leakage testing is required.

D. Install Manhole steps and grab bars in accordance with the manufacturer's standard installation instructions and/or the approved shop drawings. Steps shall be centered horizontally with the center of the access hatch above them. Vertical spacing shall be 12" minimum and 14" maximum, equally spaced for the entire structure depth.

E. Install wet well lining as specified in Section 02730. The lining may be applied prior to placing new channelization.

** END OF SECTION **
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work (Sump 146 only) consists of removing all existing manhole steps then applying a new sprayed-on internal lining material to provide wet well corrosion protection and restore structural integrity. Lining material shall be either (1.) a cementitious pre-liner with an epoxy resin coating, or (2.) a Calcium Aluminate liner.

B. Install lining, in strict conformance with the manufacturer’s directions, using factory trained and approved application technicians with at least one (1) year field experience with the application of high build coatings.

1.02 SUBMITTALS:

A. Submit details of the proposed lining system for review and approval, including, but not limited to the following:

1. Name of the liner manufacturer and product data including the safety data sheets, certifications of materials, and the physical properties and chemical resistance testing of the liner system.

2. Name of the manufacturer and product data including the safety data sheet for the patching/plugging compound and the chemical sealant if infiltration exists.

3. Plan of construction including schedule, equipment setup, inspection, preparation, cleaning, and complete installation procedures and details.

4. Qualifications of the installer including certification by the manufacturer.

PART 2 - PRODUCTS

2.01 CEMENTITIOUS PRE-LINER AND EPOXY COATING

A. Cementitious liner shall meet the following physical properties:

<table>
<thead>
<tr>
<th>ASTM Test</th>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>C109</td>
<td>Compressive strength</td>
<td>3,000 psi</td>
</tr>
<tr>
<td>C78</td>
<td>Flexural strength</td>
<td>600 psi</td>
</tr>
<tr>
<td>C596</td>
<td>Shrinkage @ 90% R.H.</td>
<td>0%</td>
</tr>
<tr>
<td>C952</td>
<td>Bond</td>
<td>130 psi</td>
</tr>
<tr>
<td>Density</td>
<td>of mixture</td>
<td>100 pcf</td>
</tr>
</tbody>
</table>

B. Cementitious products shall be formulated with clean potable water and A.S.T.M. C-150 Type I or III Cement.
C. Liner shall be Strong Seal MS-2C manufactured by Strong-Seal Systems, ThoRoc SP15 Spray Mortar manufactured by Chem Rex Inc., or approved equal.

D. Epoxy resin coating shall meet the following physical characteristics:

- **ASTM D695 Compressive strength**: 10,800 psi
- **ASTM D790 Flexural strength**: 11,300 psi
- **Solids (by volume)**: 100%
- **ASTM D2240 Hardness Shore**: D 83
- **Density of mixture**: 70 lbs./cu. ft.

E. Epoxy shall be Raven 405 manufactured by Raven Lining Systems, Inc.; Sewer Guard HBS100 Epoxy Liner manufactured by ChemRex, Inc.; or approved equal.

2.02 **CALCIUM ALUMINATE LINING**

A. Material shall be pre-mixed and specially formulated to withstand H2S (hydrogen sulfide) bacterial corrosion and abrasion in sewer manholes.

B. Chemical composition of the cement and aggregates used in the lining material shall be within the following percentage limits, by weight:

<table>
<thead>
<tr>
<th>Al2O3</th>
<th>CaO</th>
<th>FeO + Fe2O3</th>
<th>SiO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>39-44%</td>
<td>35-39%</td>
<td>9-14%</td>
<td>5-7%</td>
</tr>
</tbody>
</table>

C. Calcium aluminate liner shall meet the following minimum physical properties:

- **Compressive Strength (ASTM C495)**: 1 day > 8,000 psi, 28 days > 9,000 psi
- **Flexural Strength (ASTM C293)**: 12 hours > 1,000 psi, 28 days > 1,400 psi
- **Shrinkage at 28 days (ASTM C596)**: 0 % at 95% Relative Humidity

D. Calcium aluminate lining shall be SewperCoat PG, or SewperCoat 2000HS Regular, as manufactured by Lafarge Calcium Aluminates, Inc., or approved equal.

2.03 **ASSOCIATED MATERIALS**

A. Water used for cleaning, mixing, and/or curing shall be clean, potable water.

B. All patching, grouting, and/or applied materials used to stop infiltration, shall comply with the manufacturer’s recommendations, and meet the following minimum requirements:
<table>
<thead>
<tr>
<th></th>
<th>Compressive Strength (ASTM C597B)</th>
<th>Bond Strength (ASTM C321)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>600 psi (24 hours)</td>
<td>30 psi (1 hour)</td>
</tr>
<tr>
<td></td>
<td>1,000 psi (7 days)</td>
<td>80 psi (1 day)</td>
</tr>
</tbody>
</table>

**PART 3 – EXECUTION**

**3.01 GENERAL REQUIREMENTS**

A. Furnish all equipment necessary to gauge, control, mix, and monitor proper amounts of component lining materials in accordance with the lining manufacturer’s standard installation requirements.

B. Thoroughly mix lining materials by mechanical means to ensure all agglomerated particles are reduced to original size prior to placement via spray equipment.

C. Unless otherwise approved, apply liner from a spray nozzle as nearly perpendicular to the surface as practicable, with the nozzle at least one (1) foot from the surface.

D. Apply liner so as to achieve maximum material compaction, minimum rebound, and no visible “sags”.

E. Prior to liner application, prepare surfaces to be coated by sand blasting, pressure washing, or other means to obtain a clean, exposed aggregate condition. All loose spalled concrete shall be removed. Exposed surfaces shall be sound, and free of dust, dirt, grease, oil, fats, concrete sealing or hardening chemicals, form release agents, and/or other contaminants.

F. All patching, infiltration control, and grouting material shall be approved by the manufacturer prior to lining. Apply a cementitious plug or chemical grout such as Koster KD 2 Blitz manufactured by Koster American Corp, or equal and as required, to stop active infiltration.

**3.02 APPLICATION OF CEMENTITIOUS PRE-LINER**

A. Prior to applying cementitious liner, the surface shall be damp without noticeable free water.

B. Apply by spray application methods approved by the manufacturer.

C. Minimum thickness for cementitious liner shall be ½ inch.

D. Unless otherwise recommended by the manufacturer, allow the cementitious pre-liner to cure for a minimum of 24 hours before applying the epoxy coating. Contractor shall confirm that the epoxy product is compatible with the cementitious pre-liner.
E. Engineer will test random batches of the spray applied mortar. If mortar does not meet the minimum physical properties as listed above, then all lining performed with that particular batch shall be rejected.

3.03 APPLICATION OF EPOXY COATING (atop cementitious Pre-Liner only)

A. Cementitious liner shall be lightly sanded or water blasted before applying epoxy coating.

B. Epoxy coating shall be at least a minimum thickness of 125 mils, in conformance with the manufacturer’s instructions.

3.04 APPLICATION OF CALCIUM ALUMINATE LINING

A. Minimum total thickness of applied calcium aluminate liner shall be ½-inch. Time interval between successive layers of material application must be sufficient to allow “tackiness” to develop but not fully set.

B. Calcium aluminate liner must be moist cured for a minimum of 18 hours.

C. If determined by the Engineer that the environment is not moist enough to allow natural curing, either apply a curing compound meeting the requirements of ASTM C309 and the lining material manufacturer's requirements, or furnish and install water sprinklers or vapor/misting machines.

**END OF SECTION**
PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope Of Work

Furnish all labor, materials, equipment, and incidentals necessary to restore surfacing as shown on the drawings, and/or specified herein. Work shall include, but not necessarily be limited to preparing the subgrade, placing and compacting aggregate base, saw cutting existing pavement, placing and compacting asphalt concrete, placing Portland cement concrete, and all related work.

B. Related Work Specified In Other Sections

1. Section 02315 - Earthwork

C. Except as modified herein, surface restoration shall comply with the applicable portions of CSSS Sections 10-5, 10-7, 19, 22, 26-11, and 38.

1.02 SUBMITTALS

A. Submit the following information for approval:

1. Aggregate base certificate of compliance.
2. Concrete mix design and copies of delivery tickets
3. Asphalt concrete mix design and copies of delivery tickets.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 GENERAL

A. Existing pavement to be removed shall be saw cut full depth to provide a neat straight pavement break. For thick AC where a “T” trench is required, the existing pavement shall be saw cut again and ground a minimum of two inches deep and six inches beyond the first saw cut edge.

B. Existing pavement as well as any curbs, gutters and sidewalks that have been cut or damaged as a result of the construction activities shall be replaced. Replacement of pavement, curb, gutter or other improvements shall match that of the original as close as practical unless otherwise indicated on the Plans or in these Special Provisions. Segments of saw cut pavement which were damaged during construction shall be re-sawn in a neat straight line.
C. Aggregate base for repair and/or replacement of existing pavement shall meet the requirements in CSSS Section 10-7. Aggregate base shall be placed and compacted in accordance with CSSS Section 14, except that it shall be compacted to a relative compaction of not less than 95 percent.

D. Unless otherwise approved, furnish commercially produced Type A, Asphaltic Concrete (AC) with ½ -inch maximum medium aggregate and PG 64-10 graded asphalt binder for permanent AC pavement repair. Conform to the mix design and placement requirements of Section 22 of the City Standard Specifications. The minimum pavement section within public street right-of-ways shall consist of four (4) inches of AC over 12 inches of aggregate base. Match existing onsite thicknesses at the Sumps.

E. Concrete used in the repair and/or replacement of curb, gutter, concrete pavement, and sidewalk shall be Class “C” as specified in CSSS Section 10-5. Include 1.0 lb of lamp black per cubic yard of concrete.

F. Repair disturbed landscaped areas to match adjacent preconstruction conditions.

**END OF SECTION**
SECTION 02820
FENCES AND GATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
1. Fence, framework, fabric, and accessories.
2. Excavation for post bases and concrete foundation for posts.

B. New 8-foot tall chain-link fence shall be industrial/commercial quality with three top strands of barbed wire.

C. New 6-foot tall wrought iron fence and gates shall be industrial quality black “Classic Style” with pressed spear top pickets.

1.02 REFERENCES

A. ASTM International (ASTM):

1.03 SUBMITTALS

A. Submit the following for approval, in accordance with CSSS Section 5-7:
1. All gate elevation detail drawings.
2. Catalog cuts for new fence materials.
3. Certification reports that fence posts, hardware, chain link fabric, and gates conform to the specifications herein.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. New Chain link fence and gates: One of the following, or equal:
1. Allied Tube and Conduit.

B. Wrought iron fence and gates: Montage Industrial® Welded and Rackable Ornamental Steel fence manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, or approved equal. Furnish all required system components (i.e., panels, posts, gates and hardware) from one manufacturer.
2.02 CHAIN LINK MATERIALS

A. 8-foot Chain link fence:
   1. Fabric shall be Class 1 zinc-coated steel conforming to ASTM A 392 as follows:
      a. Height: 96 inches.
      b. Mesh: 2 inches.
      c. Wire: 9 gauge, minimum 80,000 pounds per square inch tensile strength.
   2. Framework: In accordance with ASTM F 1043 Group 1A or 1C. Pipe shall be straight and conform to the following weights:

<table>
<thead>
<tr>
<th>Pipe Size Outside Diameter (Inches)</th>
<th>Group IA Weight (Lbs/ft)</th>
<th>Group IC Weight (Lbs/ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5/8</td>
<td>2.27</td>
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<td>1-7/8</td>
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<td>5.79</td>
<td>4.64</td>
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<td>3-1/2</td>
<td>7.58</td>
<td>5.71</td>
</tr>
<tr>
<td>4</td>
<td>9.11</td>
<td>6.56</td>
</tr>
</tbody>
</table>

   a. Bottom rail: 1⅝ inches outside diameter.
   b. Top Tension wire: 7-gauge galvanized coil spring wire.
   c. Line posts: 2¼ inches outside diameter.
   d. Terminal, corner, and pull posts, including man gate hinge & strike posts:
      1) Size: 2⅛-inch outside diameter.
      2) Diagonal braces at terminal, corner and pull posts: 1 5/8-inch diameter.
      3) Truss rods: ½-inch diameter, galvanized.
      4) Turnbuckles: Heavy duty, galvanized.
   e. Coatings:
      1) Group IA: External coatings in accordance with ASTM F 1043, Type A;
         Internal coatings in accordance with ASTM F 1043, Type A.
      2) Group IC: External coatings in accordance with ASTM F 1043, Type B;
         Internal coatings in accordance with ASTM F 1043, Type D.
   3. Accessories:
      a. Fence fittings: In accordance with ASTM F 626.
         1) Post top fittings:
            a) Provide post caps sized to post dimension that fit snugly over posts to
               exclude moisture. Except atop rolling gates where barbed wire is
               vertical, provide hot dip galvanized steel combination style post caps
               with 45-deg barbed wire support arms.
            b) Attach post caps with powder actuated Hilti stainless steel fasteners or
               comparable galvanized ¼-inch or longer self-tapping Tek-screws.
         2) Rail and brace ends: Provide pressed steel or malleable castings that are
            cup shaped to receive rail and brace ends.
      b. Fabric accessories:
         1) Wire clips: Minimum 6 gauge hot-dip galvanized.
         2) Tension bars: 1/4 inch by 3/4 inch, galvanized.
         3) Steel bands: 11 gauge, 1 inch wide, hot-dip galvanized.
         4) Bolts and nuts: ¾-inch diameter.
         5) Hog rings: 11 gauge.
      c. Barbed wire (Three strands, 1-foot vertical above top of fabric): Provide class 3
         zinc coated 12.5 gage wire with four point round 14 gage barbs at 5-inch
         spacing in accordance with ASTM A121.
B. Chain link gates, General:

1. Frames shall be 1\(\frac{3}{8}\)-inch outside diameter galvanized steel pipe in accordance with ASTM F 1043 Group IA or IC.

2. Corner fittings shall be Manufacturer’s standard heavy pressed steel or malleable castings. Provide gates with diagonal tensioning rods and turnbuckles rigidly attached to gate frame.
   a) Truss rods: \(\frac{3}{8}\)inch, galvanized.
   b) Turnbuckles: Heavy duty, galvanized.

3. Chain link fence fabric: Attach to gate frame by use of tension bars and tie wires as specified for fence construction, with tension bars and associated band connectors spaced at approximately 16-inch vertical intervals.

4. Size gate frames to provide no more than a 3-inch clearance below the gate when closed.

5. Gates will be locked closed using padlocks with a minimum 5/16-inch diameter hasp.

C. Man gates:

1. Unless otherwise approved, frames shall be 4-feet wide, 6-feet 8-inches tall, with a 1-foot tall top wire and bottom rail framed chain-link covered transom above the gate.

2. Run barbed wire continuous across the man gate opening.

3. Provide a horizontal mid-height stiffener the same size as the perimeter frame.

4. Hardware:
   a. Catch and locking attachment: Commercial grade combination steel or malleable iron catch and locking attachment of acceptable design for use with a padlock.
   b. Provide man gates with minimum 3 hinges designed to securely clamp to gatepost and permit gate to be swung open 180 degrees.

2.03 CHAIN LINK FABRICATION

A. Chain link gate frames shall be welded and galvanized. Unless otherwise approved, shop weld by arc-gas shield method. Provide welds that are smooth and clean. No weld residue will be allowed.

B. Shop finishing:

1. Galvanizing: For items not fabricated of galvanized materials, hot-dip galvanize products after fabrication in accordance with following as applicable:
   a. ASTM A 123.
   b. ASTM A 153.
   c. ASTM A 385.

2. Galvanize fabricated items complete, or in largest practicable sections.

3. Provide galvanizing at rate of 2.0 ounces per square foot, minimum.

4. Repair damaged galvanized surfaces and/or welds on pre-galvanized material with a cold applied 2.5 – 3.5 mil dried film thickness of galvanic zinc-rich coating containing 95% metallic zinc by weight in the dried film; such as ZRC Galvalite™ as manufactured by ZRC Worldwide, Marshfield, MA or approved equal. Coating shall conform to Federal Specification DOD-P-21035A for repair of hot-dip galvanizing, and shall be applied in accordance with the manufacturer’s written instructions.
PART 3 - EXECUTION

3.01 PREPARATION

A. Surface preparation: Perform site grading ahead of post setting to permit grade of fence to remain constant over local elevations or depressions in ground line.

B. Request City surveyor (7-day minimum advanced notice is required) to verify fence alignment to avoid private property encroachments.

3.02 INSTALLATION

A. Chain link fences and gates:

1. General:
   a. Install chain link fence and gates as indicated on the Drawings and as specified herein. Fences shall be plumb, taut, true to line and grade, and complete in all details.
   b. Install fencing to generally follow finish grade of ground and provide pull posts at points where required to conform to changes in grade.
   d. Installed space between bottom of fence and finish grade shall not exceed 3 inches, and shall not exceed 4-inches below gates.

2. Concrete foundations for fence posts:
   a. Set fence posts centered in concrete foundations spaced not over 10 feet apart, that extend at least 3 feet into ground for line and 4 feet for terminal posts. Place additional posts at each abrupt change in line or change in grade, or as required for gate rail supports. Concrete shall be Class C per CSSS Section 10-5.1.
   b. Provide concrete foundations having at least a minimum 12 inch diameter for line posts and 18 inch diameter for terminal posts.
   c. Provide foundations that extend a minimum of 2-inches below bottom of posts, and a minimum of 1 inch above unpaved finish grade. Surface depressions that don’t drain will not be allowed adjacent to posts embedded in concrete paving.
   d. Finish trowel tops of footings, and slope to drain water away from the posts.
   e. Set keepers, stops, sleeves, tracks, eye bolts, and other accessories into concrete as required.

3. Post bracing:
   a. After posts are installed and concrete has set firmly, place top rail, braces, and bottom tension wire approximately 4 inches above grade.
   b. End corner, pull, and gate posts: Brace with same material as top rail and trussed to line posts with rods and tighteners.
   c. Bracing end, corner, slope, and gate posts:
      1) Brace to midpoint of nearest line post or posts with horizontal braces used as compression members.
      2) Then from such line posts truss from brace back to bottom of end, corner, slope, or gate post with 3/8-inch steel truss rods with turnbuckles or other suitable tightening devices used as tension members.

4. Bottom rail:
   a. Unless otherwise directed, install fence with bottom rail and top tension wire.
   b. In the middle of each bottom rail, embed a galvanized ½”x6½”x2”x2” U-bolt with a nut and washer on each leg into the underlying concrete paving to deter lifting up the bottom rail.

5. Fabric:
   a. Place fabric on gates and fence framework on outward side of the posts (away from the Sump) and install so that top edge projects over top wire.
b. Stretch fabric taut by means of mechanical fence stretchers to remove slack and securely fasten to posts, top rail, and bottom tension wire. Splice fabric lengths together by reweaving without breaking continuity of knuckled or twisted and barbed selvage.
c. Install tension wire parallel to line of fabric.
d. Fabric: Connect fabric to:
   1) Line posts with wire clips minimum every 14 inches.
   2) Terminal, corner, and gate posts with tension bars tied to posts minimum 14 inches on center and with steel bands and bolts and nuts.
   3) Tension wires with hog rings minimum 24 inches on center.

6. Barbed wire:
   a. Stretch strands to remove sag and anchor firmly to extension arms.
   b. Unless otherwise directed, incline extension arms on line posts away from the Sump at approximately 45 degrees from vertical.

B. Wrought iron fences and gates:
   1. Space gate posts per the manufacturers’ drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on standard industrial application criteria. Shop drawings shall identify the necessary gate hardware required, including a central drop post mechanism that can be secured with a padlock. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer’s recommendations.

3.03 ADJUSTING

   A. All gates shall operate smoothly, with no more than 4-inches clearance below the gate when closed.
   B. Remove and replace un-plumb posts and fencing improperly located or not true to line and grade.
   C. Padlocks shall be accessible for keyed entry from the street side of the fence.

**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
   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. Backfill trenches for buried electrical conduits with Class “D” or Class “B” concrete containing five pounds (5 lbs.) of red oxide per cubic yard.
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**
PART 1 - GENERAL

1.01 DESCRIPTION
A. Work Included
   1. This specification covers mortar and grout mixes for use with concrete masonry unit block (CMU) construction.

B. Related work specified in other sections
   1. Section 04220: Concrete masonry units

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 referenced publications in effect at the time of the bid shall govern.

   B. American Society of Testing Materials (ASTM)

<table>
<thead>
<tr>
<th>ASTM</th>
<th>Description</th>
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<tbody>
<tr>
<td>C144</td>
<td>Specification for Aggregate for Masonry Mortar</td>
</tr>
<tr>
<td>C150</td>
<td>Specification for Portland Cement</td>
</tr>
<tr>
<td>C207</td>
<td>Specification for Hydrated Lime for Masonry Purposes</td>
</tr>
<tr>
<td>C270</td>
<td>Specification for Mortar for Unit Masonry</td>
</tr>
<tr>
<td>C387</td>
<td>Specification for Packaged, Dry, Combined Materials for Mortar and Concrete</td>
</tr>
<tr>
<td>C404</td>
<td>Specification for Aggregates for Masonry Grout</td>
</tr>
<tr>
<td>C476</td>
<td>Specification for Grout for Reinforced and Non-reinforced Masonry</td>
</tr>
</tbody>
</table>

1.03 SUBMITTALS
A. Submit Manufacturer's Data for:
   1. Mortar
   2. Grout

PART 2 - PRODUCTS

2.01 WATER
A. Water used in mortar and grout shall be taken from a supply distributed for domestic purposes and at the time of mixing shall be clean and free of acids, alkalies, or other organic materials.
2.02 AGGREGATE
A. The aggregate used in mortar shall be either natural or manufactured sand conforming to ASTM C144.
B. The aggregate for masonry grout shall be either natural or manufactured sand conforming to ASTM C404, Fine Aggregate Size No.1.

2.03 CEMENT
A. The cement shall conform to ASTM C150, Type II 'Low Alkali'. Masonry cement is not acceptable and shall not be used on this job.

2.04 HYDRATED LIME
A. Hydrated lime shall conform to ASTM C207, Type S. Air entraining hydrated lime shall not be furnished.

2.05 ADMIXTURES
A. Admixtures shall not be used in either mortar or grout except by written consent from the Engineer.

2.06 MORTAR
A. Mortar shall consist of specified water, aggregate, cement and hydrated lime conforming to the requirements of the proportion specification in ASTM C270, Type S, 1,800 psi at 28 days.

2.07 BLOCK CELL GROUT
A. Grout shall consist of specified water, aggregate, cement and hydrated lime conforming to ASTM C476, Table 1, Coarse Grout. The grout shall obtain 2,000 psi at 28 days.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION
A. Concrete areas to be in contact with mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond between the mortar or grout and the concrete surfaces. The surfaces shall be flushed with water and allowed to dry to a surface dry condition immediately prior to placing the mortar or grout.

3.02 MORTAR
A. Mortar shall be machine mixed in a motor driven mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than 5 minutes, approximately 2 minutes of which shall be for mixing the dry materials and not less than 3 minutes for hydrated lime if used for mortar requiring lime.

A. Contractor shall have the option of using the dry mixed method of first converting the hydrated lime into putty. Where the dry mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed dry materials indicates that the cementitious materials has been thoroughly distributed throughout the mass. Water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.
B. Jointing and pointing of mortar used for reinforced hollow concrete block shall conform to Section 04220: Concrete Masonry Units. Mortar boxes shall be cleaned out at the end of each day's work, and all tools shall be kept clean. Mortar that has begun to set shall not be used.

3.03 GROUT

A. Grout may be placed in the reinforced hollow concrete block wall and associated metal frame assemblies after the units have been set for at least 24 hours.

B. Grout shall be placed by grout pump, concrete hopper or bucket.

C. Grout spaces shall not be wet prior to pouring grout.

D. Unless otherwise indicated the grout shall have a 9 inch to 11 inch slump.

E. Grout shall completely fill and shall be tightly packed into recesses and holes, on surfaces, and under structural members.

**END OF SECTION**
SECTION 04220
CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

1. The Contractor shall furnish all labor, materials, equipment and incidentals required to construct all concrete masonry unit (CMU) work as shown on the drawings and as specified herein.

2. Work under this Section includes but is not necessarily limited to:
   a. CMU’s
   b. Grouting and mortar
   c. Control joint construction
   d. Caulking and sealing

3. The work shall also include the setting and incorporating into the masonry of all bolts, anchors, attachments, nailing blocks, inserts, and reinforcement as indicated on the drawings and as specified herein.

B. Related Work Specified In Other Sections

1. Section 04100: Masonry Mortar and Grout

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 referenced publications in effect at the time of the bid shall govern.


<table>
<thead>
<tr>
<th>ASTM</th>
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<tbody>
<tr>
<td>A82</td>
<td>Steel wire, plain, for concrete reinforcement</td>
</tr>
<tr>
<td>A615</td>
<td>Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement</td>
</tr>
<tr>
<td>C90</td>
<td>Hollow Load-Bearing Concrete Masonry Units</td>
</tr>
<tr>
<td>C140</td>
<td>Sampling and Testing Concrete Masonry Units</td>
</tr>
<tr>
<td>C426</td>
<td>Drying Shrinkage of Concrete Block</td>
</tr>
</tbody>
</table>

C. International Masonry Industry All-Weather Council (IMIAC)

1.03 SUBMITTALS

A. Manufacturer's Data
   1. CMU's, including all special shape blocks
   2. Reinforcement
   3. Caulking

C. Test Reports
   1. CMU compressive strength and absorption per ASTM C140.
   2. CMU linear shrinkage per ASTM C426.

D. Samples
   1. Submit two samples of block to illustrate color, texture, and extremities of color range.

PART 2 - PRODUCTS

2.01 CMU's

A. CMU’s shall conform to ASTM C90, lightweight, Grade N, Type I, hollow, load bearing units of 8 inches x 16 inches nominal face size and bed dimension as shown on the Drawings. Maximum weights of individual units shall be 30 pounds. CMU's shall have a compressive strength of 1500 psi at 28 days.

B. CMU's shall be free from substances that will cause staining or popouts, and shall be fine, even texture with straight and true edges. All units shall have been wet steam cured for at least 18 hours and then air cured in covered storage for not less than 28 days before delivery.

C. All stretchers and special shape units shall be obtained from one manufacturer to insure even color and texture.

D. Provide all special shape CMU’s required on this job including: solid, corner, pilaster, lintel, jamb, header, half-hi and control joint units.

E. All CMU’s shall have a minimum net tensile strength of not less than 135 psi.

F. CMU’s shall have been air cured for not less than 28 days or the equivalent.

G. All CMU’s shall have a maximum linear shrinkage of 0.045 of 1 percent from saturated to oven dry conditions, when tested in accordance with ASTM C426.

2.02 REINFORCEMENT

A. Steel Bars: Steel reinforcement bars shall conform to ASTM A615, Grade 60..

2.03 MORTAR AND GROUT

A. Provide mortar and grout per Section 04100.
PART 3 - EXECUTION

3.01 MASONRY - INSTALLATION

A. CMU's shall not be laid at temperature below 40 degrees F or during wet humid weather. Maximum course height shall be 60 inches per day. All work shall be done in such a manner as to insure the proper and normal hardening of all mortar. All masonry work shall be so protected and heated that the temperature at the surface will not fall below 50 degrees F for a period of 72 hours after placing. During dry cold weather above 40 degrees F, follow the recommendations of the IMAIAC. Any completed work found to be affected by freezing shall be taken down and rebuilt by the Contractor at his expense.

B. All CMUs shall be laid in a full bed of mortar, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well compacted vertical mortar joints for the full shell thickness. Units shall set with all cells in a vertical position. The moisture content of the units when laid shall not exceed 35 percent of the total absorption as determined by laboratory test.

C. CMUs shall be laid in stretcher (running) bond with units machine sawn at panel ends to produce the proper bonding. Tool dense and neat.

D. Sizes shall be as specified and called for on the Drawings, and where "Soaps" and "Splits" are used, the space between these members and the backup material shall be slushed full of mortar.

E. Joints of all masonry shall be tooled in accordance with the following:
   1. Wait until unit mortar is thumb-print hard before tooling joint. This may require as much as 3 hours in the shade and 1 hour in the sun.
   2. The required personnel of the Contractor shall be kept on the job after hours, if necessary, to properly tool joints.
   3. Both vertical and horizontal joints shall be maintained uniform in spacing.
   4. Joints for CMUs shall be 3/8 inch concave rodded.

F. Install all frames required to be set in masonry. Set masonry tightly against frames, and build in all frame anchors.

G. Surfaces shall be brushed as work progresses and maintained as clean as practicable. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind. Sweep the work surface clean before continuing work on previously CMU's. The tops of walls or other unfinished work shall be protected against all damage by frost or the elements by means of waterproof paper, tarpaulins, boards or other means approved by the Engineer.

H. Contractor shall build in all miscellaneous items to be set in masonry for which
placement is not specifically provided under separate Divisions, including, anchors, and shall cooperate with other trades whose work is to be installed in the block walls.

K. All anchorage, attachment, and bonding devices shall be set as to prevent slippage and shall be completely covered with mortar or grout.

3.03 TOLERANCES

A. Alignment to pilasters shall be maximum 1/4 inch from true line.
B. Variation from unit to adjacent unit shall be 1/32 inch maximum.
C. Variation from plane of wall shall be 1/4 inch in 10 feet and ½ inch in 20 feet or more.
D. Variation from level coursing shall be 1/8 inch in 3 feet; 1/4 inch in 10 feet; ½ inch maximum.
E. Variation of joint thickness shall be 1/8 inch in 3 feet.
F. Maximum variation from cross sectional thickness of walls shall be plus or minus 1/4 inch.

3.04 REINFORCING AND GROUTING

A. Keep reinforcing bars straight except for bends and hooks.
B. Lap bars 45 diameters minimum at splices.
C. Place horizontal steel and lap as work progresses.
D. Install solid grouting in all cells.

3.05 CLEANING

A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar of same color as that of the original and adjoining work.
B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surfaces as the work progresses.
C. All exposed masonry shall be thoroughly cleaned. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 square feet in a location approved by the Resident Engineer. No further cleaning work may proceed until the sample area has been approved by the Resident Engineer after which time the same cleaning materials and method shall be used on the remaining wall area.

**END OF SECTION**
SECTION 05090
WELDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Unless otherwise approved or directed, perform all required project welding as specified herein.

B. Related Work:
   1. Section 05505: Miscellaneous Metal Work

C. Definitions:
   1. Definitions shall be in accordance with AWS A3.0.
   2. Symbols shall be in accordance with AWS A2.4 for welding and nondestructive testing, respectively, unless otherwise indicated.

1.02 REFERENCES

A. The following references 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>Reference</th>
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<tr>
<td>AISC - 1999</td>
<td>LRFD Specification for Structural Steel for Buildings (with Commentary &amp; Errata Incorporated as of September 4, 2001)</td>
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<tr>
<td>ANSI Z49.1-1973</td>
<td>Safety in Welding and Cutting</td>
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<td>AWS A2.4-79</td>
<td>Symbols for Welding and Nondestructive Testing</td>
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<td>Welding Terms and Definitions</td>
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<td>Specifications for Carbon Steel Filler Metals for Gas Shielded Arc Welding</td>
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<td>MIL-W-8611A</td>
<td>Welding, Metal Arc and Gas, Steels and Corrosion and Heat Resistant Alloys</td>
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<td>MIL-STD-248C</td>
<td>Qualification Tests for Welders (Other than Aircraft Weldments)</td>
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<tr>
<td>MIL-STD-22D</td>
<td>Welded Joint Design</td>
</tr>
</tbody>
</table>
1.03 QUALITY ASSURANCE

A. Erector/Fabrication Qualification

1. Each welder and welding operator assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1, MIL-STD-248C and as specified herein.

2. Each welder or welding operator shall be assigned an identifying number, letter or symbol which shall be used to identify all welds made by him.
   a. The Engineer may, at his discretion, require welders and welding operators assigned to the project to identify their completed welds with their identifying number, letter or symbol by means of a rubber stamp, felt-tipped marker and waterproof ink, or other methods that do not result in an indentation in the metal.

3. Re-qualification of a welder or welding operator shall be required under any of the following conditions:
   a. The welder or welding operator has not used the specific welding process for which he is qualified for a period exceeding six (6) months.
   b. There is specific reason to question his ability to make welds that meet the requirements of these specifications.
   c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract and a qualification test has not been taken within the preceding twelve (12) months.

B. Welding Operations:

1. Welding shall be performed where indicated on the contract drawings, on approved shop drawings, and/or in other sections of the specifications. Unless otherwise indicated, welded connections shall conform to the applicable requirements of AISC Specification for the nondestructive Design, Fabrication and Erection of Structural Steel for Buildings.

C. Dimensional tolerances and quality of welds shall be in accordance with the applicable requirements of the AWS D1.1 and to the satisfaction of the Engineer.

1.04 SUBMITTALS

A. Welders Certificates:

1. Current welder’s certificates for each welder on this job.
PART 2 - PRODUCTS

2.01 WELDING MATERIALS

A. Welding materials shall comply with the applicable requirements of AWS D1.1 and AWS A5.18.

PART 3 - EXECUTION

3.01 WELDING OPERATIONS

A. Workmanship and techniques for welded construction shall be in conformance with the applicable requirements of the AISC-1999 LRFD Specification for Structural Steel for Buildings, and of AWS D1.1. In case of conflict between AWS D1.1 and the AISC specification, the requirements of AWS D1.1 shall govern.

B. When inspection or testing indicated defects in the weld joints, the welds shall be repaired by the Contractor using a qualified welder or welding operator. Corrections shall be in accordance with the applicable requirements of AWS D1.1.

** END OF SECTION **
SECTION 05501
ANCHOR BOLTS AND ANCHORING DEVICES

PART 1 – GENERAL

1.01 SUMMARY
A. Section Includes: Anchor bolts, concrete anchors and other anchoring devices.

1.02 DESIGN REQUIREMENTS
A. Anchor bolts for equipment frames and foundations shall be designed for a lateral seismic acceleration value of 0.3g, wind loading per the UBC, and an overturning safety factor of 1.5.
B. Where specified in the individual equipment sections, provide calculations and supporting drawings and details prepared and signed by a professional civil or structural engineer registered in the state of California. Submit with equipment.

1.03 SUBMITTALS
A. Comply with CSSS Section 5-7.
B. Include the following items:
   1. Product Data: Manufacturer’s data for nuts, bolts, concrete anchors, chemical anchors and other fasteners.
   2. Catalog data and ICC reports for each type of anchor bolt.

1.04 QUALITY ASSURANCE
A. Do not use expansion-type concrete anchors or adhesive-type anchors set in holes drilled in the concrete as a substitution for cast-in-place anchor bolts.

PART 2 – PRODUCTS

2.01 MATERIALS
A. Unless otherwise specified or indicated on the Drawings, materials of construction for anchoring devices shall conform to the following:
   1. Anchor bolts and other anchoring devices, nuts and washers installed indoors: Type 304 stainless steel.
   2. Anchor bolts and other anchoring devices, nuts and washers installed outdoors or in locations exposed to wastewater: Type 316 stainless steel.
      a. Locations exposed to wastewater includes:
         1) Below tops of walls of water-containing structures.
2) Underside of roof, slab or walkways of enclosed water-containing structures.
3) Dry side of walls on water-containing structures.

2.02 ANCHORING DEVICES

A. Cast-in-Place Anchor Bolts
   1. Conform to ASTM A320.
   2. Minimum Length of Bolt: Provide bolt length such that the length of the embedded anchor is at least 10 bolt diameters.
   3. Minimum length of 90-degree hook: four bolt diameters.

B. Concrete Anchors
   1. Concrete Anchors: Drilled in place wedge-type anchors are not allowed.

C. Studs
   1. ASTM A 108 with 50,000 pounds per square inch minimum yield strength, and 60,000 pounds per square inch minimum tensile strength.
   2. Manufacturers: One of the following or equal:
      a. Nelson Stud Welding Company, S3L Shear Connectors or H4L Concrete Anchors.
      b. Stud Welding Products, Headed Concrete Anchors and Shear Connectors or Concrete Anchors.

D. Chemical Anchors (aka: Epoxied and/or Epoxy Anchors)
   1. Do not use in overhead applications, in chlorine gas environments, or where anchor may be exposed to machine or diesel oils.
   2. Materials: Type 304 stainless steel all-thread rod with vinyl ester resin adhesive.
      a. Stainless steel all-thread rod: Conform with ASTM F 593.
   3. Manufacturers: One of the following or equal:
      a. Hilti HIT-HY 200-R (wet or dry).
      b. Hilti HIT-RE 500 (submerged).
      b. Simpson Set XP Adhesive (wet or dry).

PART 3 – EXECUTION

3.01 GENERAL ANCHORING REQUIREMENTS

A. Install anchor bolts, concrete anchors and other anchoring devices with at least two threads projecting beyond the nut, but no more than ½ inch projecting beyond the nut.

B. Prior to installing nuts, coat threads of stainless steel bolts with material to prevent galling of threads.
   1. Manufacturers: One of the following or equal:
b. Oil Research, Inc., WLR No. 111.

C. Tighten nuts on anchor bolts, concrete anchors and other anchoring devices to the "snug-tight" condition, defined as tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary wrench.

3.02 CAST-IN-PLACE ANCHOR BOLTS

A. Accurately place anchor bolts to be embedded in concrete within the formwork and perpendicular to surface from which they will project. Secure in correct position while concrete is placed.

B. Do not allow anchor bolts to touch reinforcing steel. Where anchor bolts are within ¼ inch of reinforcing steel, isolate with a minimum of four wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.

C. In anchoring machinery bases subject to heavy vibration, use two nuts, with one serving as a locknut.

D. Where bolts are indicated on the Contract Drawings for future use, first coat thoroughly with non-oxidizing wax, then turn nuts down full depth of thread and neatly wrap exposed thread with waterproof polyvinyl tape.

E. Where indicated on the Contract Drawings, set anchor bolts in metal sleeves having inside diameter approximately two inches greater than the bolt diameter and a minimum of 10-bolt diameters deep. Fill sleeves with grout when equipment is grouted in place.

F. Anchor bolts may be cast in concrete in lieu of using concrete anchors.

3.03 CONCRETE ANCHORS AND CHEMICAL ANCHORS

A. Do not use concrete anchors or chemical anchors in lieu of anchor bolts.

B. Drill holes using concrete drill bits and impact type drill motors. Hole diameter shall be in accordance with the manufacturer’s recommendations.

C. Clean drilled hole using compressed air to dislodge and remove drilling dust.

D. Accurately locate concrete anchors and set perpendicular to surfaces from which they will project. Minimum embedment lengths as indicated on the Contract Drawings.

**END OF SECTION**
SECTION 05505

MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Furnish all labor, materials, equipment and incidentals required and install all miscellaneous metals as shown on the drawings and specified herein.

2. Unless otherwise approved or directed, anchorages and fabricated items for use in the wetwells below the basin covers shall be made from type 316 stainless steel.

B. Related Work:

1. Section 05090: Welding
2. Section 09900: Painting

1.02 COORDINATION

A. The work of this section shall be completely coordinated with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this section before fabrication and installation of items herein specified.

B. Furnish to the pertinent trades all items included under this section that are to be built into the work of other sections.

1.03 SUBMITTALS

A. Manufacturer's certificate of compliance shall be submitted for approval on all materials and manufactured products provided under this specification.

B. Submit shop drawings for manufactured specialty items for review prior to fabrication. Submit catalog cuts, layout dimensions, plus erection and installation details. Submittals shall include but not be limited to the following:

1. Sump 146 Basin Wet well Cover
2. Sump 146 wetwell valve operator extension and guide brackets.
3. Sump 146 Knife Gate Mountings
4. Handrails and Grab bars

1.04 REQUIREMENTS

A. General: Verify all measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with Section 05090: WELDING. Items specified to be galvanized, shall be hot-dip processed after fabrication. Galvanizing shall be in accordance with ASTM A123, A153, A386 and A525, as applicable.
B. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included.

C. All bolts, anchors, supports, braces, connection and other items necessary for completion of the miscellaneous metal work shall be provided. Necessary lugs and brackets shall be provided so that the work can be assembled in a neat and substantial manner. Holes for bolts and screws shall be drilled or punched. Burning of holes is prohibited. Poor machining of holes shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

D. Dissimilar Materials: Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint conforming to MIL-C 18484 or to TT-V-51 or a coat of zinc chromate primer conforming to TT-P 645 to prevent corrosion.

E. Workmanship: Miscellaneous metal work shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean, true lines and surfaces. Welding shall be continuous along the entire area of contact (except where tack welding is specifically shown on the drawings). Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces for work in place shall have a smooth finish, and exposed riveting shall be flush. Where tight fits are required, joints shall be milled to a close fit. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Work shall be executed and finished in accordance with approved drawings, cuts and details.

F. Anchorage: Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts or expansion shields; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Slotted inserts shall be of types required to engage with the anchors. Do not use power driven fasteners on this job.

G. Galvanized Materials: Unless otherwise indicated or approved, all exposed ferrous metal and structural steel shall be hot-dipped galvanized. Fabricated items shall be ground smooth at welded joints, edges, and corners and galvanized after fabrication.

Other items to be galvanized shall include, but are not necessarily limited to, all steel hardware, nuts, bolts, washers, anchors, and threaded rods, except as noted, or items fabricated from stainless steel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall conform to the requirements specified for the particular item. Where these requirements are not specified in detail, the materials shall be suitable for the
intended usage of the item. Materials listed below shall conform to the respective specifications and other requirements as designated:

1. Aluminum: Alloy 6061-T6, raised pattern plate, thickness as indicated, 1/4 inch minimum. Fasten all accessories by welding or stainless steel bolts.

2. Stainless steel bars, plates, bolts and nuts shall conform to ASTM A193 Type 316.

3. Structural carbon steel for riveted, bolted, or welded work shall conform to ASTM A36.

4. Steel pipe for structural use shall conform to ASTM A53.

5. Structural steel tubing for riveted, bolted or welded work shall conform to ASTM A500 or A501.


7. Washers: Circular washers shall be flat and smooth and conform to ANSI B27.2, Type A. Beveled washers for American Standard beams and channels shall be square or rectangular, shall taper in thickness and shall be smooth. Washers shall conform to FF-W-84. Flat washers shall be suitable for the use intended.


2.02 SUMP 146 WET WELL BASIN COVER

A. Wet Well basin cover shall be custom fabricated with integral hinged double doors; an integral nutrail with Type 316 stainless steel sliding nuts for guide-rail and misc hardware attachment; and hinged stem nut access covers for the influent valve operators. Outside diameter of cover shall match the outside diameter of the wetwell. Unless otherwise approved or directed, furnish with the following features:

1. Hatches hinged on sides perpendicular to the nutrail.

2. Hatch doors, frame, and wet well cover shall be fabricated from 1/4" or thicker checkered or diamond plate mill finish aluminum, reinforced with structural aluminum shapes. Furnish with Type 316 stainless steel hinges, lock hasps, and associated hardware.

3. Assembled unit shall support 400 lbs per square foot uniform load with minimal deflection.

4. Provide at least six 5/8-inch diameter holes equally spaced around perimeter of cover for bolting to the underlying concrete structure.

5. Hatch doors shall open at least 90 degrees; shall be equipped with flush cast aluminum lifting handles; an aluminum staple shall protrude through each door for use with a City supplied padlock; and each shall have a 316 stainless steel automatic hold-open arm to keep the door in the open/upright position. As shown on the plans, provide doors with “one curved side for maximum accessibility to the manhole steps.

6. Portion of the wet well cover in contact with the concrete shall have a protective bituminous coating.
7. Stem nut access covers shall be attached to the cover plate w/ one stainless steel hinge. Provide a flush drop handle to open each cover. No lock required.

B. Verify that the hatch openings provide sufficient clearance to lift each pump vertically off the guiderails without contacting the influent shut-off knife gates, the hatch frame, or the adjacent closed hinged hatch door. Prior to fabrication, verify the hatch position relative to the wet well center and the planned pump positions.

C. Provide a customized pedestrian rated basin cover as manufactured by U.S.F. Fabrication, Inc., Hialeah, FL, or approved equal. Submit shop drawings for approval.

2.03 CASTINGS

A. All casting shall be sound and free from shrinkage cracks, blow holes and other defects. All fins and burnt sand must be removed. Excessive porosity and spongy surfaces will constitute causes for rejection. The Engineer shall be final judge as to whether the defects present are sufficient to cause rejection.

B. No welding or patching of defects in castings will be permitted unless authorized by the Engineer. Any such welding or patching done without the Engineer's consent shall be cause for rejection.

C. Castings shall be true to form and the dimensions shown. Unless otherwise indicated, coat, machined surfaces with a blue rust inhibitive lacquer, or other approved material prior to shipping.

D. The dimensions of the finished castings shall not be less than the specified dimensions. Castings shall not be more than seven and one-half (7-1/2) percent overweight. Large casting shall be suspended and hammered over their entire area. No cracks, flaws, or other defects shall appear after such hammering.

E. Castings shall be provided with adequate, continuous fillets cast in place in all re-entrant angles. The radius of curvature of the exposed surface of a fillet shall define the size of the fillet. The size of fillets shall not be less than one-half (1/2) of the thickness of the thinnest adjoined member nor less than one-half (1/2) inch long.

F. Iron castings shall be dipped or painted with asphalt, which will form a tough, tenacious, non-scaling coating which does not have a tendency to become brittle when cold or sticky when hot.

2.04 HANDRAILS AND GRAB BARS

A. Handrails, grab bars, and safety chain shall be designed to withstand a 200lb concentrated load applied in any direction and at any point. Conform to Cal/OSHA Title 8, California Code of Regulations, §’s 3209 and 3277. Top of the handrail, the safety chain sections, and the grab bars shall extend between 42- and 45-inches above the wetwell cover. Locate intermediate handrails such that a 21-inch diameter sphere cannot pass through any opening.

B. Unless otherwise approved, construct handrail from 1 1/2" IPS Schedule 40 aluminum pipe grade 6105-T5, ASTM-B-429 or ASTM-B-221 and aluminum-magnesium alloy
cast slip-on/bolt-on structural pipe fittings, such as Speed-Rail® fittings, by the Hollaender® Manufacturing Company of Cincinnati, Ohio, KeeLite® fittings by the KeeSafety, Inc of Buffalo New York, or approved equal. Where chain is shown, furnish only top safety chain segments of #5 straight-link type 304 stainless steel chain to run between the adjacent uprights, with 5/16-inch stainless steel spring snap links to engage fixed eye loops on the grab bar uprights.

C. Except where detent pins are called for, fasten fittings to the pipe with stainless steel set screws per the fitting manufacturer. Where detent pins are called for, drill the appropriate pipe fittings for one full penetration ¼-inch diameter ring grip all stainless steel push button quick-release pin, such as McMaster-Carr product #92384A041, or equal. Detent pins are to facilitate occasional removal and re-installation of the attached handrail without loosening any set screws. Furnish detent pin lengths as appropriate to fully engage all members at the joint, with not more than ⅝-inch extra length. Attach the grip ring on each detent pin to the adjacent railing with a 12-inch long stainless steel tool lanyard.

D. Submit shop drawings for approval.

PART 3 - EXECUTION

3.01 WELDING
A. All welding shall be done in conformance with Section 05090 WELDING.

3.02 FABRICATION
A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength of durability.

3.03 SHOP CLEANING
A. Steel and iron work shall be cleaned by power wire brushing, or other approved manual or mechanical means, for removal of all rust, loose paint, scale and deleterious substances. Cleaned surfaces which become contaminated with rust, dirt, oil, grease or other foreign matter shall be washed with solvents until thoroughly clean. Cleaning of steel embedded in concrete shall not be required.

3.04 PAINTING
A. Painting shall conform to the requirements of Section 09900.

3.05 GALVANIZING
A. All steel is to be galvanized unless indicated otherwise. Galvanizing shall be performed by the hot-dip process after fabrication into the largest practical sections. The galvanizing shall conform to the requirements of ASTM A123. Fabrication shall include all operations such as shearing, punching, forming, bending, welding, riveting, etc. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the coating. For those parts to be painted after galvanizing, do not apply any after galvanizing treatment.
B. Small structural steel or cast steel articles, such as bolts, nuts, washers, and similar articles that are to be galvanized, shall be galvanized after fabrication in accordance with the requirements of ASTM A153.

3.06 INSTALLATION

A. Contractor shall be responsible for installation of all miscellaneous metalwork. Items to be attached to concrete after such work is completed shall be installed in accordance with the details shown. All dimensions shall be verified at the site before fabrication is started. All installation shall be done in a workmanlike manner and be set true and plumb and in accordance with the Drawings and this specification.

**END OF SECTION**
PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers galvanized steel grating and hatches for the valve vaults.

1.02 REFERENCES

A. 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 the listed documents, the requirements of this section shall prevail.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
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<tbody>
<tr>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>ASTM A36/A36M</td>
<td>Structural Steel</td>
</tr>
<tr>
<td>ASTM A569/A569M</td>
<td>Steel, Sheet and Strip, Carbon, Hot Rolled, Commercial Quality</td>
</tr>
</tbody>
</table>

1.03 SUBMITTALS

A. Submittals shall include the following information.
   1. Certificate of compliance indicating compliance with these specifications.
   2. Shop drawings for each vault showing layout plans, appropriate sections, and installation details for each integral hinged hatch.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel grating bearing and cross bars shall be of mild carbon steel conforming to ASTM A569. Steel support members shall conform to ASTM A36.

B. Unless otherwise approved, galvanize support members after fabrication.

2.02 FABRICATION

A. Rough weld beads and sharp metal edges on gratings and plates shall be ground smooth. Welds exposed to view shall be uniform and neat. Welds to be galvanized shall be sandblasted prior to galvanizing.
B. Bearing bars and cross bars shall be continuous. Openings shall be banded with bars having the same dimensions as the bearing bars. Perimeter edges shall be banded with bars flush at the top surface of the grating and 1/4 inch clear of the bottom surface. Bars terminating against edge bars shall be welded to the edge bars when welded construction is used. No single piece of installed grating shall weigh more than seventy (70) pounds unless otherwise approved by the Engineer.

C. Steel grating shall be hot-dip galvanized, McNichols Type GW-175, 1⅜” x 3/16” or approved equal.

D. Each valve vault shall be provided with a hinged hatch that can be padlocked closed. Provide additional support as required to support 300 pounds per square foot applied directly to the hatch and the adjacent grating. Unless otherwise approved, hatch shall be hinged off the adjacent grating (either side is acceptable), not off the perimeter angle iron anchored into the vault wall.

E. Provide ¾-inch x 2½-inch galvanized flat bars as shown in the attached reference picture that are padlocked each end to the perimeter angle iron to secure the removable grating in-place.

PART 3 - EXECUTION

3.01 INSTALLATION

A. GENERAL

1. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.

2. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed.

3.02 CLEANING

A. After installation, damaged surfaces of shop primed metals shall be cleaned and touched up with the same material used for the shop coat. Damaged surfaces of galvanized metals shall be repaired in accordance with the manufacturer’s instructions.

(Concept photos of a typical grating hatch follow this section for general information.)

**END OF SECTION**
SECTION 09900
PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION
A. 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 the following (Protective Coating System #):
   1. Ductile iron pipe in the wet wells and valve vaults (2).
   2. Re-paint the existing electrical equipment cabinets to remain (5).
   3. Repair of damaged hot-dip galvanized coatings (28).
   4. Isolation of aluminum covers from wet well walls (27).

1.02 REFERENCES
A. The following is a list of standards which may be referenced in this section:
   National Association of Corrosion Engineers (NACE): RP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
   The Society for Protective Coatings (SSPC):
      1. PA 1, Shop, Field, and Maintenance Painting.
      2. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
      4. SP 1, Solvent Cleaning.
      5. SP 2, Hand Tool Cleaning.
      6. SP 3, Power Tool Cleaning.
      7. SP 5, Joint Surface Preparation Standard White Metal Blast Cleaning.

1.03 DEFINITIONS
A. Terms used in this section:
   1. Coverage: Total minimum dry film thickness in mils or square feet per gallon.
   2. MDFT: Minimum Dry Film Thickness, mils.
   3. MDFTPC: Minimum Dry Film Thickness Per Coat, mils.
   5. PSDS: Paint System Data Sheet.
6. PVC: Polyvinyl Chloride.
7. SFPG: Square Feet Per Gallon.
8. SFPGPC: Square Feet Per Gallon Per Coat.
9. SP: Surface Preparation.

1.04 SUBMITTALS

A. Paint Systems Data:

1. For each paint system, furnish Paint System Data Sheet (PSDS), manufacturer's technical data sheets, and paint colors available (where applicable).

2. Submit Manufacturer's written verification that submitted products are suitable for the intended use.

3. If manufacturer of finish coating differs from that of shop primer, provide both manufacturers' written confirmation that materials are compatible.

1.05 QUALITY ASSURANCE

A. Perform surface preparation and painting in accordance with recommendations of the following:

1. Paint manufacturer's instructions.
3. Standard preparations described herein.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in unopened containers that plainly show designated name, date of manufacture, color, and manufacturer.

B. Store paints in a protected area that is heated or cooled to maintain temperature range recommended by paint manufacturer.

1.07 PROJECT CONDITIONS

A. Do not apply paint in temperatures outside of manufacturer's recommended maximum or minimum allowable, or in dust, smoke-laden atmosphere, damp or humid weather.

B. Do not perform abrasive blast cleaning whenever relative humidity exceeds 85 percent, or whenever surface temperature is less than 5 degrees F above dewpoint of ambient air. Adhere to coating manufacturer's recommendations.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Paint manufacturer shall be nationally recognized manufacturer of paints and protective coatings and regularly engaged in production of such materials that have essentially identical service conditions as this Project.

B. Minimum of 5 years verifiable experience in manufacture of specified products.

C. Sherwin Williams, Frazee, Dunn Edwards, ZRC Worldwide, or approved equal.

2.02 PAINT MATERIALS

A. Material Quality: Manufacturer’s highest quality products and suitable for the intended service. Primer and Finish Coats produced by same paint manufacturer. Thinners, cleaners, driers, and other additives as recommended by paint manufacturer of particular coating.

B. Products:

<table>
<thead>
<tr>
<th>Product</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Bituminous Paint</td>
<td>Single-component, coal-tar pitch based</td>
</tr>
<tr>
<td>Epoxy Primer</td>
<td>Converted epoxy primer containing rust-inhibitive pigments, minimum 69% volume solids</td>
</tr>
<tr>
<td>High Build Epoxy</td>
<td>Polyamide or polyamidoamine epoxy, minimum 69% volume solids, capability of 4 to 8 MDFT per coat</td>
</tr>
<tr>
<td>Polyurethane Enamel</td>
<td>Two-component, acrylic based polyurethane; high gloss ultraviolet (UV) resistant finish</td>
</tr>
<tr>
<td>Cold-Galvanizing Repair</td>
<td>Single component, ASTM A-780 compliant metallic zinc coating, containing 95% zinc in the dried film, that imparts cathodic protection to ferrous metals</td>
</tr>
</tbody>
</table>

2.03 COLORS

A. Provide as selected by City. Unless otherwise directed, apply ANSI No. 61 (gray) to exposed electrical cabinets, and Light Tan to Ductile Iron Pipe.

B. Formulate with colorants free of lead, lead compounds, or other materials, which might be affected by presence of hydrogen sulfide or other gas likely to be present at Project site.

C. Proprietary identification of colors is for identification only. Any authorized manufacturer may supply matches.

2.04 DUCTILE IRON PIPE

A. Use DIPRA Surface Preparation Specification equivalent to SSPC grade specified.
B. Prior to blast cleaning, grind smooth surface imperfections including, but not limited to, delaminating metal or oxide layers.

C. Surface preparation and application of primer coats shall be performed by pipe manufacturer.

2.05 SHOP FINISHES

A. Shop Blast Cleaning: Reference paragraph Shop Coating Requirements, this section.

B. Surface Preparation: Provide Engineer minimum 7 days’ advance notice to start of shop surface preparation work and coating application work.

C. When required by equipment Specifications, equipment shall be primed and finish coated in shop by manufacturer and touched up in field with identical material after installation.

D. Where manufacturer’s standard coating is not suitable for intended service condition, Engineer may approve use of a tie-coat to be used between manufacturer’s standard coating and specified field finish. In such cases, tie-coat shall be surface tolerant epoxy as recommended by manufacturer of specified field finish coat. Coordinate details of equipment manufacturer’s standard coating with field coating manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

A. Inspect and provide substrate surfaces prepared in accordance with these Specifications and printed directions and recommendations of paint manufacturer whose product is to be applied. In event of conflict, more stringent shall apply.

B. Notify Engineer minimum 7 days’ prior to start of surface preparation work or coating application work.

C. Perform work only in presence of Engineer, unless Engineer grants prior approval to perform work in Engineer’s absence.

D. For coatings subject to immersion, obtain full cure for completed system. Consult coatings manufacturer’s written instructions for these requirements. Do not immerse coating until completion of curing cycle.

E. The intention of these Specifications is for new metal and submerged metal surfaces to be painted, whether specifically mentioned or not, except as modified herein.

F. Perform painting in accordance with recommendations of the Paint manufacturer and federal, state, and local agencies having jurisdiction.
3.02 PROTECTION OF MATERIALS NOT TO BE PAINTED

A. Protect all surfaces adjacent to, or downwind of Work area from overspray. Contractor shall be responsible for any damages resulting from overspray.

B. Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not specified elsewhere.

C. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.

D. Protect working parts of mechanical and electrical equipment from damage.

E. Mask openings in motors to prevent paint and other materials from entering the motors.

3.03 FIELD SANDBLASTING

A. Perform sandblasting for items and equipment where specified, and as required to restore damaged surfaces previously shop or field blasted and primed. Materials, equipment, procedures shall meet requirements of the Society for Protective Coatings.

3.04 PREPARATION OF SURFACES

A. Metal Surface Preparation:

General:

1. Submit samples prior to surface preparation blasting.

2. Conform to current Society for Protective Coatings specifications as follows:
   c. Power Tool Cleaning: SP 3.
   d. White Metal Blast Cleaning: SP 5.

3. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet- or vacu-blast methods may be required. Follow coatings manufacturers’ recommendations for wet-blast additives and first coat application.

4. Hand-tool clean areas that cannot be cleaned by power-tool cleaning.
Blast Cleaning Requirements:

5. Comply with applicable federal, state, and local, air pollution and environmental control regulations for blast cleaning and disposition of spent aggregate and debris.

6. Alternatives to standard abrasive blast cleaning methods subject to Engineer review.

3.05 PAINT MIXING

A. Prepare using all the contents of container for each component as recommended by paint manufacturer.

B. Keep paint materials sealed when not in use.

C. Where more than one coat of material is applied within given system, alternate color to provide visual reference that required number of coats has been applied.

3.06 PAINT APPLICATION

A. General:

1. Inspection: Schedule with Engineer in advance for cleaned surfaces and all coats prior to succeeding coat.

2. Apply coating in accordance with paint manufacturer’s recommendations. Allow sufficient time between coats to assure thorough drying of previously applied paint.

3. Paint units to be bolted together and to structures, prior to assembly or installation.

4. Extent of Coating (Immersion): Coatings shall be applied to internal vessel and pipe surfaces, nozzle bores, flange gasket sealing surfaces, carbon steel internals, and stainless steel internals, unless otherwise specified.

B. Shop Primed or Factory Finished Surfaces:

1. Inspection: Schedule inspection for compliance with Specifications of shop primed or factory finished items with Engineer in advance of delivery to jobsite.

2. Hand or power sand areas of chipped, peeled, or abraded coating, feathering the edges. Follow with a spot primer using specified primer.

3. For two-package or converted coatings, consult coatings manufacturer for specific procedures as relates to manufacturer’s products.

4. Prior to application of finish coats, clean shop-primed surfaces free of dirt, oil, and grease and apply mist coat of specified primer, 1-mil dry film thickness.
5. After welding, prepare and prime holdback areas as required for specified paint system. Apply primer in accordance with manufacturer’s instructions.

C. Manufacturer Applied Paint Systems:

1. Repair abraded areas on factory finished items in accordance with the equipment manufacturer’s directions.

2. Carefully blend repaired areas into original finish.

3.07 FIELD QUALITY CONTROL

A. Testing:

1. Magnetic type dry film thickness gauge, to test coating thickness specified in mils, as manufactured by Nordson Corp., Anaheim, CA; Mikrotest.

2. Electrical holiday detector, low voltage, wet sponge type, to test completed coating systems, 20 mils or less MDFT, for holidays and discontinuities as manufactured by Tinker and Rasor, San Gabriel, CA, Model M-1.

3. High voltage holiday detector for coatings in excess of 20 mils MDFT. Unit to be as recommended by coating manufacturer.

B. Number of Coats:

1. Minimum required, irrespective of coating thickness.

2. Additional coats may be required to obtain minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions.

C. Application Thickness:

1. Do not exceed coating manufacturer’s recommendations.

2. Use wet film thickness gauge to measure proper coating thickness during application.

D. Film Thickness Measurement and Electrical Inspection of Coated Surface:

1. Perform with properly calibrated instruments.

2. Recoat and repair as necessary for compliance with Specifications.

3. Coats will be subject to inspection by Engineer and coating manufacturer's representative.

E. Give particular attention to edges, angles, flanges, and other similar areas, where insufficient film thickness are likely to be present, and ensure proper millage in these areas.
F. Apply additional coats as required to complete hiding of underlying coats. Hiding shall be so complete that additional coats would not increase hiding.

G. Thickness and Continuity Testing:

1. Measure coating thickness specified in mils with magnetic type dry film thickness gauge in accordance with SSPC PA2.

2. Check each coat for correct millage. Do not make measurement within 8 hours, minimum, after application of coating.

3. Test finish coat, 20 mils thick or less, except zinc primer, galvanizing, and elastomeric coatings, for holidays and discontinuities with electrical holiday detector, low voltage, wet sponge type in accordance with NACE RP0188.

4. Holiday detect coatings in excess of 20 mils MDFT with high voltage units recommended by coating manufacturer, and in accordance with NACE RP0188.

5. After repaired and recoated areas have dried sufficiently, retest each repaired area. Final test may also be conducted by Engineer.

H. Damaged Coatings, Pinholes, and Holidays:

1. Feather edges and repair in accordance with recommendations of paint manufacturer.

2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather edges. Follow with primer and finish coat in accordance with Specifications. Depending on extent of repair and appearance, finish sanding and topcoat may be required.

I. Apply finish coats, including touchup and damage-repair coats, in a manner, which will present uniform texture and color-matched appearance.

J. Unsatisfactory Application:

1. Clean and top coat surfaces found to have improper finish color or insufficient film thickness.

2. Evidence of runs, bridges, shiners, laps, or other imperfections shall be cause for rejection.

3. Repair defects in coating system per written recommendations of coating manufacturer.

K. Leave staging up until Engineer has inspected surface or coating. Replace staging removed prior to approval by Engineer.

3.08 CLEANUP

A. Place cloths and waste that might constitute fire hazard in closed metal containers or destroy at end of each day.
B. Upon completion of work, remove staging, scaffolding, and containers from site or destroy in legal manner.

C. Completely remove paint spots, oil, or stains from adjacent surfaces and floors and leave entire job clean.

3.09 PROTECTIVE COATINGS SYSTEMS

A. System No. 2 Ductile Iron Pipe:

<table>
<thead>
<tr>
<th>Surface Prep.</th>
<th>Paint Material</th>
<th>Min. Coats, Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 5, White Metal Blast Cleaning</td>
<td>Prime in accordance with manufacturer’s recommendations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Build Epoxy</td>
<td>2 coats, 16 MDFT</td>
</tr>
</tbody>
</table>

B. System No. 5 Exposed Metal Cabinets:

<table>
<thead>
<tr>
<th>Surface Prep.</th>
<th>Paint Material</th>
<th>Min. Coats, Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 2, Hand Tool Cleaning &amp; Sanding</td>
<td>Epoxy Primer</td>
<td>1 coat, 2.5 MDFT</td>
</tr>
<tr>
<td></td>
<td>Polyurethane Enamel</td>
<td>1 coat, 3 MDFT</td>
</tr>
</tbody>
</table>

C. System No. 27 Aluminum and Dissimilar Metal Insulation:

<table>
<thead>
<tr>
<th>Surface Prep.</th>
<th>Paint Material</th>
<th>Min. Coats, Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1, Solvent Cleaning</td>
<td>Prime in accordance with manufacturer's recommendations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bituminous Paint</td>
<td>1 coat, 10 MDFT</td>
</tr>
</tbody>
</table>

D. System No. 28 Repair of Damaged Hot-Dip Galvanizing:

<table>
<thead>
<tr>
<th>Surface Prep.</th>
<th>Paint Material</th>
<th>Min. Coats, Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 2, Hand Tool Cleaning &amp; Sanding</td>
<td>No Prime. Apply direct to prepared surface</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cold-Galvanizing paint</td>
<td>2 coats, 3 MDFT</td>
</tr>
</tbody>
</table>

3.10 SURFACES NOT REQUIRING PAINTING

A. Unless otherwise stated herein or shown, the following areas or items will not require painting:

1. Concrete and masonry surfaces.
2. Nonferrous and corrosion-resistant ferrous alloys such as copper, bronze, Monel, aluminum, chromium plate, atmospherically exposed weathering steel, and stainless steel, except where required for electrical insulation between dissimilar metals; where aluminum is in contact with concrete or masonry, or where color coding of equipment and piping is required.

3. Nonmetallic materials such as glass, wood and porcelain, except as required for architectural painting or color coding.

4. Prefinished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches, building louvers, and wall panels.

5. Nonsubmerged electrical conduits attached to unpainted concrete surfaces.

6. Items specified to be galvanized after fabrication, unless specified elsewhere or subject to immersion.

** END OF SECTION **
PART 1 - GENERAL

1.01 SCOPE

A. Contractor shall provide a ventilated, weather tight, prefabricated metal building to house the new electrical switchgear and MCC cabinets. Building shall be suitable for exterior use. Door and ceiling heights shall be such that 90 inch tall electrical cabinets can be mounted after the bldg is placed on its foundation slab.

B. Related Work
   1. Section 16050 Electrical Work

1.02 SUBMITTALS

A. Submit descriptive literature of all materials furnished under this section, including, but not limited to, the following:
   1. Manufacturer's catalog data and standard color chart.
   2. Complete shop drawings with fastening and anchor details.
   3. MSDS info for 25-yr plus exterior caulk at foundation perimeter.
   4. Engineering calculations for the structure as required per California UBC-2010 and local ordinance requirements; signed by a registered "state of origin" engineer following California regulations.
   5. Assembly and installation instructions.

1.03 QUALITY ASSURANCE

A. Manufacturer shall have experience in the manufacturing and assembly of prefabricated metal buildings for a minimum of 10 years.

B. Manufacturer's Certificate of ISO 9001 Compliance.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products so as to prevent damage. Maintain factory protection, or cover with heavy canvas or plastic to keep out dirt, water, and construction debris.

B. Lift only by installed lifting eyes.
1.05 SERVICE CONDITIONS

A. The building shall be designed and constructed to satisfactorily operate in the following service conditions:

1. Location: outdoors.
2. Ambient temperatures: 0 to 40 degree C
3. Humidity: 95%, non-condensing
4. Address location for Sump 80: Lat 38º 37' 11.9” N, Lon 121º 26’ 14.4”W

1.06 WARRANTY

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for one year from date of installation or 18 months from date of purchase, whichever occurs first.

PART 2 - PRODUCTS

2.01 REFERENCE STANDARDS

A. The building shall be designed and manufactured according to the latest version of the following standards:

1. ANSI/NFPA 70: National Electrical Code
4. Steel Structures Painting Council (SSPC): Painting and Finishing Standards.

2.02 PRODUCT COMPONENTS

A. Floor: Cover with ¾" thick Thermo-Lite® Supreme fiberboard with embossed "elephant" textured anti-skid finish. Furnish covered internal foundation anchorage plates.

B. Walls: The walls shall be made with at least 2” of rigid insulation and an overall R-value of 13. Install ¾” class C white laminated 7-ply plywood over interior of the walls. Wall panels shall be manufactured from 12 gauge galvannealed steel.

C. Roof: The walls shall be made with at least 2” of rigid insulation with an overall R-value of 13. Install ½” class C white laminated 7-ply plywood over interior of the roof panels. The roof panels shall be manufactured from 12 gauge galvannealed steel.

D. Paint: Exterior walls and roof shall be powder coated in accordance with manufacturer’s recommendations. Paint color to be Tiger Drylac® RAL 1015 or equal, as approved by the Engineer.

E. Doors: Provide one 38” x 94” door with 2” of insulation. Provide stainless door
hinges and pins. Door shall be manufactured out of 12 gauge galvannealed steel. Locate the door as shown on the plans (not more than 12” clear from the outside bldg corner).

F. Door hardware – The locks and panic bar shall be fire rated and tested in accordance to ANSI A156.3, 1989, Grade 1. The lock/panic bar shall be Von Duprin 22L-F or approved equal. The panic bar to be mounted inside the door shall be Von Duprin 22EO-F. The matching trim to be mounted outside the door shall be Von Duprin 230L with Mortise cylinder. This cylinder shall fit a City provided core by Best Locks. A key shall be used to open the mortise lock and when the key is removed the mortise lock shall lock automatically. The lever style shall be standard, the finish color shall be dark bronze. The City will provide a construction core and one (1) key for Contractor access during construction.

Provide one zinc plated pop rod to hold door open at 90 and 160 degrees.

Provide EPDM extruded rubber weather tight gasket.

G. Vents: Provide intake and exhaust vents located at the gable ends of the roof with a moisture resistant polyester fiber snap-in-place filter.

H. Exhaust fan: Provide a 273 CFM centrifugal ventilation fan rated at 115 VAC with thermostat. Contractor shall connect the exhaust to the new lighting panel as shown on the plans. Contractor shall mount the thermostat to the interior wall and install conduit and conductors to the exhaust fan. Engineer shall determine the location of the thermostat.

I. Lifting Lugs: Provide manufacturer’s standard lifting lugs (leave in-place).

2.03 MANUFACTURER

A. Prefabricated building shall be manufactured by PTMW, Inc., Topeka Kansas, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in conformance with referenced standards, the approved shop drawings, and as shown on the plans. Completed structure shall be weather tight.

3.02 FIELD QUALITY CONTROL

A. Building shall be handled in a manner to prevent damage. Any damage shall be repaired to the satisfaction of the Engineer.

B. Inspect installed building for anchoring, alignment, and grounding. Reinstall internal anchorage plate covers after foundation bolts are secured.
C. Adjust all access doors and operating handles to operate smoothly.

D. Clean interior of the building to remove debris, dirt, and shipping materials.

E. Repaint scratched or marred exterior surfaces to match original finish.

**END OF SECTION**
PART 1 - GENERAL

1.01 SCOPE

A. Contractor shall provide a single roof-slope, clear span, un-insulated, steel clad metal structure open on one side, to shelter existing electrical equipment.

B. Basic configuration dimensions are shown on the plans, along with the planned concrete strip footing foundations upon which the structure is to be mounted. Contractor shall provide engineering design calculations for the metal structure, including the foundation anchor bolts. Structure shall be an Occupancy Category I structure designed to support a minimum 20 pound per square foot roof live load, and separately, without the roof live load, the structure shall be designed in accordance with the Minimum Design Loads for Buildings and Other Structures (ASCE Manual 7-05) for the larger of the pressures from an 85 mph 3-second wind gust or the minimum wind pressures per ASCE 7-05 for an enclosed or partially enclosed building.

C. Unless otherwise approved, primary frame shall be a welded rigid frame design with pinned base columns and flush girt/purlin members. Provide a roof frame member for supporting the fluorescent ceiling lite as shown on the plans.

1.02 SUBMITTALS

A. Submittals shall include, but not be limited to, the following:

1. Metal roof/wall panel manufacturer’s standard color chart and warranty.
2. Complete instructions and assembly drawings with, fastening and anchorage details.
3. Engineering calculations for the structure signed by a California registered Civil or Structural Engineer.

1.03 QUALITY ASSURANCE

A. All light-gauge, mill steel, cold formed, and/or welded structural members, including the metal roof and wall panels, shall be designed in accordance with the applicable sections, relating to design requirements and allowable stresses, of the American Iron and Steel Institute (AISI) “Specification for the Design of Cold Formed Steel Structural Members.

B. Manufacturer shall have at least 5 years experience manufacturing metal buildings.

D. Manufacturer shall provide at least a 20-year manufacturer's defect warranty, pro-rated from year 1, that the Galvalume® coated and manufacturer painted roof and wall panels and all associated trim that is supplied will not fade, chalk, peel, crack, check, chip, or perforate due to red rust.

**PART 2 - PRODUCTS**

**2.01 COMPONENTS**

A. Provide 26 gauge Galvalume® coated and factory painted metal roof and wall panels. Panel color and profile shall be “Lightstone” and PBR ECO-4™ respectively, from AFP Metal Products, Inc., 3730 S. Capitol Ave., Whittier, CA (1-800-705-4550), or approved equal.

B. Frame and anchorage shall be in accordance with the approved design calculations.

C. Unless otherwise approved, steel framework shall be galvanized or factory painted.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

A. Install in conformance with the approved shop drawings, and as shown on the plans.

B. Building components shall be handled in a manner to prevent damage. Any damage shall be repaired to the satisfaction of the Engineer.

**END OF SECTION**
SECTION 15010

GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Provisions of this Section include all materials, labor and services necessary to furnish, install and conduct specified tests under actual operating conditions for Mechanical Work shown on the plans and/or wherever specifically required in these specifications.

1.02 QUALITY ASSURANCE

A. Equipment, piping, wiring and supports shall be provided to produce complete, operable systems with all elements properly interconnected as shown in schematic diagrams, as shown on the approved shop drawings, and/or as required to provide specified operations. If a specific dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and show them on Shop Drawings submitted for review.

B. Equipment and materials shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work so that connecting and disconnecting of piping, equipment and accessories can be readily made, and all parts are easily accessible for inspection, operation, maintenance, and repair.

1.03 MANUFACTURER'S INSTRUCTIONS

A. The recommendations and instructions of the manufacturers of products used in the work are hereby made part of these Specifications, except as they may be superseded by other requirements of these Specifications.

B. During the initial operation of the equipment, where specified, the manufacturers' representatives shall stay at the equipment site until proper operation is attained, unless other arrangements have been made with the Engineer. See the specific Equipment Specifications for recommended supervision periods. The Contractor shall have the sole responsibility for proper functioning of the equipment.

1.04 SUBMITTALS

A. Each piece of equipment, for which certified witnessed or non-witnessed performance tests are required, shall be accompanied by a completed form which will contain at least the following information:
1. Owner's name and location of project.
2. Contractor's name and subcontractor if applicable.
3. Name of item being submitted.
4. Specification reference by section, paragraph and page.
5. Data on item (manufacturer, general descriptive data, dimensions, size of connections, speeds, performance curves, serial number).
6. Motor data, type, voltage, frequency, phase, full load amperes, starting method, frame sizes, enclosure insulation type (NEMA Code letter), dimensions, service factor, efficiency, serial number.
7. Date and signature of person certifying the performance.

1.05 COVERING WORK

A. No work shall be covered or enclosed until it has been tested and inspected and then approved by the Engineer. Any work covered prior to such inspection, test, or approval shall be uncovered, if so requested, and after approval, covered again without cost to the City.

PART 2 - PRODUCTS

2.01 DESIGN

A. General: All equipment shall be designed for the service intended, shall be of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection and during continuous or intermittent operation, shall be adequately stayed, braced and anchored, and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details. Materials of construction shall be cathodically compatible.

B. Seismic: All equipment shall be anchored to resist axial and seismic forces. This requirement applies, but is not limited to light fixtures, tanks, railings, electrical and instrumentation panels, pumps, piping, generators, motors, cabinets, shelving, fans, and air ducts. The design of the anchoring system shall be the responsibility of the manufacturer or supplier. Anchorage shall be made to structural elements only, and shall be so designed and installed that the resisting capabilities of the structural elements are not exceeded. If, in the opinion of the manufacturer or Contractor, the available structural elements are incapable of resisting the seismic anchorage forces, the Engineer shall be notified in writing. Unless otherwise approved, anchor bolts shall be sized in accordance with Section 05501.

C. Noise: When in operation no single piece of equipment shall exceed the OSHA noise level requirements for a one hour exposure.

2.02 MATERIALS AND STANDARDS

A. Materials: Design, fabricate and assemble equipment and systems with new materials in accordance with acceptable modern engineering and shop practices.
Manufacture individual parts to standard sizes and gauges so repair parts can be installed in the field. Make like parts of duplicate units interchangeable. Do not place equipment in service at any time prior to delivery except as required for factory or shop tests.

B. Uniformity: Unless otherwise specified, equipment or material of the same type or classification used for the same purpose shall be the product of the same manufacturer and shall be the same model.

2.03 LIFTING EYES

A. All equipment weighing over 100 pounds shall be supplied with lifting eyes. Parts of equipment assemblies which are normally serviced separately, such as motors, shall have lifting eyes of their own in accordance with this section.

2.04 NAMEPLATES

A. Equipment nameplates shall be engraved or stamped of stainless steel and fastened to the equipment in an accessible, conspicuous location with oval head stainless steel screws or drive pins. Identify equipment with symbols shown on drawings.

2.05 TOOLS AND SPARE PARTS

A. All special tools required for exclusive operation and maintenance of respective items of equipment shall be furnished for those items of equipment by the manufacturer. This includes special tools, instruments, accessories required for proper "in-plant" adjustment, maintenance, overhaul and operation. Tools shall be high-grade, smooth, forged, alloy tool steel. Instruments or accessories shall be of top quality.

B. All tools and spare parts shall be carefully packed in wood or metal chests or containers labeled with indelible markings and shall be adequately treated for a long period of storage. Complete ordering information including manufacturer, part number, part name and equipment name and number(s) for which the part is to be used shall be supplied with the required spare parts. Deliver and store tools and spare parts in a location and method as directed by the Engineer.

C. Spare parts for equipment provided have been specified in pertinent sections of the Specifications. Collect and store spare parts as required in an area to be designated by the Engineer. In addition, furnish the Engineer with an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier, and the delivered cost of each item. Copies of actual invoice for each item shall be furnished with inventory to substantiate the delivery.

2.07 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjacent surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt,
heavy bituminous coatings, nonmetallic separators or washers or other approved materials. Connections of dissimilar piping materials shall utilize dielectric unions, flanges, couplings or bushings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be as shown by skilled mechanics in strict accordance with the respective manufacturer's instruction and recommendations and in the locations shown on the drawings.

B. Coordinate installation with equipment manufacturer requirements and all related work in conformance with the drawings and specifications.

C. Installation and testing of piping and all equipment shall be as specified under the respective sections for the different types of pipe and equipment.

3.02 EQUIPMENT MOUNTS, GROUTING AND VIBRATION ISOLATION

A. Equipment mountings shall be as shown. Where a steel or cast base is shown between the equipment and a concrete pedestal, it shall be painted after fabrication in conformance with applicable provisions of Section 09900: PAINTING. It also shall be equipped with drain pans and drain connections, where applicable.

B. Unless shown otherwise, all concrete plan dimensions for bases or pedestals shall be at least two (2) inches larger in each dimension than the steel or cast base installed thereon. Conduits, piping connections, drains, etc., shall be installed as shown on the drawings, and/or standard mechanical details.

C. Furnish all necessary materials and construct suitable raised concrete foundations for all equipment installed by him, even though such foundations may not be indicated on the drawings. The tips of foundation shall be at such elevation as will permit grouting as specified below.

D. In setting pumps, motors and other items of equipment customarily grouted, make an allowance of at least one inch for grout under the equipment bases. All shims shall be removed. All grout used for setting equipment shall be an approved non-shrink type grout. All pumps, fans, engines, etc., shall be vibration isolated.

E. Where practicable, the grout shall be placed through the grout holes in the base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.

F. Where such procedure is impracticable, the method of placing grout shall be as approved. After the grout has hardened sufficiently, all forms, hoppers and excess grout shall be removed, and all exposed grout surfaces shall be patched in an approved manner, if necessary, given a burlap-rubbed finish, and painted with at least two coats of an approved paint.
3.03 PAINTING

A. Unless otherwise specified herein or elsewhere in these specifications:

1. All motors hoists, drives, pumps and other similar manufactured items shall be shop primed and provided with manufacturer's standard synthetic or baked-on enamel finish paint.

2. Shop Priming: All items constructed of shop or field fabrication steel shall have surface preparation and prime painting performed in the shop by the Contractor in conformance with Section 09900: PAINTING.

B. Galvanizing shall conform to Section 05505: MISCELLANEOUS METALS. Galvanized steel or aluminum equipment and appurtenances shall not be shop primed or painted unless specified otherwise.

3.04 EQUIPMENT START-UP, TESTING, AND ADJUSTMENT

A. Conform to Sections 01650 and 16950.

B. Each facility shall be demonstrated to be in full operating order prior to acceptance. Should any equipment or part thereof fail to operate as intended, it shall be immediately removed and replaced at the Contractor's expense.

**END OF SECTION**
PART 1 - GENERAL

1.01 SCOPE

A. This section includes mounts, supports, and the anchorage for equipment, piping, and accessories.

1.02 QUALITY ASSURANCE

A. Support, anchorage, and mounting of all piping, and equipment shall be provided by the Contractor according to manufacturer’s recommendations, *Uniform Building Code*, and industry standards requirements unless otherwise specified. All elements required to resist the calculated forces described herein or required by the equipment manufacturer shall be provided by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

A. Equipment mountings shall be as shown.

B. Anchor and assembly bolts shall be of ample size and strength for the purposes intended as determined by the equipment manufacturer in accordance with the requirements of this section. Anchor bolt material shall be stainless steel unless otherwise approved, shown, or directed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. EQUIPMENT

1. Each piece of equipment shall be anchored to resist axial as well as lateral forces as required by the latest edition of the Uniform Building Code (UBC), or as required by the manufacturer of the equipment. Unless otherwise approved, anchor bolts shall be sized in accordance with Section 05501. No equipment shall be anchored to vertical structural elements without written approval of the Engineer.

2. Equipment that is not vibration isolated shall be anchored directly to the supporting floor system. In addition to the anchorage, all such equipment shall be internally designed so that all static and moving parts are anchored to the supporting framework to resist the imposed seismic force. All forces must be transmitted to the base in order to be anchored as required. Vibration isolated equipment shall comply with these same requirements.
B. PIPING

1. All piping, raceways, accessories, and appurtenances furnished with equipment shall be anchored to resist a lateral seismic force of 30% of its operating weight without excessive deflection. This force shall be considered acting at the center of gravity of the piece under consideration.

2. Piping with flexible connections and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system.

** END OF SECTION **
SECTION 15100
PLANT PIPING

PART 1 - GENERAL

1.01 SCOPE
A. This section covers all work necessary to furnish and install polyvinyl chloride (PVC) piping, PVC drain piping, ductile iron piping (DIP), Acrylonitrile-Butadiene-Styrene piping (ABS), and piping accessories, as shown on the drawings, and specified herein.

1.02 SUBMITTALS
A. Submittals shall demonstrate full compliance with all aspects of this specification and shall include, but not be limited to, complete manufacturer’s data on pipe material, fittings, and coatings.

Part 2 - MATERIALS

2.01 ABS PIPING
A. Conform to CSSS Section 10-19.4.a.
A. Joints shall be solvent welded.

2.02 PVC PIPING
A. J.M. Eagle pipe is not allowed.
B. Buried fittings for 4-inch and larger diameter pipe shall be cement mortar lined Ductile Iron conforming to CSSS Section 10-28.3.
C. Where glued PVC fittings are used, conform with pipe manufacturer’s requirements.

2.03 DIP PIPING
A. DIP pipe and fittings shall conform to CSSS Section 10-28.3.
B. Unless otherwise directed, provide joint types as shown on the plans.

2.04 FLEXIBLE COUPLINGS
A. Furnish and install flexible couplings where shown on the drawings or otherwise required for the installation. Couplings shall be suitable for minimum working pressure of one hundred fifty (150) psi.
B. Flexible couplings shall be Rockwell (Smith-Blair) Type 411, Dresser Style 38, or equal with the stop removed from the middle ring.
2.05 FLANGE ADAPTERS AND MECHANICAL JOINT RESTRAINTS
A. Provide ductile iron fittings as manufactured by EBBA Iron, Inc., or approved equal.

Part 3 - EXECUTION

3.01 PREPARATION AND HANDLING OF PIPE
A. Inspect all pipe, specials, and interior and exterior protective coatings before installation. Damaged areas, which are repairable in the opinion of the Engineer, shall be patched in the field with material similar to the original. Pipe unable to be repaired shall be removed from the project site and replaced with new, undamaged pipe. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

B. Use proper implements, tools and facilities for the safe and proper protection of the pipe. Carefully handle pipe in such manner as to avoid any physical damage. Do not drop or dump pipe into trenches.

3.02 INSTALLATION OF PIPING
A. GENERAL
   1. ABS piping shall be installed in accordance with CSSS Section 26.
   2. PVC and DIP piping shall be installed as indicated on the drawings and in general conformance with the applicable portions of CSSS Section 27.
   3. All pipe shall be carefully placed and supported at the proper lines and grades and, where possible, shall be sloped to permit complete drainage. Piping runs shown on the drawings shall be followed as closely as possible, except for minor adjustments to avoid structural features. If major relocations are required, they shall be approved by the Engineer.
   4. All flanges shall be set true and perpendicular to the axis of the pipe.
   5. Piping shall be installed without springing or forcing the pipe in a manner which would set up stresses in the pipe, valves, or connected equipment.
SECTION 15135
SUBMERSIBLE PUMPS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Provide new submersible pumps for Sump 146 specifically designed to pump raw unscreened sewage.

B. Furnish and install centrifugal pumps complete with submersible motors, fast-out mountings, pump base elbows, lifting cables, plus all other appurtenances necessary per the pump manufacturer to insure compatibility and warranty integrity.

1.02 QUALITY ASSURANCE

A. Submersible pumps shall be by one manufacturer. Pump design capacities and total dynamic heads for each pump shall be as shown on the plans. Pump model numbers shown on the plans are for the purpose of designating the minimum required characteristics, features, and level of quality. Refer to CSSS Section 5-18 regarding use of alternative pumps.

B. Alternative pumping systems furnished shall be of a design that has been used in at least five (5) similar applications for a minimum of five (5) years with satisfactory performance.

C. Pump manufacturer shall comply with the requirements of the ISO 9001 Quality and ISO 14001 Environmental Management Systems. Such compliance shall be verified by an independent certification agency approved by the International Organization for Standardization.

1.03 SUBMITTALS

A. Submit manufacturer’s catalog cuts, installation instructions, and verification of ISO 9001 and ISO 14001 compliance.

B. Submit shop drawings showing placement of the pumps relative to the wet well manhole center and to the hatch openings.

C. Submit operation and maintenance data. Include maintenance instructions, assembly views, lubrication instructions, and replacement parts lists.

1.04 SERVICES OF MANUFACTURER

A. Furnish the services of a representative of the manufacturer to assist in adjusting and testing the equipment furnished, to supervise in the initial operation, and to make any final adjustments as may be necessary to assure the owner that the pump(s) is (are) in satisfactory operating condition.
B. Furnish sufficient supervision, data, and information from the manufacturer to train operators in the proper operation and maintenance of the pump(s) furnished.

PART 2 PRODUCTS

2.01 GENERAL

A. The pump units shall be explosion proof, designed for continuous operation.

B. Flanges shall be drilled to meet ANSI 125 lb. bolting.

C. Provide pump manufacturer’s standard cast iron fast-out elbows. Permanently mount the bases in the wetwell. Pumps shall be supported by positive interlocking flanges that engage the base flanges by weight of the pump. No portion of the pump shall bear directly on the sump floor or bottom channelization.

D. Provide 316 stainless steel guiderail mounts and rails of the sizes shown to guide the pumps into position, and 316 stainless steel pump lifting cables. Each pump shall be fitted ten (10) feet more stainless steel lifting cable than the installed nutrail to wetwell invert distance. The working load of the lifting system shall be 50% greater than the pump unit weight. Provide swaged thimbles each end of the lifting cables, and coil the excess cable on a nutrail mounted hook.

E. Power cables shall be sized per NEC and ICEA standards with P-MSHA approval. Cables shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant.

2.02 FLYGT PUMPS (Sump 146)

A. Basic design shall be a centrifugal self-cleaning semi-open channel impeller pump for wastewater pumping applications. Each pump motor shall be cooled by submergence in the pumped media.

B. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pump, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

C. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies,
silicones, or other secondary sealing systems shall not be considered equal.

D. Pump motors shall be NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C.

E. The pump and motor shaft shall be a single piece unit extension of the motor shaft fabricated from ASTM A479 S43100-T stainless steel. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two row angular contact ball bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

F. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber.
All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Also unacceptable are shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Seal springs shall be isolated from the pumped media to prevent material packing around them.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

G. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

H. The impeller shall be of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the gray iron impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

I. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

J. Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor.
Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

A. Installation shall be in strict accordance with the manufacturer's instructions and the approved shop drawings.

B. Refer to Sections 15010 and 16950 for additional requirements.

(FLYGT std dimension drawings follow this section for general information)

**END OF SECTION**
NP 3102 MT 3~ 462
Dimensional drawing

[Drawing of dimensional measurements and annotations]

* DIMENSIONS TO ENDS OF GUIDE BARS

<table>
<thead>
<tr>
<th>Weight (lbs)</th>
<th>Pump</th>
<th>Dish</th>
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<tbody>
<tr>
<td>340</td>
<td>60</td>
<td></td>
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Project: Aecom SRCSD
Project ID: Xylec20095917
Created by: [Name]
Created on: 2015-02-09
Last update: 2015-02-09

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CP/DN/NP-3102

NOTES:

1. Configuration and dims. shown are suggested requirements only. All details, including sizing of pit, type, location and arrangement of valves and piping, etc., are to be specified by the consulting engineer and are subject to their approval.

2. Reference generic duplex lift station layout for elevation view.

3. Locate anchor bolts using inside edge of clear opening and pump centerline as reference point. Bolt locations must be held to maintain exact position of pump to clear opening.

4. Flygt mix-flush valve.

Simplex

Duplex

All dimensions are in inches.
SECTION 15140
WATER METERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Install new water meters on existing water services at both sumps in accordance with the installation methods outlined in American Water Works Association Standards M6 - Manual of Water Supply Practices (AWWA), the UPC, and the requirements herein. City will provide the meters to contractor after the meter boxes, meter setters, and backflow preventers have been installed. Water service line replacement from the main, if required at Sump 146, will be considered extra work in accordance with CSSS Section 4-6.

PART 2 – PRODUCTS

2.01 GENERAL

A. Meter box and meter setting equipment shall conform to CSSS Sections 10, 27, and 38 and shall be in accordance with the attached Drawings. Unless otherwise directed, meter boxes shall be Christy B30 boxes with a B30P lid, or equal. The lid shall be furnished with a 1.75" diameter hole with a 4" diameter by \( \frac{1}{8} \)" deep recess centered over the hole to accommodate the City's automated meter reading endpoint and lid lock.

B. Coordinate with Underground Service Alert regarding other utilities prior to locating and exposing the existing water service laterals.

C. Supply all fittings and any additional pipe necessary to complete the meter installations.

PART 3 – EXECUTION

3.01 GENERAL

A. Water main shut downs to turn off the service during the meter installations will not be allowed. Contractor shall be responsible for shutting off the service during the meter retrofit of the water service by freezing, crimping the service, live setting, or utilizing other City and AWWA approved methods.

B. Surface restoration associated with this item shall be in accordance with Section 02740 of these Technical Specifications. Pavement cutting shall be perpendicular and parallel to the centerline of the road. Saw cut, and replace existing sidewalk and/or surfacing as required to install the meters.

C. Lay out the systems in careful coordination with the drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system.
D. Follow the general layout shown on the drawings except where other work may interfere.

E. Installation and connection of water systems shall be performed in accordance with all applicable sections of the latest revised Uniform Plumbing Code (UPC). All underground work shall be inspected prior to backfilling.

(City Drawings W-402R & W-402RE follow and are part of this Section.)

**END OF SECTION**
SIDEWALK INSTALLATION

ALLEY INSTALLATION

PLAN VIEW

METER OR IDLER AND SETTER
(MUELLER B2434 N, 1x12 FULL PORT OR EQUAL)

CENTER METER BOX IN SIDEWALK AREAS

8" MIN, 12" MAX. IF
SIDEWALK IS NOT PRESENT.

EXISTING CURB
AND GUTTER

PROVIDE BRICKS FOR METER
BOX SUPPORT (ALL AROUND)

SEE NOTE 2
TO CITY WATER MAIN

IF EXISTING PIPE IS
GALVANIZED OR PLASTIC,
REPLACE WITH TYPE K
COPPER OR HDPE WATER
SERVICE

IF EXISTING COPPER
SERVICE, PLACE
COUPLING AND COPPER
PIPE TO SETTER

EXISTING SERVICE, PLACE
COUPLER AND COPPER
PIPE TO SETTER

RESIDENTIAL WATER
SERVICE TO HOUSE
HOSE BIBB

AMM

CLASS 2
AGGREGATE BASE

POINT OF SERVICE

DEPT OF EXISTING
SERVICE MAY VARY

NOTES:

1. STRAIGHT METER VALVE MAY BE USED IN LIEU OF
METER SETTER ON SERVICES WITH 20" OR LESS OF COVER.

2. 6 MIL POLYETHYLENE WRAP WITH 10 MIL TAPE SHALL BE REQUIRED
ON COPPER TUBBING.

3. IF THERE IS LESS THAN 3 FEET FROM THE (E) CS TO THE BOW,
THEN THE (E) WATER SERVICE BETWEEN THEM SHALL BE REPLACED
PER CITY STANDARD.

CITY OF SACRAMENTO
DEPARTMENT OF UTILITIES

RETROFIT OF 1-INCH WATER SERVICE
WITHIN SIDEWALKS & ALLEYS

REV. DATE DESCRIPTION

APPR’D BY:

DATE:

NO SCALE

DWG. NO. W-4028

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NOTES:
1. STRAIGHT METER VALVE MAY BE USED IN LIEU OF METER SETTER ON SERVICES WITH 20° OR LESS OF COVER.
2. 6 MIL POLYETHYLENE WRAP WITH 10 MIL TAPE SHALL BE REQUIRED ON COPPER TUBING.
3. IF THERE IS LESS THAN 3 FEET FROM THE (E) CS TO THE METER SETTER, THEN THE (E) WATER SERVICE
   BETWEEN THEM SHALL BE REPLACED PER CITY STANDARD. WHERE THE CS IS OUTSIDE OF THE EXISTING EASEMENT,
   THE (E) WATER SERVICE BETWEEN THE (E) CS AND METER SETTER SHALL BE REPLACED, AS PERMITTED BY THE
   PROPERTY OWNER.
4. WATER MAIN LOCATION AND DEPTH WILL VARY FOR EACH SERVICE. CONTRACTOR SHALL INSTALL THE WATER METER
   WITHIN THE EXISTING UTILITY EASEMENT WHICH MAY INCLUDE INSTALLING THE NEW METER ON TOP OF, OR BEHIND,
   THE EXISTING WATER MAIN IN ORDER TO KEEP THE PUBLIC FACILITIES WITHIN THE EASEMENT.
5. WHERE THE CURB STOP IS LOCATED OUTSIDE THE EXISTING EASEMENT, THE EXISTING CURB STOP SHALL REMAIN
   IN PLACE UNLESS OTHERWISE DIRECTED BY ENGINEER.
6. ORIENTATION OF THE METER AND METER BOX SHALL BE PERPENDICULAR TO THE WATER MAIN UNLESS OTHERWISE
   DIRECTED BY ENGINEER.
7. UNLESS OTHERWISE NOTED ON THE PLANS OR SPECIFICATIONS, OR DIRECTED BY THE ENGINEER, CONTRACTOR
   SHALL ASSUME THE EXISTING EASEMENT STARTS AT THE FENCE LINE.
8. NUMBER OF FITTINGS USED TO COMPLETE RETROFIT MAY VARY BASED ON (E) WATER MAIN LOCATION, EASEMENT
   WIDTH, AND CONFLICTS FOUND ON-SITE.
9. WHERE METERS ARE INSTALLED WITHIN HARDSCAPE (SUCH AS SIDEWALK BRICKS OR CONCRETE), FILL UNDER METER
   SHALL BE CLASS 2 AGGREGATE BASE.
SECTION 15200

VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 SCOPE

A. This section covers all work necessary to furnish and install, complete and operable, valves and appurtenances as shown on the drawings and specified herein, and as referred to in Section 15100: Plant Piping.

B. Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.02 SUBMITTALS

A. Provide a submittal for all proposed valve types to be furnished. Submittals shall demonstrate full compliance with all aspects of this specification.

1.03 REFERENCE STANDARDS

A. The standards listed below are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<table>
<thead>
<tr>
<th>References</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWWA C509</td>
<td>Resilient Seated Gate Valves for Water and Sewerage</td>
</tr>
<tr>
<td>AWWA C550</td>
<td>Standard For Protective Coatings for Valves</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall be suitable for the intended application. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended.

B. Valves shall be furnished full-line size unless specifically called out to be of reduced size. Flanges for valves may be raised or plain face. Flanges for valves shall be faced and drilled to Class 150 dimensions per ANSI B16.1. All valves shall have a minimum pressure rating of 150 psi, unless otherwise indicated.

C. Unless otherwise specified, the interior and exterior surfaces of all iron-body valves shall be epoxy coated. Valve Manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment. Valve flange faces shall not be epoxy coated.

D. Cast name of manufacturer and size of valve on body or bonnet or show on a
permanently attached label in raised letters. Label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, permanently attached to the valve or on the wall adjacent to the valve as approved by the Engineer.

2.02 GATE VALVES

A. Gate valves 3-inch and larger shall be resilient seated types to conforming to AWWA Standard C-509. The valves shall be suitable for a design working water pressure of 200 psig, with flanged, bell and spigot, or mechanical joint ends as indicated. Valve body, bonnet, and wedge/disc, shall be constructed of ductile iron. The exterior of the iron wedge shall be fully encapsulated with rubber. Buried valves shall be non-rising stem with a 2" square nut. Above-ground valves shall be rising stem with handwheel. All internal and external surfaces of the valve body and bonnet shall have a fusion bonded epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly. Body and bonnet wall thickness shall be equal to or greater than the minimum wall thickness as listed in Table 2 of ANSI/AWWA C509. The stem, stem nuts, glands, and bushings shall be of bronze, with the stem seal per ANSI/AWWA C 509. Gate valves shall be Series 2500 manufactured by American Flow Control, or equal.

B. Gate Valves smaller than 3-inch, for general purpose use, shall be non-rising stem, heavy-duty type for industrial service, with screwed or soldered ends to match the piping. The bodies shall have union bonnets of bronze conforming to ASTM B 62 - Composition Bronze or Ounce Metal Castings. The stems shall be of bronze conforming to ASTM B 62, or ASTM B 371 - Specification for Copper-Zinc-Silicon Alloy Rod. The solid wedges shall be of bronze conforming to ASTM B 62. The valves shall have malleable iron hand wheels, unless otherwise indicated, and stem seals shall be of Teflon-impregnated or other acceptable non-asbestos packing.

2.03 SWING CHECK VALVES

A. Provide swing check valves with a cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, non-asbestos gasket, outside lever and weight, suitable for installation in a horizontal position, or in a vertical position with upward flow. Valves shall be Mueller Catalog No. A-2600-6-02, Clow Catalog No. F-5380, or approved equal.

2.04 KNIFE GATE VALVES

A. Knife gates for use in the valve vaults shall be hand wheel operated, full round ported, resilient seated, bonnetless type valves, with either cast type 316 stainless steel bodies, or cast iron bodies with type 316 stainless steel liners. All wetted parts shall be made of type 316 stainless steel. Knife gates for use in the wetwell shall be furnished with a 2-inch square operator nut.

B. The resilient seat shall be a molded or extruded elastomer with an internal stainless steel rod for stiffening. Seat retainers shall be provided in the lower half of the body to retain the seat and guide the gate.

C. Packing gland shall be provided with sufficient gland bolts to provide even tightening of the packing. Packing shall be Teflon lubricated synthetic packing with a
minimum of 4 rows of packing. Packing gland bolts, studs and nuts shall be type 304 stainless steel.

D. Valve stem shall be 304 stainless steel with full ACME threads. The lifter shall be cast 304 stainless steel, welded to the stem and be a two horizontal bolt design. Stem nut shall be bronze.

E. Provide DeZurik type “KGL”, Red Valve series “G”, or approved equal valves.

F. For wetwell valves, provide an operator stem extension, stem guides, and all appurtenances to allow valve operation from the top of the wet well by use of a T-handled wrench. With the exception of the valve, all materials within the wet well shall be type 316 stainless steel, including anchor bolts. Stem guides and stem extension shall be sized in accordance with the valve manufacturer’s requirements. Locate the 2-inch square operating nut on the stem extension centered beneath the removable plate in the basin cover.

2.05 ACCESSORIES

A. Provide cast iron valve cover boxes for buried service valves capable of withstanding H20 loading complete with all necessary bases and accessories. Provide bolt-down covers utilizing type 304 stainless steel bolts. If required provide extension piece to bring the 2-inch square operating nut to within 6 inches of the ground surface. Extension shall be as recommended by the valve manufacturer.

2.06 LINK SEALS

A. Where shown on the plans, link seals and compatible wall sleeves shall be provided for wall penetrations. Wall sleeves shall include a weep ring as shown. Manufacturers recommended service designation shall apply unless noted otherwise. Where exposed to wastewater, wall sleeve and all wetted parts shall be 316 stainless steel.

B. Link seals shall consist of linked rubber sealing elements and pressure plates tightened together with bolts. Link seals shall be as manufactured by Thunderline Corporation, or equal.

PART 3 - EXECUTION

3.01 PLACING

A. General: All valves and shutoff assemblies shall be installed in a workmanlike manner in strict accordance with the manufacturer’s recommendations.

B. Brace to prevent warpage under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

C. Buried iron body valves shall be wrapped in 8-mil polyethylene wrap per ANSI/AWWA C105/A21.5 prior to being backfilled.

** 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. Attention is directed to the requirement for proper coordination of the work of Division 17.

C. Provide electrical work for complete and operable bypass pumping including all pump controls and manhole high level alarms per Section 01920.

D. Vendor supplied electrical equipment and control panels, such as the Booster Pump system, shall meet requirements of Division 16 and Division 17.

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 ductbanks, handholes, and equipment housekeeping pads.

F. Provide all utility work shown on Contract Drawings, and per SMUD Drawings, Specifications and Standards. Coordinate with the Sacramento Municipal Utility District (SMUD). Work includes, but is not limited to, secondary conduits and conductors, service pole riser, Utility Meter, and required grounding and bonding. The City will pay all SMUD fees.

G. Allow time at PLC Panel Factory Acceptance Testing for verification of PLC program with hardwired wiring and software registers. Coordinate with and assist City with field testing of PLC programming in both local and Supervisory Control and Data Acquisition (SCADA) remote modes.

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. NETA – International Electrical Testing Association
   3. NFPA 820 – National Fire Protection Association
4. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)
5. Title 8, Subchapter 5, California Administrative Code – Electrical Safety Orders

B. All electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL), or by an independent testing laboratory acceptable to the local code enforcement agency having jurisdiction.

C. Installation of electrical equipment and materials shall comply with Occupational Safety and Health Administration (OSHA) Safety and Health Standards, state building standards, and applicable local codes and regulations.

D. Where the requirements of the specifications conflict with UL, National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA), or other applicable standards, the more stringent requirements shall govern as approved by the local authority having jurisdiction.

1.03 SIGNAGE

A. Provide danger, caution, and warning signs and equipment identification markings in accordance with applicable federal, state, 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 and Section 16341. 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 Junction Boxes – Each local disconnect switch or Junction Box for motors, and other equipment, shall be legibly marked to indicate its purpose. Phenolic tag to have minimum ¼-inch lettering. Inscription to include equipment name, equipment tag number, and the source of power.

3. Equipment Nameplates – Provide engraved phenolic equipment nameplates on all electrical and instrumentation equipment. Nameplate to be inscribed with equipment name and equipment tag number, at a minimum.

4. Warning Signs:
   a. Provide signs near equipment that can start automatically, including sewage lift pumps (at NEMA 7 Junction Boxes) 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. Ductbank 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

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Electrical Work, General

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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. “Ductbanks” 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 ductbanks and trenches. Provide physical locations with width and depth call outs.

1.08 CONTRACTOR 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. Provide separate submittals for the following equipment per facility, i.e. Sump 40 submittals must be separate from the Sump 146 submittals.

3. 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.

4. Submit listing of equipment nameplates complete with inscriptions for review.

5. Check submittals for proper number of copies, adequate identification, correctness and compliance with Drawings and Specifications.
6. Submit Operation and Maintenance (O&M) Manuals per Section 01770.

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: Panelboard. 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 Sections 16010 and 16011.

2. Table 1 lists the type of Electrical Equipment and Materials to be used based on applied area in Table 2.
### Table 1
**Electrical Equipment and Materials**

<table>
<thead>
<tr>
<th>Applied Area Classification</th>
<th>Enclosure, Pullbox or JBox 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 Corrosive and Class 1, Div 1 Hazardous</td>
<td>NEMA 7</td>
<td>Not Allowed</td>
<td>316 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>Galvanized Rigid Steel</td>
<td>PVC Sch 40</td>
</tr>
<tr>
<td>Exterior Corrosive and Class 1, Div 2 Hazardous</td>
<td>NEMA 4X (non-sparking) NEMA 7 (sparking)</td>
<td>PVC Coated Cast Steel</td>
<td>304 Stainless Steel</td>
<td>PVC Coated Galvanized Rigid Steel</td>
<td>PVC Sch 40</td>
</tr>
</tbody>
</table>

3. Table 2 identifies Area Classifications.

### Table 2
**Areas Classifications By Building/Facility and Room**

<table>
<thead>
<tr>
<th>Building/Facility</th>
<th>Room</th>
<th>Area Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewage Lift Station (SLS)</td>
<td>Interior of SLS Wetwell</td>
<td>Interior Corrosive and Class 1, Div 1</td>
</tr>
<tr>
<td></td>
<td>Outside of SLS Wetwell (18” high extended 3’ from hatch edge)</td>
<td>Exterior Corrosive and 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 strictly to the requirements of the National Electrical Code and NFPA 820.

**B. Material Requirements**

1. NEMA 4 and 12 enclosures shall be steel coated with ANSI 61 light grey paint.

2. NEMA 4X 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 75 miles of project site. If Factory Acceptance Testing is greater than 75 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 two weeks 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. 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.

G. Underground – Buried in ground, including under building slabs.
H. 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 grey color, except Sump 40 Panelboard which shall be tan. Provide two spray cans of touchup paint, for each color. Some exterior equipment shall have further finish applied, refer to individual 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. Incidental: Provide all materials and incidental required for a complete and operable system, even if not required explicitly by the Specifications or the Drawings. Typical incidental 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. Seismic sill leveling channels embedded in the concrete pad shall be installed for the Panelboard. Refer to Contract Drawing Detail EM.

C. 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. 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 MOTOR ROTATION

A. After final service connections are made, check and correct the rotation of all motors.

B. Coordinate rotation checks with the Engineer and supplier responsible for the driven equipment for their witnessing.

### 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.

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 Section 01650 – Facility Startup for further testing requirements.

B. Perform miscellaneous electrical testing and provide results to third party testing organization for evaluation and inclusion in testing submittal.

1. Miscellaneous Testing:
   a. Demonstrate that loads are powered by named breaker per Panelboard schedule and drawings.
   b. Test photocells for exterior light circuits.
   c. Test Ground Fault Circuit Interrupter (GFCI) receptacles.

C. Pre Demonstration period for electrical work shall include 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. Perform Pre Demonstration Testing per Section 01650 – Facility Startup.

D. Demonstration period for electrical work shall include 7 day functional testing of sewage lift station pumping system. Perform Demonstration Testing per Section 01650 – Facility Startup.
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.

1.02 CONTRACTOR SUBMITTALS
   A. General: Submittals shall be furnished in accordance with Section 01105 and Section 16050 – Electrical Work, General.
   B. Shop Drawings: Complete catalog cuts of all raceways, fittings, boxes, supports, and mounting hardware, marked where applicable to show proposed materials and finishes.
   C. Tags and Inscriptions: Contractor to provide conduit tags and inscriptions. Submit tag materials and inscription schedules for approval.

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.
   B. Demonstrate to the Engineer that the approved manufacturer’s recommended installation tools and methods are being utilized on the job site by all persons engaged in the installation of PVC-coated rigid steel conduit, elbows, nipples, and fittings. These tools and methods shall include, but not be limited to, clamp inserts for use on power-driven units of chain vises, new die heads and enlarged pipe guides in conduit threading machines, and strap wrenches and extra wide wrench jaws for use in conduit assembly.

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. Set screw type couplings, bushings, elbows, nipples and other 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 CONDUIT

A. Rigid Galvanized Steel (RGS) Conduit
   1. Rigid steel conduit shall be mild steel, hot-dip galvanized inside and out.
   2. Rigid steel conduit and all appurtenances shall be manufactured in accordance with ANSI C80.1 – Rigid Steel Conduit, Zinc Coated, and UL-6.
   3. Manufacturers, or equal:
      a. Allied Conduit
      b. Western Tube and Conduit

B. Rigid Non-Metallic (PVC) Conduit
   1. 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.
   3. Conduit shall be marked for use with conductors having 90° C insulation.
   4. Provide PVC conduits for primary and secondary electrical service as required by the Sacramento Municipal Utility District.
   5. Manufacturers, or equal:
      a. Carlon Plus Rigid PVC
      b. PW Pipe

C. Rigid PVC Coated Galvanized Steel (PVCRGS) Conduit
   1. The conduit, prior to PVC coating, shall meet the requirements for RGS conduit above.
   2. A 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.
   3. 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.
4. PVCRGS shall be manufactured in accordance with the following standards:
   a. UL-6
   b. ANSI C80.1
   c. NEMA RN1 – PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
   d. Federal Specification WW-C-581E.
5. Conduits shall be suitable for conductors with 75° C insulation.
6. Manufacturers:
   a. Robroy Plasti-Bond Red
   b. Occidental Coating Company OCAL-Blue Double-Coat
   c. Perma-Cote Industries Supreme Conduit
D. Stainless Steel (SSC) Conduit
   1. Stainless steel conduits, couplings, and fittings shall be UL listed manufactured with 316 grade stainless steel.
   2. Manufacturers, or equal:
      a. Crouse-Hinds RCOND xxx 316SS, RCxxx316SS
E. Liquidtight Flexible Metal Conduit
   1. Liquidtight flexible metal conduit shall be constructed of a flexible galvanized metal core with a sunlight resistant thermoplastic outer jacket.
   2. Liquidtight flexible metal conduit shall be manufactured in accordance with UL-360 - Steel Conduits, Liquid-Tight Flexible.
   3. Conduits shall have insulated throat and stainless steel sealing O-ring.
   4. Manufacturers, or equal:
      a. Anaconda, "Sealtite" Type UA
      b. Electriflex, "Liquatite" Type LA
F. Explosionproof Flexible Metal Conduit
   1. Explosionproof flexible conduit shall conform to requirements of Class I, Division 1 hazardous atmospheres per NEC Articles 500 series.
   2. 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.
3. Provide special lengths and conduit size as noted on Contract Drawings. For example gas analyzer cable shall be encased in $\frac{1}{2}''$ by 84" long explosionproof flexible metal conduit.

4. Manufacturers, or equal:
   a. Crouse-Hinds #ECGJH Series

G. Electrical Metallic Tubing and Intermediate Metallic Conduit will not be accepted.

2.03 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 Rigid Steel 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: Thomas & Betts 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 seal, insulated throat and ground bonding locknut. Acceptable products: 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. Straight, 45 degree and 90 degree fittings shall be used where applicable.

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

1. All fittings for use with rigid non-metallic conduit shall be PVC, solvent welded type.

2. Provide all welding solvent as required for installation of non-metallic conduit and fittings.

3. Manufacturers, or equal:
   a. Carlon
   b. Crouse-Hinds

E. Fittings and Conduit Bodies for PVC Coated Rigid Steel Conduit

1. Use insulated throat grounding bushings for PVC Coated Rigid Steel conduit. Provide threaded zinc-plated malleable iron grounding bushings with bonding screw and insulated throat rated for 150° C. Acceptable products include: Thomas & Betts Grounding and Bonding Bushings, OZ Gedney Type BLG, Appleton Threaded Grounding Bushings, or equal.

2. Watertight and corrosion resistant hubs for PVC Coated Rigid Steel 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, Occidental Coating Company OCAL-Blue Double-Coat Type ST Hub, or equal.

3. For conduit bodies for use with PVC Coated Rigid Steel conduit, sized as required by the NEC, use cast iron conduit bodies and covers with captive stainless steel screws, a 40 mil minimum PVC exterior coating and nominal 2 mil internal urethane coating, and pressure sealing sleeves on all conduit openings. Acceptable products include: Robroy Plasti-Bond Red Form 8 Conduit Bodies, Occidental Coating Company OCAL-Blue Double-Coat Form 8 Conduit Bodies, Perma-Cote Industries Supreme Form 8 Conduit Bodies, or equal.
2.04 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 number of conductors enclosed in the box.

B. Boxes shall conform to NEMA ICS6 Type 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. Device boxes shall be OZ Gedney FD Series, Crouse-Hinds FD Series, Appleton FD Series, Occidental Coating Company OCAL FD Series, or equal.

C. Where boxes larger than outlet or device boxes are required for junction of pull boxes, provide the following:

1. Utilize NEMA 4 watertight and raintight enclosures for outdoor locations or where the subscript WP (weatherproof) is indicated at the box location on the Drawings. Furnish 14-gauge or 16-gauge steel enclosures with continuously welded seams, continuous door hinge, external fast operating clamp cover, external mounting feet, oil-resistant gasket and adhesive, and a polyester powder coating inside and outside. Acceptable products include: Hoffman Bulletin A51NF Boxes, or equal.


2.05 NEMA 7 JUNCTION BOXES AT WET WELL

A. Provide explosionproof, cast aluminum, Junction Boxes for various conduits and cables leaving the Wet Well. Junction Boxes shall be rated NEMA 7, for Class 1, Division 2 environments. Junction Boxes shall be hinged covers, O-ring gasket, with stainless steel mounting feet.

B. Junction Boxes shall have nominal, minimum interior dimensions of 12" x 12" x 8" and 12" x 24" x 8", or larger as required based on number of conduits and NEC.

C. Provide space for submersible pump cable splices (Polaris IT Series) within NEMA 7 Junction Boxes, including both power and control conductors.
Provide cord grip fittings within NEMA 7 Junction Boxes, for each manufacturer cable leaving box going to wetwell. Provide a complete loop of manufacturer cable within each NEMA 7 Junction Boxes for each manufacturer cable.

D. Junction Boxes shall be Appleton AJBEW Cast Junction Boxes, Model No. AJBEW121208 and AJBEW122408, or approved equal.

2.06 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. 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.

B. Seal fittings acceptable products include: PVC coated galvanized rigid steel Crouse-Hinds Type EYS (horizontal) and EYD (vertical) series, or equal.

C. Sealing compound used for seal fittings shall be rated for hazardous area. Acceptable products include: Chico A with Chico X fibers, or equal.

D. Unions shall be electrogalvanized ferrous alloy type. Acceptable products include: Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal.

2.07 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.

2.08 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.

2.09 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.

2.10 CONDUIT PénéTRATION 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.

2.11 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.

2.12 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.

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 concrete capped where three or less conduits in common trench, or encased in non-reinforced concrete where ductbanks contain four or more conduits. Ductbank conduits shall be supported with conduit spacers installed every five feet, refer to Section 16111 for specification. Provide a minimum cover of two feet over the top of conduit for all underground raceways.

D. 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.

H. Support

1. 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.

2. 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.

I. Bends

1. 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.

2. 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.

3. For PVC Schedule 40 and Schedule 80 conduits, use factory made elbows for all bends 30 degrees or larger.
4. Make no bends in flexible conduit that exceed allowable bending radius of the cable to be installed or that significantly restricts the conduits flexibility.

J. Insulated Throat Grounding Bushings and Conduit to Enclosure Connections

1. 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.

2. 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.

K. PVC Schedule 40 Conduit: Solvent weld PVC conduit joints with solvent recommended by the conduit manufacturer. Follow manufacturer’s solvent welding instructions and provide watertight joints. Use acceptable PVC terminal adapters when joining PVC conduit to metallic fittings. Use acceptable PVC female adapters when joining PVC conduit to galvanized rigid metal conduit or PVC coated rigid steel conduit.

L. PVC Coated Rigid Steel Conduit: Install in strict accordance with the manufacturer’s instructions. 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.

M. Penetrations

1. Conduits shall not be cast as part of cast-in-place structures. Cast-in-place structures shall include sleeves, and conduits shall pass through the sleeves to penetrate the structures. Coordinate sleeve installation with structural work.

2. 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.
3.02 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 ductbank to exposed conduit. Conduit shall emerge from the ductbank 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.

3.03 REQUIRED RACEWAY TYPE FOR SPECIAL LOCATIONS AND INSTALLATION METHOD

A. Provide 316 stainless steel conduit and fittings at Class 1, Division 1 classified areas and where called out on Contract Drawings. Sanitary Sewage Lift Station (SLS) wetwell are considered Class 1 Division 1 areas. Refer to National Electrical Code Article 500 for raceway requirements. Size conduits per NEC based on submitted and approved manufacturer cable, or as shown on Contract Drawing, whichever is larger.

B. Provide PVC coated GRS conduits and fittings at Class 1, Division 2 classified areas. Outside of Sanitary Sewage Lift Station (SSLS) wetwell extending 18" above top of wetwell and measured out 3’ from hatch opening is considered Class 1 Division 2 areas. Refer to National Electrical Code Article 500 for raceway requirements. Size conduits per NEC based on submitted and approved manufacturer cable, or as shown on Contract Drawing, whichever is larger.

C. Final Connection to Certain Equipment: Make final connection to motors, instrumentation and other equipment where flexible connection is required to facilitate removal or adjustment of equipment with liquidtight flexible metal conduit. Liquidtight flexible metal conduit shall be of 12-inch minimum to 24-inch maximum lengths, unless otherwise approved by the Engineer.
3.04 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.

3.05 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.

3.06 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.

3.07 NEMA 7 JUNCTION BOXES AT WET WELL

A. Install in accordance with all the requirements described above for junction boxes and enclosure materials. Label each Junction Box with a permanently attached nameplate.

3.08 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.

3.09 CONDUIT IDENTIFICATION

A. All conduits shall be identified with minimum of two labels, one at either end. Labels shall be permanent, waterproof, legible, and attached with stainless steel wire.

B. All conduit labels shall be provided with submitted and approved inscription. Conduits shall be labeled prior to pulling cables and prior to beginning Pre Demonstration period.

END OF SECTION
SECTION 16111 - UNDERGROUND RACEWAY SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide underground 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 CONTRACTOR SUBMITTALS

A. General: Submittals shall be furnished in accordance with Section 01105 and Section 16050 – Electrical Work, General.

B. Shop Drawings: Complete catalog cuts of all underground raceway systems, including transformer pads, handholes, conduits, ductbanks, trenches, etc.

C. Tags and Inscriptions: Provide handhole labels and conduit tags with inscriptions. Submit label and tag materials and inscription schedules for approval.

D. Underground raceway system shall be documented on Raceway Routing Drawings to be submitted and approved as-built for record drawings. Refer to Section 16050 – Electric Work, General. Provide surveyed as-built drawings of all installed ductbanks providing top-of-ductbank elevation, ductbank width, handholes, and routing. Include cross-section information for all ductbank sections.

PART 2 - PRODUCTS

2.01 GENERAL

A. Handholes, conduits and fittings which are dedicated to the underground raceway system shall comply with the requirements of this Section.

2.02 SMUD SUBSTRUCTURES

A. Provide all substructure preparation and compaction as required per SMUD standards.

B. Provide and install secondary conduits per SMUD standards.

C. Provide and install grounding and bonding system at Utility Meter per SMUD standards.
2.03 HANDHOLES

A. Handholes and special marking covers shall be designed for AASHTO M309 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 for electrical or control shall have identification letters one-inch high and ¾-inch wide minimum, indicating “ELECTRIC” or “SIGNAL”, as applicable. Handhole numbers, as shown on Contract Drawings, shall be inscribed on one-inch high and ¾-inch wide plastic phenolic nameplates. Nameplates shall be epoxy glued to cover.

C. Where conduits enter the side of the handhole, install flush with the interior of the handhole.

D. Acceptable products include: Christy Concrete B1017, B1324, or B1730 with extensions, check plate hot dipped galvanized cover, and security bolts, or approved equal. Provide with identification lettering and inscribed handhole tag number nameplate on cover.

2.04 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 ductbanks, colored red.

D. Refer to Section 16110 – Electrical Raceway Systems for PVC conduit specification. Provide end bells on all conduit ends.

E. Conduit spacers shall be Carlon Snap-Loc Spacers, or equal, with minimum 1-1/2” duct separation.

2.05 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.

PART 3 - EXECUTION
3.01 GENERAL

A. Underground conduits for SMUD shall be inspected by SMUD.

B. All conduits located underground shall be non-reinforced concrete encased ductbanks or concrete capped. Install conduit spacers in for all underground ducts to prevent movement during concrete placement. Install spacers at five foot on center intervals for ductbanks and eight foot center for concrete capped conduits. Provide a minimum cover of two feet over the top of conduit for all underground raceways.

C. Do not concrete encase underground raceways until they have been inspected by the Engineer. Do not backfill concrete encased ductbanks until they have been inspected by the Engineer.

D. Warning Tapes: Bury warning tapes approximately 16-inches above top-of-conduits in all underground conduit runs or duct banks. Align parallel to and within six inches of the centerline of runs that are 12-inches wide or less. Provide two tapes and align parallel to and within six inches of the centerline of each side of runs that are more than 12-inches wide. Provide three tapes and align parallel to and within six inches of the centerline of each side of runs that are more than 30-inches wide.

3.02 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.

3.03 DUCTBANKS AND TRENCHING

A. Separation and Support

1. Separate parallel runs of four or more raceways in a single trench with preformed, nonmetallic spacers designed for the purpose. Install conduit spacers at intervals of five feet.

2. 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. Arrangement and Routing

1. Arrange multiple conduit runs substantially in accordance with any details shown on the drawings.
2. 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.

3. 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.

4. Ductbank 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.

5. Provide bell-ends on all PVC conduits entering handholes, stubbing up into transformer precast pad, and under open bottom floor mounted panelboards.

C. Concrete Encasement and Concrete Cap

1. Encase or cap all underground conduits with red colored concrete per Section 03300.

2. Hold conduits for concrete-encased raceways securely in place by conduit spacer supports.

3. 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.

4. Do not use power-driven tampers or agitators unless they are specifically designed for the application.

5. 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 T 180.
3.04 HANDHOLES
A. Provide excavation, backfilling, compaction and grading, etc., in accordance with requirements specified in Contract Documents.

B. Do not install handholes until final conduit grading, including field changes necessitated by underground interferences, 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.

3.05 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.

B. Install conduits for use in secondary electrical service in accordance with SMUD requirements.

3.06 CONDUIT IDENTIFICATION
A. All underground conduits shall be identified with minimum of two labels, one at either end. Labels shall be engraved phenolic, red with white lettering, and attached with black nylon cable tie, Ty-Rap or equal.

B. All conduit labels shall be provided with submitted and approved inscription. Conduits shall be labeled prior to pulling cables and prior to beginning Pre Demonstration period.

C. Where conduits enter the side of the handhole, provide a phenolic tag that is epoxied to the interior of the handhole.

3.07 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.

3.08 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.

3.09 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.

END OF SECTION
SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide wires and cables, complete and operable, in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATION, CODES, AND STANDARDS

A. Reference Codes: All work specified herein shall conform to or exceed the applicable requirements of the National Electrical Code (NEC); provided that, where a local code or ordinance is in conflict with the NEC, the provisions of said local code or ordinance shall take precedence. For additional requirements, see Section 16050 – Electrical Work, General.

B. Commercials Standards

2. ANSI/NFPA 70 National Electrical Code.
3. ICEA S-95-658 Insulated Cable Engineers Association
4. NEMA WC70 National Electrical Manufacturers Association

1.03 CONTRACTOR SUBMITTALS

A. General: Submit Shop Drawings in accordance with Section 01105 and Section 16050 – Electrical Work, General.

B. Shop Drawings

1. Product Data: Provide complete catalog cuts of all cables, wires, terminations, splices, fittings, identification systems, and tape. This applies to vendor-supplied cables including sewage lift pumps, gas analyzers, float switches, and flow meter.

2. Test Reports: Indicate results of the cable test with terminations and splices installed in tabular form and in plots of current versus voltage for incremental voltage steps, and current versus time at 30-second intervals at maximum voltage.

C. Tags and Inscriptions: Contractor to submit overall cable tag and individual wire tags. Submit tag materials and inscription schedules for approval.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section and with a minimum of 15 years of documented experience.
1.05 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 on site in manufacturer’s packaging. Inspect for damage.
C. Store and protect in accordance with manufacturer’s instructions.
D. Protect from weather. Provide adequate ventilation to prevent condensation.

PART 2 - PRODUCTS

2.01 GENERAL
A. All conductors, including grounding conductors, shall be stranded copper. Aluminum conductor wire and cable will not be permitted. Insulation shall bear the UL label and the manufacturer’s trademark, and shall identify the type, voltage, and conductor size. All conductors (except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment such as motors and controllers) shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400, and fixture wires shall conform to Article 402. The use of the manufacturer’s name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

2.02 LOW VOLTAGE WIRE AND CABLE
A. Power and Lighting Wire:
1. All power and lighting circuits wire shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations.
2. All insulated ground wires shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations, and colored green.
3. Acceptable products include: Okonite X-Olene XHHW-2, or equal.
B. Single Conductor Control Wire:
1. Single conductor control wires shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations.
2. Acceptable products include: Okonite X-Olene XHHW-2, or equal.
3. Control wires within panels or cabinets shall be as specified in Section 16485 – Local Control Stations or Section 17200 – Control Panels, respective to type of panel or cabinet.

C. Instrumentation Cable:

1. Instrumentation cable shall be rated at 600 volts, 90°C wet or dry locations. Individual conductors shall be No. 16 AWG stranded copper. Insulation shall be color-coded polyethylene, black and white. Instrumentation cables shall be composed of the individual conductors, an aluminum polyester foil tape with 100-percent coverage, stranded tinned copper drain wire, and a PVC outer jacket with a thickness of 0.045 inches. Cable shall meet UL 1277 standards.

2. Acceptable products include: Okonite Okoseal-N Type P-OS Type TC Instrumentation Cable, or equal.

2.03 COMMUNICATION CABLES

A. CAT 6: Provide Category 6 cables per IEEE 802.3 and TIA/EIA-854. Cables shall be 23 AWG bare copper wire insulated with polyolefin or similar. Two insulated conductors twisted together to form a pair and four such pairs cabled around a cross filler to form basic unit which is injected with a water resistant compound and jacketed with UV resistant polyethylene jacket or similar. Suitable for Power Over Ethernet. Jacket shall be printed with sequential footage. Acceptable Products: Belden DataTwist 2400, or equal.

2.04 DIRECT BURIED GROUNDING CONDUCTORS

A. Provide bare concentric stranded copper conductors conforming to ASTM B-8, size as indicated on the drawings, or minimum size as specified in Section 16450 – Grounding, for the ground system at ground grids, transformers, panelboards, and where indicated.

B. Acceptable Products: Southwire Bare Copper Wire, or equal.

2.05 ANTENNA CABLE, CONNECTORS AND WEATHERPROOFING

A. Antenna cables shall be 1/2" coaxial or larger as required by acceptable signal loss calculations.

B. Provide all antenna cable connectors and weatherproof connection kit, and miscellaneous hardware for complete and operable radio system.

C. Provide sealed fitting at top of antenna mast to prevent water entrance into conduit.
D. Acceptable Products:

1. Antenna Cable: Andrew 1/2-inch Heliax Model LDF4-50A, or approved equal. Connectors by Andrew, or approved equal.

2. Coaxial Connectors: As required and not limited to; Andrew Model F4PNF-C, F4PNM-C, or approved equal.

3. Connector weatherproofing: Commscope Part No. 245174, or approved equal. Provide 6” of weatherproofing on either side of connector.

2.06 600V Cable Termination

A. Compression connectors shall be Burndy "Hi Lug", Thomas & Betts "Sta-Kon," or equal. Threaded connectors shall be split bolt type of high strength copper alloy.

B. Pressure type, twist-on connectors are only acceptable for light and receptacle circuits.

C. General purpose insulating tape shall be Scotch No. 33, Plymouth "Slip-knot", or equal. High temperature tape shall be polyvinyl as manufactured by Plymouth, 3M, or equal.

D. Provide insulated tap connectors for splicing submersible pump cable to field wiring. Provide Polaris “IT Series”, or approved equal.

2.07 Conductor and Cable Tags

A. Tags relying on adhesives or taped-on markers are not acceptable for conductor and cable tags.

B. Provide tags for individual wires at both termination ends for wires 1/0 and smaller. Tags shall be white heat-shrink with thermal transfer printing, 3-to-1 shrink ratio, two inches long, and meet UL 224. Acceptable products include: Raychem Tyco Shrink Mark Heat Shrinkable Sleeves, or equal.

C. Provide tags for cables with legible permanent sleeve of white heat-shrink polyolefin with thermal transfer black marking. Install markers with black nylon-tie wraps. Acceptable products include: Raychem Tyco Shrink Mark CM Cable Markers, or equal.

2.08 Electrical Tape for Color Coding

A. Electrical tape shall be premium grade, not less than seven mils thick, rated for 90°C minimum, flame-retardant, weather resistant, and available in suitable colors for color coding. The tape shall be resistant to abrasion, ultraviolet rays, moisture, alkalies, solvents, acids, and suitable for indoor and weather-protected outdoor use. The tape shall be suitable for use with PVC
and polyethylene jacketed cables, and meet or exceed the requirements of UL 510.

B. Acceptable products include: 3M 35 Scotch Vinyl Electrical Tape for Color Coding, Plymouth Rubber Company Premium 37 Color Coding Tape, or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide and terminate all power, control, and instrumentation conductors, except where indicated.

3.02 INSTALLATION

A. No conductors shall be installed until conduits have been cleaned and labeled, and Interconnect Drawings have been submitted and approved.

B. If mechanical means are used to pull cable, the pulling tension shall be monitored, recorded and submitted to the Engineer.

C. Tighten terminal bolts using torque type wrenches and/or drivers to tighten to the inch-pound requirements of the NEC and UL.

D. Single conductors and cables in handholes and other indicated locations shall be bundled with nylon, self-locking, releasable cable ties placed at intervals not exceeding 18 inches on centers.

E. Instrumentation wire shall not be run in the same raceway with power and control wiring except where specifically indicated.

F. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.

G. Install bare ground conductor 36 inches below finished grade as shown on the Drawings. Reference Specification Section 16450 – Grounding for further requirements.

3.03 SPLICES AND TERMINATIONS

A. General:

1. There shall be no cable splices without the approval of the Engineer, except for site lighting circuits, or as noted on Drawings.

2. Stranded conductors shall be terminated directly on equipment box lugs making sure that all conductor strands are confined within the lug. Use forked-tongue lugs where equipment box lugs have not been provided.
3. Excess control and instrumentation wire shall be properly taped and terminated as spares.

B. Control Wire and Cable:
   1. Control conductors shall be terminated only at the locations indicated and only on terminal strips or terminal lugs of vendor furnished equipment.
   2. All control wire and spare wire shall be terminated to terminal strips in junction boxes, motor control centers, enclosures and control panels.

C. Shielded instrumentation cables shall be grounded at one end only, preferably at the PLC Panel.

3.04 CABLE IDENTIFICATION

A. All cables and conductors shall be identified. All cables shall be identified by a cable tag at each end and at every handhole, junction box, panels, pullbox, etc. All conductors shall be wire labels at each termination point. Labels shall be permanent, waterproof, legible, and securely attached.

B. Cable labels and conductor labels shall match Interconnect Drawings. All cables and conductors shall be identified with minimum of two labels, one at either end.

C. Cable labels located in handholes shall be engraved phenolic, red with white lettering, and attached with black nylon cable tie, Ty-Rap or equal.

D. Cables and conductors shall be labeled prior to beginning Pre Demonstration period.

3.05 GROUPING OF WIRES AND CABLES

A. All wires and cables shall be neatly grouped in pull boxes, junction boxes and handholes. Wires and cables shall be grouped so that the wires of the individual circuits are together and tagged with the cable number.

B. Cables passing through handholes shall be looped at least once along every wall. Loops shall be organized, trained, and neatly installed.

3.06 FIELD TESTING

A. Cable Testing:
   1. Cables – shall be tested by Contractor after pulling and prior to termination:
      a. Power and Control Conductor Test – After installation, provide megger testing at 1000V for conductor to conductor, and conductor to ground.
b. 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.

c. CAT6 Cable Test – After installation measure with a CAT6 tester the following: return and insertion loss, attenuation NEXT, PSNEXT, FEXT, ELFEXT, PSELFEXT, ACR and PSCAR.

d. Provide cable testing per these specifications and the latest NETA standards.

e. Antenna cable and antenna test: Test the radio transmission cables for return loss and voltage standing wave ratio. Make all connections from the radio to the antenna then test the transmission cables starting at the radio for return loss and voltage standing wave ratio (VSWR). Test equipment shall be Anritsu or approved equal. Submit a printout from the testing device showing the return loss and VSWR. Return loss shall be between 14dB to 48dB. The VSWR shall be between 1 and 1.4. If these values are not achieved, replace the cable connectors, lightning arrester, and/or the transmission cables until these values are obtained. The testing shall be done at a frequency of 902 MHz to 928 MHz.

2. All field testing shall be done after cables are installed in the raceways and prior to energizing. Disconnect equipment that might be damaged by this test.

3. Cable field testing shall be witnessed and signed off by the Engineer. Cable field testing results shall be submitted to the Engineer for review and acceptance.

4. Provide cable testing results to third party NETA testing agency for review and final approval of cables. Refer to Section 16950.

B. Refer to Specification of Section 17200 – Control Panels for further testing requirements.

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.
   B. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

1.02 CONTRACTOR SUBMITTALS
   A. General: Contract submittals shall be in accordance with Section 01105 and Section 16050 – Electrical Work, General.
   B. Shop Drawings
      1. Complete catalog cuts of switches, receptacles, enclosures, covers, and appurtenances, marked to clearly identify proposed materials.
      2. Documentation showing that proposed materials comply with the requirements of NEC and UL.

PART 2 - PRODUCTS

2.01 GENERAL
   A. All devices shall carry the UL label.

2.02 LIGHTING SWITCHES
   A. Light switches shall be heavy duty, industrial, toggle type, 20-amp, 125 VAC-rated, self-grounding, and back and side wired. Light switch handles shall be brown. Contact arm spring and terminal plate shall be copper alloy. Contact points shall be silver cadmium oxide. Ground terminal shall be nickel-plated steel with brass screw.
   B. Switches shall conform to UL 20.
   C. Acceptable products: Hubbell 1221B, or equal.

2.03 GENERAL PURPOSE RECEPTACLES
   A. Duplex receptacles shall be 125 VAC, 20 amperes, polarized three-wire type, NEMA 5-20R confirming to UL 498. Receptacles shall be brown. Receptacles
shall conform to UL 498. External wiring shall be provided by side mounted terminal screws. Acceptable products: Hubbell 5362, or equal.

B. Ground-fault circuit interrupting receptacles (GFCIs) shall be installed at outdoor locations. GFCIs shall be rated 125 V, 20 amperes NEMA 5-20R, conforming to UL 498 and UL 943, and brown. Acceptable products: Hubbell GF-5362, or equal.

### 2.04 GENERATOR RECEPTACLE

A. Generator receptacle shall be Hubbell Part No. HBL4100MI9WR, 240VAC, 3 phase, 4 pole, 100 amp, to match City standard, no equal.

### 2.05 OUTLET AND DEVICE BOXES

A. Outlet and Device boxes are specified in Section 16110.

### 2.06 DEVICE COVERS

A. Outdoor switch covers shall be rated weatherproof and shall be cast malleable iron with external pushrod, stainless steel screws, and neoprene gasket. Covers shall be Appleton FSK-XVTS series, or equal.

B. Outdoor receptacle covers shall be rated weatherproof and shall be die cast aluminum weatherproof lift covers for GFCI receptacles stainless steel screws, and neoprene gasket. Covers shall be Appleton FSK-WGF1 series, or equal.

C. Indoor device coves shall be galvanized steel.

### 2.07 MOTION SENSOR

A. Provide outdoor rated motion sensor, mounted to site lighting pole, with dry contact output. Motion sensor shall be 270 degree, dark bronze, LED indicator, dusk to dawn operation, manual override, sensitivity and time adjustment, UL listed for wet locations. When motion detected, sensor shall close a contact to energize relay, signaling intruder and sending alarm signal to PLC as well as energize the site light. Motion Sensor shall be 120 VAC with 120 VAC, rated contact.

B. Motion Sensor shall be Lithonia MS270, or approved equal.

### 2.08 STROBE ALARM LIGHT

A. Provide outdoor rated strobe alarm light, wired to motion sensor controls. Strobe shall by UL listed. Strobe shall mount on site lighting pole, refer to Contract Drawings. Strobe shall be amber. Strobe shall be 120 VAC.
B. Strobe alarm light shall be Federal Signal LP3M 5WF89, or approved equal.

2.09 NAMEPLATES
A. Provide nameplates on switch and receptacle wall plates stating panelboard (or lighting control panel) and circuit number feeds to the device. For example, a receptacle nameplate may be inscribed “LP-1, Circuit 12”.

2.10 NON-FUSED DISCONNECT SWITCHES, INDIVIDUAL, 0 TO 600 VOLTS
A. Provide disconnect switches in NEMA rated enclosures as specified in Section 16050 – Electrical Work, General. Provide switches that can be locked in the OFF position. Interlock enclosure and switches to prevent opening the cover with the switch in the ON position. Provide switches which are motor-rated, load-break, heavy-duty (HD) type, having external marking clearly indicating ON and OFF positions. Furnish switches meeting the requirements of NEMA KS 1. Provide switches suitable for use with 75°C wire at full NEC 75°C ampacity.

B. Provide disconnect switches with phenolic, engraved, nameplates (black lettering on white background) citing the name of the equipment, equipment tag, voltage, phase, service location.

C. Acceptable products include: Eaton Heavy Duty Safety Switches, or equal.

D. Booster pump disconnecting switch shall be motor rated, panel mounted rotary load switch, 16 amps, 240 VAC, three phase, 3 HP with padlockable handle. Allen Bradley 194E Series, or equal.

PART 3 - EXECUTION

3.01 GENERAL
A. Perform work in accordance with the National Electrical Code (NEC).

3.02 CONNECTION
A. Rigidly attach wiring devices in accordance with manufacturer instructions.

B. Securely fasten nameplates using epoxy glue centered under or on the device, unless otherwise indicated.

3.03 INSTALLATION
A. Mount boxes at the following heights unless otherwise indicated (heights are to the centerline of the box):

1. Light Switches 48 inches above grade to top of box
2. Motion Sensor 9 feet above grade
3. Strobe 8 feet above grade
4. Non-fused Disconnect 54 inches above grade
5. Convenience Receptacles:
   a. Outdoor: Minimum 24 inches above grade
   b. Indoor: 18 inches above grade to top of box

B. Where above heights do not suit the building construction or finish, locate boxes where directed by the Engineer.

C. Locations indicated are approximate. Study the Contract Drawings in relation to spaces and equipment surrounding each outlet. When necessary, and with the approval of the Engineer, relocate outlets to avoid interference with mechanical equipment or structural features. Locate all light switches on the lock side of doors; for double doors refer to Contract Drawings.

D. Install boxes in a secure, substantial manner supported independently of conduit by attachment to the building structure or a structural member.

E. Where boxes support lighting fixtures, provide proper means of attachment with adequate strength.

F. Open on more knockouts in boxes than are actually required. Seal any unused openings in any type box.

3.04 GROUNDING

A. Ground all devices, including switches and receptacles, in accordance with NEC and Section 16450 – Grounding.

B. Ground switches and associated metal plates through switch mounting yoke, outlet box, and raceway system.

C. Ground flush receptacles and their metal plates through positive ground connections to the outlet box and grounding system. Maintain ground to each receptacle by spring-loaded grounding contact to mounting screw or by grounding jumper, each making positive connection to the outlet box and grounding system at all times.

3.05 DISCONNECT SWITCHES

A. Mount disconnect switches in locations that are easily accessible, but do not obstruct working areas and walkways and that are in line-of-sight of the equipment for which the switches are used as disconnects. Attach a
nameplate to the front of each switch, identifying the name and tag number of the connected equipment.

3.06 FIELD TESTING

A. Provide checkout, field, and functional testing of wiring devices in accordance with Section 16950 – Electrical Testing.

B. Test each receptacle for polarity and ground integrity with a standard receptacle tester.

C. Wiring Devices testing shall be completed during Pre Demonstration period.

END OF SECTION
SECTION 16341 - PROTECTIVE DEVICE STUDIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Perform the following protective device studies for the electrical power system in accordance with the Contract Documents: Preliminary Short Circuit Study, Final Short Circuit Study, and Arc Flash Study. Provide these studies for each facility and submit separately.

B. A Preliminary Short Circuit Study shall be prepared and submitted early in the project to verify the suitability of submitted equipment short circuit and arc flash ratings and allow for Engineer approval. Use the first named supplier for the preliminary studies. Estimate cable lengths for the preliminary study.

C. The Final Short Circuit Study shall cover the maximum available 3-Phase Faults and line-to-ground faults based on installed equipment and cables.

D. The Arc Flash Study shall calculate maximum available fault current to establish Arc Flash label information.

E. Obtain from the Sacramento Municipal Utility District (SMUD) the information required to perform all of the studies, typical for each facility. Contact SMUD and obtain the short circuit contribution and impedance values in writing for these facilities that are needed for these studies, and submit copy to the Engineer.

F. Obtain from appropriate vendors the information required to perform all the studies. Contact the protective device manufacturers and obtain the ratings and time current curves for all protective devices including circuit breakers, motor circuit protectors, and overload protective elements.

G. Perform all needed field investigation and inspections to properly identify equipment including motors and any appropriate settings and nameplate data to get the correct information to work with including impedance values, voltage ratings, base kVA ratings, cable lengths, and/or current ratings for final studies submittal.

H. Arc Flash labels must be installed prior to energizing.

I. After the facilities are built and operating, all comments on the studies and studied equipment shall be addressed and all corrections made to input data and the three studies submittal for Record Set. The Record Set of the studies shall include all calculations rerun, coordination plots remade, copies of arc flash labels, tabulations corrected, and reports adjusted reflecting the post Field Tested as-built equipment with as left settings. Provide electronic files of
studies from SKM software. Submit studies per O&M Manual guidelines with Contract specifications.

1.02 QUALIFICATIONS

A. The studies and analysis shall be performed using the latest version of the SKM Systems Analysis Power Tools for Windows (PTW) software program.

B. The Preliminary Short Circuit, Final Short Circuit and Arc Flash studies shall be thoroughly reviewed, stamped and signed by an electrical engineer who is registered in the state of California, full time employee of the approved firm, who has experience performing short circuit and arc flash studies, and who directly supervised the collection of information, the creation of the studies and the furnishing of reports.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least five actual arc flash hazard analysis it has performed in the last five years.

1.03 CONTRACTOR SUBMITTALS

A. Studies shall be submitted and approved prior to final project acceptance in accordance with Section 16050 – Electric Work, General and Section 01105.

B. Preliminary Short Circuit Study shall be submitted and approved prior to approval of any electrical equipment and vendor panels. Final Short Circuit Study shall be submitted and approved prior to energizing equipment.

C. Copy of Arc Flash labels inscriptions, with a description of the installed location, shall be submitted and approved prior to energizing equipment. Labels shall meet City requirements.

D. The protective device studies, reports, settings, calculations, plots and tabulations shall be performed in a timely matter and included in the Contractor’s schedule, including the Preliminary Study to allow approval of submitted equipment. The Final Studies (after the Preliminary Study) as a part of normal construction, setup and startup of the facilities to be approved prior to Field Testing and energizing. The Record Set shall be submitted with the O&M Manual, as a separate submittal after all comments, corrections, updated input data, and as left settings have been inserted into the software programs to produce an as-built set of studies, reports, settings, calculations, labels, plots and tabulations.

E. A CD disk of the as-built set of studies, reports, settings, calculations, plots and tabulations utilizing SKM software.
F. A separate CD disk of the original source format of input data used as direct input to the selected software to perform the calculations, generate the reports, generate the tabulations, plot the curves and graphs, and list the device settings for the as-built facilities.

G. Resume of electrical engineer performing the Protective Device Study.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The study shall include single-line and impedance diagrams of the power system. This diagram shall identify all components considered in the study and the ratings of all power devices, including circuit breakers, relays, fuses, buses, and cables. The resistances and reactances of all cables shall be identified in the impedance diagram. The study shall contain all written data from the electric utility company regarding maximum available short circuit current, voltage, and X/R ratio of the utility power system.

B. The study shall include all protective devices and feeders included under this Contract. The SMUD short circuit information and overcurrent protective device and ground fault protective device shall be used as a fixed reference and starting point for these studies.

C. The study shall for both facilities shall be performed for the following scenarios:

1. Facility fed from utility power using the normal available fault current from the utility with all loads on and then with all loads off.
2. Facility fed from utility power using the alternate available fault current from the utility with all loads on and then all loads off.
3. Facility fed from a portable or facility generator with all loads on. The consultant shall contact the City to obtain the size of the portable generator.

D. The work shall be performed in the following sequence:

1. A Preliminary Short Circuit Study, submitted by Contractor and approved by the City and the Engineer.
2. Submit electrical equipment with short circuit rating greater than maximum available fault current per approved Preliminary Short Circuit Study.
3. Final Protective Device Studies submitted which includes Short Circuit Study, and Arc Flash Study, as approved by the City and the Engineer.
4. Set all adjustable protective devices. This shall include circuit breaker trip unit settings, motor solid state starter settings, and motor solid state overload settings, all as recommended in the protective device study...
5. Install approved arc flash labels on equipment.


7. Energize equipment. Equipment shall not be energized until Sequence Steps 1 through 6 above are completed and approved by the City and the Engineer.

8. Provide further testing including, but not limited to manufacturer recommended field testing, Pre Demonstration testing, Demonstration 7 day functional testing, and as required by the Specifications.

9. Update and replace arc flash labels on equipment if protective device settings are modified during testing and start-up phase.

10. Complete Record Set of Protective Device Studies, approved by the City and the Engineer.

### 3.02 SHORT CIRCUIT STUDY

A. The Short Circuit Study shall be performed with the aid of a digital computer program, and shall be in accordance with:

1. ANSI/IEEE 141 – Recommended Practice for Electrical Power Distribution for Industrial Plants
2. ANSI/IEEE 242 – Recommended Practice for Protection, and Coordination of Industrial, and Commercial Power Systems
3. ANSI/IEEE C 37.010 – Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI/IEEE C 37.13 – Low-Voltage AC Power Circuit Breakers Used in Enclosures

B. The Short Circuit Study shall be performed to determine the adequacy of circuit breakers, molded case switches, and fuses. Any problem areas or inadequacies in the equipment due to prospective short-circuit currents shall be promptly brought to the Engineer's attention.

C. The Short Circuit Study shall include:

1. Single line diagram for each scenario with the incident energy shown at each bus.
2. Tabulations of electrical capacities and characteristics of the equipment and protective devices.
3. Table comparing the calculated short circuit and the equipment ratings for each scenario.

D. Do not utilize series-rated circuit breakers to meet short circuit requirements for this project. Devices shall be fully rated to withstand available fault currents.
E. As-built the Short Circuit Study and rerun and adjust all the reports, calculations, device settings and output tabulations for all the protective devices reflecting the as-built facilities after all corrections have been inserted into the input data and all previous comments have been addressed.

3.03 ARC FLASH STUDY

A. The Arc Flash Study shall be performed with the aid of a digital computer program to cover the whole power distribution system. The Arc Flash Study shall calculate, determine and report the “Arc Flash Boundary” incident energy at 18 inches expressed in cal/sq-cm, voltage shock hazard, limited shock approach boundary, restricted shock approach boundary, prohibited shock approach boundary and “Personal Protective Equipment” (PPE) level. The Arc Flash Study shall calculate and determine these items for electrical equipment in the power distribution system study. The Arc Flash Study shall be performed in conjunction with short circuit calculations and protective device coordination. The Arc Flash Study shall be done for worst-case analysis, considering minimum/maximum utility fault current and with motors either on or off. The Arc Flash Study shall be in accordance with the latest version of:

1. NFPA 70E – Standard for Electrical Safety Requirements for Employee Workplaces
2. IEEE 1584 – Institute of Electrical and Electronics Engineers (IEEE) guide for performing Arc Flash Hazard Calculations
3. OSHA (29 CFR PART 1910) – Occupational Safety and Health Standards for General Industry
4. ANSI Z535.1 – Safety Color Code
5. ANSI Z535.3 – Criteria For Safety Symbols
6. ANSI Z535.4 – Product Safety Signs and Labels

All calculation shall be performed in accordance with IEEE 1584. The use of thumb rules is not acceptable in place of a calculated value as shown in IEEE 1584.

B. The study shall determine and report the following: The recommended values for the “Arc Flash Boundary” incident energy at 18 inches expressed in cal/sq-cm, voltage shock hazard, limited shock approach boundary, restricted shock approach boundary, prohibited shock approach boundary and PPE levels, based on the Arc Flash Study results. These results shall be tabulated with all identified equipment or short circuit interrupting items in the short circuit and coordination study.

C. The study shall recommend the Personal Protective Equipment (PPE) that the City should maintain on site for standard maintenance and operations
expected to be conducted for this electrical system. The study shall recommend the safety label design that should be posted on electrical equipment. The study shall recommend the specific information that should be typewritten as part of the safety label. Label information shall also be coordinated with City requirements during submittal period. These recommendations shall be based on the National Electrical Code (NEC) requirements, Occupational Safety and Health Administration (OSHA) standards, and National Fire Protection Association (NFPA) recommended practices. Furnish and install the field markings required by the NEC for Flash Protection on all power distribution equipment. The field marking shall be the approved recommended safety label.

D. Arc Flash Hazard warning stickers shall be sized 4” x 6”. These labels shall be 3 mil matted vinyl film with a pressure sensitive adhesive and be resistive to moisture, solvents, and UV light. The label shall include the following information, at a minimum:

1. Bus location designation which shall be easily identified from the single line drawing.
2. Nominal voltage
3. Flash protection boundary in inches
4. Incident energy in cal/cm2
5. Glove class
6. Limited and restricted approach in inches
7. Working distance in inches
8. Name of the City facility and date.

E. All labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the City and after any system changes, upgrades or modifications have been incorporated in the system.

F. Labels shall be machine printed, with no field markings.

G. Arc flash labels for dangerous conditions shall also state the following:

1. “No Safe PPE Exists”
2. “Energized Work Prohibited”
3. “Do Not Work On Live”

H. As-build the Arc Flash Study and rerun and adjust all the reports, calculations, and adjust the PPE recommendation reflecting the as-built facilities after all corrections have been inserted into the input data and all previous comments have been addressed.
3.04 RECORD SET

A. The results of the power system studies shall be summarized in a Record Set. Submittal shall follow guidelines of O&M Manual and as described below. The Record Set shall include the following:

2. Impedance diagram for 3-Phase Faults.
3. Impedance diagram for line to ground faults.
4. Tabulation of all protective devices for 3-Phase Faults, which shall be identified on the single line diagram.
5. Tabulation of all protective devices for line to ground faults, which shall be identified on the single line diagram.
6. Computerized 3-Phase Fault current calculations.
7. Computerized line to ground fault current calculations.
8. Recommended settings to achieve < 8 cal/sq-cm; or specific recommendations on how to mitigate all locations to < 8 cal/sq-cm (Item 13 below).
9. Motor starting inrush current plotted on the associated time current protective curves.
10. Sensing instrumentation, condition, and connections, as applicable, for each study.
11. Arc Flash Study report including tabulations, label design and recommendations.
12. Tabulation of all power distribution measuring, control, monitoring, communication and setup device settings.
13. Specific recommendations shall include how to potentially reduce the arc-flash incident-energy levels for each location having more than 8 cal/sq-cm present. Include a budgetary estimate for implementing any proposed change.

B. The Record Set shall include information concerning the computer program used for the study and also shall include a general discussion of the procedure, items, and data considered in preparing the study.

C. The Record Set shall include electronic CD disks as well as hard paper copy form of all input data, all calculation reports, all plotted curves, all drawings, all output data, and all device settings in tabulated organized form. Submit the final model with scenarios in original source format on a separate CD that can be utilized by the City.

END OF SECTION
SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.01 THE REQUIREMENT

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

B. The requirements of Section 16050 – Electrical Work, General apply to this Section.

C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts and manufacturer's services.

D. The grounding system is intended to provide a low resistance path to earth ground. Acceptable ground system resistance is 2 ohms or less. Provide and install additional ground rods as needed until acceptable resistance is achieved.

E. Coordinate, provide and install grounding system at the Sacramento Municipal Utility District (SMUD) Utility Meter, per SMUD requirements. Bond per NEC.

1.02 CONTRACTOR SUBMITTALS

A. General: Submittals shall be in accordance with the requirements of Section 01150 and Section 16050 – Electrical Work, General.

B. Shop Drawings: Manufacturer's product information for connections, clamps, and grounding system components, showing compliance with the requirements of this Section.

PART 2 - PRODUCTS

2.01 GENERAL

A. All components of the grounding electrode system shall be manufactured in accordance with American National Standards Institute (ANSI)/UL 467 – Standard for Safety Grounding and Bonding Equipment, and shall conform to the applicable requirements of National Electrical Code (NEC) Article 250 and local codes. The minimum size shall be as outlined in National Electrical Code.

B. There shall be an equipment grounding conductor in each raceway.
2.02 GROUNDING ELECTRODE SYSTEM

A. Grounding loop conductors shall be bare annealed copper conductors suitable for direct burial. Conductors shall be #2/0 unless indicated otherwise.

B. 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.

C. Exothermic connections shall consist of a molecular weld utilizing the reaction of copper oxide and aluminum powder in a semi-permanent graphite mold.

D. Exothermic connectors shall be as manufactured by Erico Products Cadweld, Thermoweld, or equal.

E. Cable-to-cable connections and all concealed connections shall be made using exothermic type welds.

2.03 GROUND ROD BOXES

A. Boxes shall be precast, high density, reinforced concrete, measuring a 10-inch interior diameter at the top and 12 inches deep. Covers shall be cast iron. All covers shall include special markings: “GROUND ROD”.

B. Boxes and covers shall be manufactured by Christy Concrete G03, or equal.

PART 3 - EXECUTION

3.01 GROUNDING

A. General: When sizes are not specifically indicated on the drawings, grounding cable shall be sized in accordance with all applicable code requirements. 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 more than two ohms. Measured resistance may be required to be less than two ohms where specific code or utility requirements apply. The grounding system shall be in strict accordance with Article 250 of the NEC.

B. Equipment Ground: Ground continuity throughout the facility shall be maintained by means of a ground conductor run in all conduits. Grounding conductors which are run in conduit shall be insulated copper conductors, sized in accordance with the NEC and the drawings. Conductors shall meet the requirements of Section 16120 – Wires and Cables.

1. Make connections of any grounding conductors to motors 10 hp and above or circuits 20 amps or above, by a solderless terminal and a 5/16-
inch minimum bolt tapped to the motor frame or equipment housing. Ground connections to smaller motors or equipment may be made by fastening the terminal to a connection box. Connect junction boxes to the equipment grounding system with a 3/8-inch machine screw.

2. Completely remove all paint, dirt, or other surface coverings at grounding conductor connection points so that good metal-to-metal contact is made.

3. Bond all exposed structural members and metallic enclosures of electrical equipment, including Utility Meter, Panelboard ground bus, generator receptacle, NEMA 7 Junction Boxes, control panels, magmeter flow tube to the ground rings by means of copper wire. Unless otherwise indicated on the Contract Drawings or required by NEC, the ground connections direct to the ground grid shall be minimum No. 2 AWG for equipment rated 240 or 208 volts; and No. 6 for 120-volt equipment. Route all exposed grounding conductors in PVC-coated galvanized rigid steel conduits unless noted otherwise on the Contract Drawings.

4. Provide #10 AWG insulated ground conductor to handhole covers, typical at each “Electric” handhole with metal cover. Provide a minimum six feet of insulated grounding conductor loop within the handhole to allow cover removal.

C. Grounding Electrode System: Install the grounding electrode system with all required components in strict accordance with National Electrical Code Article 250.

1. Connection to ground electrodes and ground conductors shall be bolted pressure type where exposed or above grade. Bolted connectors shall be assembled wrench tight to manufacturer’s requirements. Ground rings shall have a minimum buried depth of 36 inches below finished grade. Connections to ground conductors shall be exothermic where installed below grade.

2. Insulated throat grounding fittings shall be employed for all grounding connections to steel conduits. Provide solid #10 AWG, bare copper wire, tying all insulated throat grounding fittings together to ground grid.

3. Within slab on grade the grounding cable shall be embedded in or installed beneath the slab. Provide exothermic weld between concrete encased grounding conductor and the slab on grade reinforcement bars.

4. Bonding jumper shall be sized as shown and, if not shown, shall be sized per the requirements of National Electrical Code Article 250.

5. Install sufficient ground rods in addition to code-required grounding so that resistance to ground as tested by standard methods does not exceed two ohms unless otherwise approved in writing by the Engineer. Where more
than one rod is required, install rods at least 10 feet apart. Set ground boxes flush with grade or slab.

6. Bond neutral at Utility Meter to grounding electrode system.

7. In ground rod boxes, install ground rods with one end exposed six inches above a sand backfill with bolted connections of grounding conductors fully visible and accessible.

D. Shield Grounding

1. Shielded instrumentation cable shall be grounded at one end only; this shall typically be at the PLC Panel end.

2. Termination of each shield drain wire shall be on its own terminal screw. All of these terminal screws in one rack shall be jumpered with No. 16 solid tinned bare copper wire. The connection to the ground shall be accomplished with a No. 12 green insulated conductor to the main ground bus.

3.02 FIELD TESTS

A. All grounding shall be installed prior to start of Pre Demonstration period.

B. All tests to be witnessed and signed off by the Engineer.

C. In the Engineer’s presence, test the ground resistance of the grounding system using the Institute of Electrical and Electronics Engineers (IEEE) “Fall of Potential Method.”

D. Test all ground fault circuit interrupter (GFCI) receptacles and/or GFCI circuit breakers for proper connection and operation with methods and instruments prescribed by the manufacturer.

E. Provide copies of reports of all grounding system tests for inclusion in Operation and Maintenance Manuals and for review by the Engineer.

F. Refer to Specification 16950 – Electrical Testing for further testing requirements.

G. Grounding tests shall be completed and approved prior to energizing electrical equipment.

END OF SECTION
SECTION 16480 - UTILITY METER AND PANELBOARD

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide the Utility Meters and the Panelboards complete and operable, in accordance with the Contract Documents.

B. The pull section and metering section of the Utility Meters shall meet Sacramento Municipal Utility District (SMUD) service meter requirements and EUSERC standards.

C. Sump 40 Utility Meter cabinet shall be outdoor NEMA 3R rated, 100 amp, 120/240 VAC, three phase, four wire, 60 Hz service.

D. Sump 146 Utility Meter cabinet shall be outdoor NEMA 3R rated, 100 amp, 120/208 VAC, three phase, four wire, 60 Hz service.

E. The Sump 40 Panelboard shall be outdoor NEMA 3R rated, 100 amps, 120/240 VAC, three phase, four wire, 60 Hz. Panelboard shall meet UL508A. Panelboard shall be full length dead-front with controls on interior swing panel doors.

F. The Sump 146 Panelboard shall be indoor NEMA 12 rated, 100 amps, 120/208 VAC, three phase, four wire, 60 Hz. Panelboard shall meet UL508A. Panelboard shall be full length with controls on exterior doors.

G. The requirements of Section 16050 – Electrical Work, General, apply to the Work of this Section.

H. Provide arc flash labels inscribed with maximum available fault current (and date of calculation) on the Utility Meter, Panelboard with main breaker, and each of the Panelboard motor feeder breakers. Provide electrical shock warning labels in addition to arc flash labels on each door of the Panelboard.

1.02 CONTRACTOR SUBMITTALS

A. General: Submittals shall be in accordance with Section 01105 and Section 16050 – Electrical Work, General.

B. Provide separate submittals for Sump 40 Utility Meter, Sump 40 Panelboard, Sump 146 Utility Meter, and Sump 146 Panelboard.

C. Shop Drawings for Utility Meters and Panelboards as applicable:

1. Enclosure National Electrical Manufacturers Association (NEMA) rating and color.

2. Bus ampacity, voltage rating and interrupting capacity. Include materials of construction.
3. Ground bus size and material of construction.
5. Main incoming line entry provision (bottom) for Utility Meter.
6. Utility Meter cabinet and equipment meeting SMUD standards, with proof of approval by SMUD.
7. Surge suppressors.
8. Nameplate schedule.
9. All circuit breaker types, frames and settings.
11. Power Quality Meter (Shark).
12. Power Fail Relay.
13. All starter NEMA sizes, auxiliary contact provisions, coil voltage.
14. Relays, timers, pilot devices, control transformer VA and fuse sizes.
15. Schematics Drawings and Elevation Drawings.
16. Short circuit rating of the complete assembly.
18. Seismic design certification of the anchoring system.
20. Certified welders resume.

D. Operation and Maintenance Manuals.

1.03 **APPLICABLE CODES AND REQUIREMENTS**

A. As specified in 16050.
B. IEEE - Institute of Electrical and Electronic Engineers.
C. EUSERC – Electric Utility Service Equipment Requirements Committee
E. UL – Underwriters’ Laboratories.

1.04 **SEISMIC CERTIFICATION**

A. All equipment to be furnished under this contract shall be designed, constructed, and installed in accordance with the earthquake regulations of the California Building Code, Title 24, and the International Building Code (IBC).
B. Provide equipment anchorage calculations and details, coordinated with the
equipment mounting provision, prepared and stamped by a licensed civil
engineer in the state of California. Information shall be complete for welder to
attach Panelboard to mounting channel, refer to Detail EM on Contract
Drawings.

1.05 DUTIES OF THE MANUFACTURER’S QUALIFIED FACTORY
REPRESENTATIVE

A. A manufacturer’s engineering representative for the equipment specified
herein shall be present at the jobsite for the frequency and minimum duration
(travel time excluded) as specified below to perform the following
manufacturer's services:

1. A minimum of one trip for individual two-hour sessions for operation and
maintenance training of Owner's personnel. Typical for each facility.

PART 2 - PRODUCTS

2.01 GENERAL

A. Devices of the same type shall be products of the same manufacturer and
supplier. This requirement applies to all control devices, and insofar as
practical, to equipment manufactured on a production basis. It also applies
without exception to equipment custom fabricated for this project.

B. Panelboard shall conform to the standards for NEMA Class IIS, type B
diagrams and wiring.

C. Utility Meter and Panelboard shall be rated for minimum of 22k AICS, or
greater per the Preliminary Short Circuit Study.

D. Utility Meter and Panelboard including all components shall be rated for 50°
Celsius at full load.

E. Utility Meter and Panelboard wiring shall be labeled, color coded, and
furnished per applicable codes and standards requirements.

F. Panelboard shall be assembled by UL508A and UL891 listed shop.

2.02 UTILITY METER DESIGN, CONSTRUCTION, AND MATERIAL
REQUIREMENTS

A. Utility Meter shall be voltage class as noted on Drawings and suitable for
operation on a three-phase, four-wire, 60-Hz system. Utility Meter shall
contain SMUD incoming pull section and metering compartment.

B. Power distribution from the Utility Meter shall be three-phase, four-wire, with
voltage as shown on Contract Drawings. The Utility Meter shall include
provision for termination of an incoming neutral conductor in conformance to NEC requirements for service entrance, and be bonded and grounded.

C. Enclosure:

1. Structural members shall be fabricated of not less than 12-gauge steel and side and top panels and doors shall be not less than 14-gauge steel.

2. Utility Meter shall be rated NEMA 3R, suitable for surface mounting. Utility source and load side connections shall be underground (bottom) fed.

3. Utility Meter shall be fitted with the manufacturer’s nameplate which shall include the NEMA Standard electric rating and other pertinent data, including manufacturer, sales order number, date of manufacturer, and place of manufacture.

4. Finish for Utility Meter shall be factory grey.

D. Utility Meters shall be Tesco Controls, Inc., or approved equal.

2.03 PANELBOARD DESIGN, CONSTRUCTION, AND MATERIAL REQUIREMENTS

A. Panelboard shall be voltage class and ampacity as noted on Drawings and suitable for operation on three-phase, four-wire, 60-Hz system. Provide main circuit breaker with size as noted on Drawings, and means of locking in the off position.

B. Sump 40 Panelboard shall be rated NEMA 3R. Outer doors shall be dead front, padlockable and include nameplates of interior mounted equipment and devices. Interior swing panel doors shall be utilized for controls, metering displays.

C. Sump 146 Panelboard shall be rated NEMA 12. Controls, metering displays and nameplates shall be mounted on outer doors.

D. Panelboards shall house PLC Panel.

E. Size and Arrangement

1. The Panelboard shall contain main breaker, power quality meter, power fail relay, manual transfer switch, full voltage starters, OIT, flow transmitter, UPS, circuit breakers, and PLC Panel. Panelboard shall be assembled into a lineup of sections, each with separate exterior and interior doors (Sump 40) and side panels, refer to Contract Drawings. Each section shall be nominally 72 inches tall by 30 inches deep. Sump 146 Panelboard maybe narrower, per Panelboard supplier, since indoor rated.
2. Equipment within the Panelboard may be rearranged at the discretion of the Panelboard supplier, as approved by Engineer and City during Submittal review process.

F. Enclosure

1. Structural members shall be fabricated of not less than 12-gauge steel and side and top panels and doors shall be not less than 14-gauge steel.

2. Each control unit, lights and devices shall be identified by an engraved nameplate.

3. Outer doors shall include nameplates inscribed with interior mounted equipment. Refer to Contract Drawings.

G. Panelboard may be assembled by Tesco Controls, Inc., or equal, using approved products specified within.

2.04 PANELBOARD MANUAL TRANSFER SWITCH (MTS)

A. Manual Transfer Switch (MTS) shall be rated 120/240 VAC, 100 amp, three-phase, four-wire. MTS shall be open transition. MTS shall be UL 1008 rated. MTS shall be Eaton, or approved equal.

2.05 MOTOR STARTERS

A. Each motor starter unit shall consist of a combination magnetic contactor and short circuit protective device, with overloads. Short circuit protective device shall be an instantaneous, magnetic only circuit breaker. All circuit breakers provided as part of a motor starter unit shall be capable of being padlocked in the open position. Three phase electronic overload trip units shall be furnished to suit the full load current of the equipment installed. Position overload for lever operated reset pushbutton.

B. Magnetic starters shall have auxiliary contacts as required by electrical motor control diagrams including N-O and N-C contacts as indicated, plus one each spare N-O and N-C contact.

C. Each starter unit shall have its own control power transformer. It shall have a 115-volt grounded secondary. One secondary fuse and two primary fuses shall be provided. Control power transformers shall be sized to accommodate the control devices indicated. Starters shall be provided with devices as indicated in the Schematic Diagrams.

D. Motor starters shall be designed to NEMA ratings. Starters designed to IEC ratings or with dual IEC/NEMA ratings will not be acceptable.
2.06 CIRCUIT BREAKERS

A. General: The interrupting capacity of all main, and feeder branch circuit breakers shall be a minimum of 24,000 RMS symmetrical amperes at operating voltage.

B. Circuit breakers having a frame size of 225 amperes or less shall be molded case type with thermal magnetic non-interchangeable, trip-free, sealed trip units. Thermal magnetic molded case circuit breakers shall be Eaton Series C F-Frame Type EDS, or equal.

C. Circuit breakers feeding motor starters shall be molded case instantaneous only motor circuit protectors. Motor circuit protectors shall be Eaton Series C Type HMCP, or equal. Provide correct motor circuit protector size and trip rating based on installed equipment nameplate data. The interrupting capacity of the motor circuit protector breakers shall be 24,000 RMS symmetrical amperes at operating voltage.

2.07 POWER QUALITY METERS

A. Power Quality Meter shall be Shark 200-60-10-V2-D2-INP10S-X, no equal. Power Quality Meter shall have 2 Meg data logging, and 100 BaseT Modbus TCP/IP Ethernet communications to the PLC Panel.

B. Provide all required control transformers, power transformers, fuses and mounting hardware.

2.08 POWER FAIL RELAY

A. Power Fail Relays (PFR) in Panelboards shall detect phase loss, phase reversal and low voltage. PFRs shall be Timemark A258B, no equal.

B. PFD shall be automatic reset. Include base for relay.

2.09 SURGE SUPPRESSORS

A. Panelboards shall have an UL 845, UL 1449 and UL 1283 listed integrated surge suppressors installed and shall be UL labeled for such use.

B. Surge suppressors shall be installed with twelve inches or less of connecting cable from the bus to the surge suppressor electronics. Surge suppressors shall be rated for 480 volt three-phase service at 300 kA per phase. Surge suppressors shall have a built-in diagnostic package with flashing trouble light, display for the status of each phase, and have a counter and display to indicate the number of surges that have caused the device to operate.

C. Surge suppressors shall be Eaton SPD-250-240H-3-C, or approved equal.
2.10 CONTROL DEVICES

A. All control devices shall conform to the requirements of Section 16485 – Local Control Stations. Provide LED-type lamps for all indicating controls.

B. Provide Elapsed Time Meters (ETMs) for all motor starters connected to motors larger than 2 horsepower, even if not shown on electrical schematics.

C. Provide 0-30 minute spring wound timer for Booster Pump controls. Provide Intermatic Part number FF30MC.

D. Provide yellow disconnecting type terminal blocks for all terminal blocks connected to foreign voltage sources. Refer to electrical schematics for foreign voltage sources. In addition to foreign voltage sources, provide disconnecting type terminal blocks to all terminals connected with wiring to/from PLC equipment.

E. Provide the following color schemes as part of the Panelboard.

<table>
<thead>
<tr>
<th>Device Description</th>
<th>Color and Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign voltage wiring</td>
<td>Yellow wires</td>
</tr>
<tr>
<td>Motor “Run”</td>
<td>Red indicating lens</td>
</tr>
<tr>
<td>Motor “Off and Ready”</td>
<td>Green indicating lens</td>
</tr>
<tr>
<td>Motor “Alarm” or “Fault”</td>
<td>Amber indicating lens</td>
</tr>
</tbody>
</table>

2.11 FUSES, 0 TO 600 VOLTS

A. Provide a complete set of fuses wherever fuses are used. Utilize fuses that fit mountings. Provide the following types:

1. For 0- to 250-volt motor and transformer circuits, 0 to 600 amps, UL Class RK-1 with time delay, Bussmann Type LPN-RK, Shawmut Type A2D-R, or equal.

2. For 0- to 250-volt feeder and service circuits, 0 to 600 amps, UL Class RK-1, Bussmann type KTN-R, Shawmut Type A2K-R, or equal.

2.12 COATINGS

A. Enclosures shall be prepared for finish utilizing a five stage dip process. Coating shall be electrostatically applied dry polyester powder, oven baked to 3 to 5 mils DFT, tan color. The coating shall be smooth and free of flow lines, washout, streaks, blisters and any other defects. Factory coating system test specimens shall have no paint loss conforming to Cal TM 645 and less than
1/8" undercutting of the coating from lines scored exposing the base metal to salt spray per ASTM B117.

### 2.13 FACTORY ACCEPTANCE TESTS

A. Utility Meters and Panelboards, and all 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. Factory Acceptance Testing procedures shall be submitted for approval. Factory Acceptance Testing shall be witnessed by Engineer and City.

### 2.14 SPARE PARTS

A. Furnish the following for each Panelboard:

1. Three (3) fuses of each size.
2. One (1) lamp and lens of each color.

B. Spare parts shall be included in Panelboard with labels on outside of boxes and provided at delivery of Panelboard on site.

### PART 3 - EXECUTION

#### 3.01 GENERAL

A. Install Utility Meter and Panelboard in accordance with supplier’s published instructions conforming to these contract documents. Conduit installation shall be coordinated with supplier’s as-fabricated drawings so that all conduit stub-ups are within the area allotted for conduit. Conduit shall be stubbed up in the section that contains the devices to which conductors are terminated.

B. If stored at the site, Utility Meter and Panelboard shall be stored in a clean, dry space. Factory wrapping shall be maintained or an additional heavy plastic cover shall be provided to protect units from dirt, water, construction debris, and traffic. Provide temporary heaters to Panelboard PLC Panel section.

C. Utility Meter and Panelboard shall be handled carefully to avoid damage to components, enclosure, and finish. Damage shall be repaired before installation.

#### 3.02 INSTALLATION

A. Panelboard shall be installed on seismic sills in a slab on grade; refer to Drawings and Detail EM. The seismic calculations shall be approved prior to
the installation of the seismic sills. The Panelboard shall be welded to the steel embedded sills by a certified welder.

B. Torque all bus bar bolts to Manufacturer's recommendations; tighten all sheet metal and structure assembly bolts.

C. Adjust Motor Circuit Protector (MCP) devices. MCP shall be set to the instantaneous trip setting position recommended for the actual horsepower and full load amps of the motor.

D. Verify that motor overload devices are proper for equipment installed.

E. Configure power quality meter (Shark). Verify communication between PQMs and PLC, confirm with City. Coordinate IP addresses with City.

F. Set Power Fail Relay. Coordinate settings with City.

G. After equipment is installed, touch up scratches and verify that nameplate, and other identification is accurate.

3.03 FIELD TESTS

A. Visual and mechanical inspection after installation shall include:

1. Inspect for physical damage, proper anchorage and grounding.

2. Verify that the ratings of the thermal overload heaters match the motor full-load current nameplate data.

3. Check tightness of bolted connections.

B. Electrical Tests

1. Insulation tests:

   a. Measure insulation resistance of phase to phase and phase to ground for one minute. Test voltage and minimum acceptable resistance shall be in accordance with Manufacturer's recommendations.

   b. Measure insulation resistance of each starter phase to phase and phase to ground with the starter contacts closed and the protective device open. Test voltage and minimum acceptable resistance shall be in accordance with the Manufacturer's recommendations.

   c. Measure insulation resistance of each control circuit with respect to ground.

2. Verify proper operation of control logic in all modes of control.

C. NETA testing of all breakers, equal to and larger than 100 amps.

D. Provide additional testing as outlined in Specification 16950 - Electrical Testing.
E. All testing shall be witnessed by the Engineer and/or City. All testing sheets shall be signed off by the Engineer and/or City to be considered valid.

F. Refer to Section 01650 – Facility Startup for further testing requirements.

G. Pre Demonstration period for Utility Meter and Panelboard testing shall include Factory Acceptance Testing, Manufacturer certification, NETA Field Testing, equipment start-up, approval of O&M Manuals and training.

END OF SECTION
SECTION 16485 - LOCAL CONTROL STATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Panelboard, PLC Panel, and vendor supplied Booster Pump Station shall meet requirements of this Specification.

B. Provide nameplates on all control panels, including panel mounted devices, and internal mounted devices. Nameplates to include equipment description and equipment tag number.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Local control stations shall comply with the requirements of NEC, NEMA, and UL. Stations shall be built by UL listed panel shop, and contain shop sticker displaying such.

1.03 CONTRACTOR SUBMITTALS

A. Submit shop drawings in accordance with the requirements specified in Section 01105, and Section 16050 – Electrical Work, General.

B. Provide catalog cuts of all enclosures, overcurrent devices, relays, controls, pilot lights, terminations, and wire troughs.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide the control devices to satisfy the functional requirements specified in the relevant mechanical equipment, specifications, and as shown on the Electrical Schematics.

B. The controls shall be 120 volt maximum. Provide a fused control power transformer where the electrical power supply is 208 or 240-volt single-phase, 3-phase, as shown on the Contract Drawings.

C. Control conductors shall be provided in accordance with the requirements specified in Section 16120 – Wires and Cables.

D. Provide identified terminal strips for the connection of all external conductors. Provide sufficient terminal blocks to connect 10 percent additional conductors for future use. Termination points shall be identified in accordance with accepted shop drawings. All equipment associated with the stations shall be ready for service after connection of conductors to equipment, controls, and stations.
E. All internal wiring shall be factory-installed and shall be contained in plastic raceways having removable covers. Wiring to door-mounted devices shall be extra flexible and anchored to doors using wire anchors cemented in place. Exposed terminals of door-mounted devices shall be guarded to prevent accidental personnel contact with energized terminals.

F. Enclosures

1. In exterior wet locations enclosures shall be NEMA 4 304 stainless steel.
2. In corrosive locations enclosures shall be NEMA 4X 304 stainless steel.
3. Provide fast operating clamps assemblies where box is larger than four inches in either dimension; screw clamps are not acceptable.
4. Enclosures shall be freestanding, wall-mounted, or equipment skid-mounted, as specified or shown. Internal control components shall be mounted on a removable mounting pan. Mounting pan shall be finished white. All enclosures shall be hinged, except for pushbutton stations. Outdoor enclosures shall be pad lockable.

G. Identification of panel-mounted devices, conductors, and electrical components shall meet the requirements specified in Section 16050 – Electrical Work, General.

H. Provide tags for individual wires at both termination ends for wires 1/0 AWG and smaller. Tags shall be white heat shrink with thermal transfer printing, 3 to 1 shrink ratio, two inches long, and meet UL 224. Acceptable products include: Raychem Tyco Shrink Mark Heat Shrinkable Sleeves, or equal.

2.02 CONTROL DEVICES

A. Relays

1. General purposes relays shall be enclosed octal plug-in units. Relays shall be UL listed, indicating type, and push to test. Relay contact ratings shall be minimum 7.5 amps at 110 VAC, and minimum 5 amps at 30 VDC. Two- and three-pole relays shall be IDEC Series RR, or equal. Four-pole relays shall be IDEC Series RH, or equal.
2. Where shown, time delay functions shall be accomplished with time delay relays. Units shall be adjustable time delay relays with the number of contacts and contract arrangements as shown. A neon status-indicating light shall be provided with each relay. Contacts shall be rated for 7.5 A at 120 VAC. Integral knob with calibrated scale shall be provided for adjustment of time delay. Initial setting shall be as shown with time delay range approximately three times the initial setting. Delay range ability shall be at least 10:1. Timing relays shall be solid state pulse count type
utilizing a high frequency resistance-capacitance (RC) oscillator and integrated circuit counter for timing. Time delay relays shall be IDEC Series GT3, or equal.

3. All relays shall have a screw terminal interface with the wiring. Terminals shall have a permanent, legible identification. Relays shall be mounted such that the terminal identifications are clearly visible and the terminals are readily accessible.

B. Illuminated control indicating lights (including Panelboard motor control indication):

1. Shall be heavy duty, NEMA 4X, with round, plastic lens, and jumbo legend plate. Each shall be push-to-test, LED lamp, transformer type.

2. Colors shall be:
   a. Power On - White
   b. Ready, or Closed - Green
   c. Running, or Opened - Red
   d. Alarms - Amber

3. Acceptable products: Allen-Bradley Bulletin 800H, or equal

C. Non-illuminated control pushbuttons:

1. Shall be heavy duty, NEMA 4X, bootless, flush head pushbutton, momentary contact, with jumbo legend plate.

2. Colors shall be:
   a. Start, Open, Close, or Reset - Black
   b. Stop - Red


D. 2-position, 3-position, and 4-position, selector switches:

1. Position switches shall be maintained contact type, rated 20 A minimum at 120 VAC. Control knob shall be black, NEMA 4X, and shall show clearly the control switch position.

2. Selector switch shall be complete with jumbo legend plate, and with contact blocks.


E. Circuit breakers shall be din rail mounted, thermal magnetic, tease-free, trip-free, snap action mechanism with two button operation. Circuit breakers shall
be din rail mounted. Breakers shall be Phoenix Contact Model No. TMC 42-01, or equal.

F. Magnetic starters within LCPs shall meet the following requirements:
   1. NEMA rated only. IEC or dual NEMA/IEC rated type are not acceptable.
   2. FVNR type unless specified otherwise.
   3. Combination starters with magnetic only instantaneous trip circuit breakers such as Eaton HMCP, or equal. Provide with electronic overloads only.
   4. Control transformers shall be provided, with primary and secondary fuses, 120 VAC maximum control voltage.

G. Corrosion Inhibitors
   1. For panels located outdoors, including Panelboard and PLC Panel, install corrosion inhibitors inside panels to protect the given enclosure volume. Corrosion inhibitors shall produce corrosion inhibiting vapors that provide a molecular film on metal surfaces. The film shall not affect electrical or mechanical operations of contacts, relays, or other devices.
   2. The corrosion inhibitors shall provide protection from humidity, salt and other corrosive agents for up to 24 months.
   3. The corrosion inhibitors shall be as manufactured by Cortec Corporation, Hoffman Engineering Co, or equal.

2.03 CONTROL ELECTRICAL

A. Interior Panel Wiring
   1. Wiring shall be supported independently of terminations by lacing to panel support structure or by slotted flame-retardant plastic wiring channels. Wiring channels shall comply with UL 94, Type V-1. Wiring channel fill shall not exceed 40 percent of cross-section area. Only one wire per terminal block with exception of a comb jumper in addition to the single wire.
   2. Power and control wiring shall be single conductor. Stranded copper, NFPA No. 70 Type MTW, No. 16 AWG minimum.
   3. Wiring shall comply with the requirements of NEC as a minimum.
   4. Analog signal cables shall be No. 18 AWG, 7 x 28 stranded copper, twisted shielded pairs, rated 60°C, 600 V.
   5. Power and Control Insulation Colors: Power and control conductors in panels shall have the following insulation colors per NFPA 70 and NFPA 79:
<table>
<thead>
<tr>
<th>Conductor</th>
<th>Insulation Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Power and Control</td>
<td>Black and/or Red</td>
</tr>
<tr>
<td>DC Power and Control</td>
<td>Dark Blue</td>
</tr>
<tr>
<td>DC Power and Control Common</td>
<td>White with blue stripe</td>
</tr>
<tr>
<td>Intrinsically Safe</td>
<td>Light Blue</td>
</tr>
<tr>
<td>Neutral</td>
<td>White</td>
</tr>
<tr>
<td>Ground</td>
<td>Green</td>
</tr>
<tr>
<td>AC Control External Source</td>
<td>Yellow</td>
</tr>
<tr>
<td>External Neutral</td>
<td>White with yellow strip</td>
</tr>
<tr>
<td>DC Control External Source</td>
<td>Yellow with blue stripe</td>
</tr>
</tbody>
</table>

6. Signal Insulation Colors: Signal conductors in panels shall have the following insulation colors per NFPA 70 and NFPA 79:

<table>
<thead>
<tr>
<th>Conductor</th>
<th>Insulation Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Power and Control</td>
<td>Dark Blue</td>
</tr>
<tr>
<td>DC Power and Control Common</td>
<td>White with blue stripe</td>
</tr>
<tr>
<td>Intrinsically Safe</td>
<td>Light Blue</td>
</tr>
<tr>
<td>Signal, pair</td>
<td>Black, White or Clear</td>
</tr>
</tbody>
</table>

7. Terminal blocks: Terminal blocks for panels, consoles, racks, and cabinets shall meet the following requirements:

a. Provide sufficient terminations to accommodate both present and future needs. Wire all spare or unused panel mounted elements to their panels’ terminal blocks. Provide the greatest of 10 percent of all connected terminals or four unused spare terminals.

b. Provide 600-volt spring type terminal blocks. Use yoke that guides all stands of wire into the terminal. All terminal blocks shall be the knife
switch, disconnect type isolation terminal blocks. Supply terminals that allow connection of wire without any preparation other than stripping. Rail mount individual terminals to create a complete assembly. Provide terminals constructed such that jumpers can be installed with no loss of space on terminal or rail.

c. Each terminal strip shall have a unique identifying alphanumeric code at one end and a vinyl marking strip running the entire length of the terminal strip with a unique number of each terminal. Numbers shall be machine printed and 1/8-inch high. Terminal strip codes and terminal numbers shall comply with numbers listed on the wiring diagram.

d. Size all terminal block components to allow insertion of all necessary wire sizes and types. Supply terminal blocks with marking system allowing the use of preprinted or field-marked tags. Provide spring cage connection type terminal blocks manufactured by Wago, Weidmuller, or equal.

8. Field connections shall be to separate terminal blocks. Terminal blocks for field terminations shall be in a separate part of the panel close to where the field cables enter the panel. Provide sufficient space between terminal blocks and wireways to facilitate wire labels.

9. Circuits shall be fused where shown. Fuses shall be ¼ by 1¼ inch. Fuses on 120 VAC circuits shall be ceramic tube type with 25,000 amperes interrupting capacity at 125 volts and neon blown fuse indicator lamps. Fuses for 24 V DC shall be fast-acting glass tube type rated 1/8 or 1/10 amp for 4-20 and 10-50 mA loops and 3 amps for the power supply to individual instruments. Fuse holders for 120 VAC shall be draw out type and molded from melamine plastic.

10. Two (2) ¼-inch-wide by 3-inch-long copper buses shall be provided: one for signal and shield grounding and one for equipment and cabinet grounding. The signal ground bus shall be mounted on insulated stand-offs and the entire signal ground system bonded to the cabinet ground system at a single point.

B. Signal distribution within panels:

1. 4 to 20 mA signals shall be distributed within panels as 4 to 20 mA signals.

2. Signals distributed outside panels shall be isolated 4 to 20 mA signals.

3. Instrument loop field wires shall terminate on panel terminal strips in the control panel.
PART 3 - EXECUTION

3.01 FIELD TESTING

A. Field testing of control devices shall be part of the testing requirements of panel. Refer to Panelboard or Control Panels for field testing requirements.

END OF SECTION
SECTION 16500 - LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide lighting fixtures, poles, concrete base design, anchoring calculations, cabling, conduits and accessories for all lighting systems and antenna poles, complete and operable, in accordance with the Contract Documents.

B. Coordinate location of light fixtures and mounting heights as not to interfere with other equipment, piping, etc. Engineer to approve final lighting fixture positions and mounting heights based on equipment supplied and installation and routing of materials.

C. Coordinate mounting brackets and wiring handholes for the motion sensor and strobe alarm on site lighting pole. Refer to Specification 16140 for motion sensor and strobe alarm devices.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these specifications, all work hereunder shall conform to the applicable requirements of the referenced portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section.

1. National Electric Code (NEC)

2. Underwriters Laboratories (UL)

1.03 CONTRACTOR SUBMITTALS

A. Submit the following in accordance with the requirements of Section 01105.

1. Shop drawings and catalog data.

2. Catalog literature for each fixture and pole.

   a. Materials of construction, type of diffusers, hardware, gaskets, reflector and chassis, finish, and ballast.

   b. Exterior Luminaries: Submit technical photometric data for each luminaries, including the Illuminating Engineering Society (IES) lighting classification and isolux diagram. Submit fastening details of luminaries to structure or pole and method of fastening.

   c. Poles: Pole construction details, handhole orientation, receptacles, finish, gauge, anchoring requirements with seismic calculations.
3. Lamps: Submit manufacturer's catalog data, including voltages, colors, approximate hours, life, approximate initial lumens, lumen maintenance curve, lamp type, and base.

4. Photocell data submittal shall indicate switching capacity, the means of adjusting the lighting pickup level, and enclosure.

B. Substitutions for specified fixtures: Provide a sample of the specified luminaries and the proposed substituted luminaries for each proposed substitution. Substitutions will be accepted only if judged equal or better in performance characteristics, construction quality, ease of maintenance, and aesthetic appearance by the City and the Engineer per contract documents.

C. Provide seismic conformance computations carried out by a professional civil engineer registered in the state of California. Submit calculations that verify the supports for the lighting fixtures greater than 50 pounds. Submit calculations that verify the anchoring requirements and pole base reinforcement design.

1.04 QUALITY ASSURANCE

A. Lighting fixtures shall be stored in their original cartons from the manufacturers until the time of installation.

1.05 CLEANUP

A. Fixture lenses, diffusers, and reflectors shall be cleaned just prior to the system demonstration test.

B. Fixture trim, including poles and support brackets, where finish has been damaged, shall be refinished to level acceptable to Engineer.

PART 2 - PRODUCTS

2.01 FIXTURES - GENERAL

A. Provide luminaires as shown in Fixture Schedule, with proper hangers, mounting stems, lamps, etc., necessary for complete installation. Provide luminaires having "feed thru", or separate junction boxes. Provide luminaires with all electrical components easily accessible and replaceable without removing the luminaires from the structure.

B. Special Requirements

1. Install appropriate fittings provided by the luminaries' manufacturer to make the assembly complete.

2. Provide luminaires installed outdoors with SUITABLE FOR WET LOCATIONS label.
3. Mount all luminaires in accordance with specified seismic requirements.

PART 3 - EXECUTION

3.01 LUMINAIRES

A. General

1. Install each luminaire in a manner recommended by the luminaire manufacturer and accepted by the Engineer.

2. Furnish and install all additional ceiling bracing, and other structural reinforcements to the building to properly and safely mount luminaires to meet the seismic requirements of Section 16050 – Electrical Work, General, all acceptable to the Engineer.

3. Be responsible for handling the luminaires, installing plumb and level, and keeping luminaires clean.

4. After construction of total project is completed, remove all labels and other markings, wash dirty luminaires inside and out with a nonabrasive mild soap or cleaner. Clean luminaries’ plastic lenses with antistatic cleaners only. Touch up all painted surfaces of luminaires with high-grade exterior enamel, and poles with paint supplied by manufacturer.

5. All stored equipment shall be protected in accordance with the manufacturer’s recommendations and as specified. All equipment shall be covered with heavy-gauge polyethylene sheeting or canvas while stored and during construction to protect the equipment from dust and moisture until accepted, or as directed by the Engineer.

6. Provide and install all fixtures complete, including lamps, and ready for service. Deliver all warranty paperwork to Engineer.

7. Verify structure ceiling type and conditions and order fixtures for proper application required by the type of ceiling installed.

8. Install fixtures in such a manner as to avoid obstructions and to give proper illumination result. Verify layouts with the Engineer.

3.02 FIELD TESTS

A. Test all lighting systems for proper operation and conformity to these specifications and as shown on the Contract Drawings. Perform field testing to verify operation of light fixtures, controls, photocell, etc. Verify lighting circuits match panelboard schedule.

B. Lighting system testing shall be witnessed by the Engineer and City for functional operation. Field testing of lighting systems shall be performed during Pre Demonstration period.
C. Refer to Section 01650 – Facility Startup for further testing requirements.
SECTION 16950 - PREOPERATIONAL 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 during Pre Demonstration period. Refer to Section 01650 – 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, 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. Utility Meter and Panelboard: Including bus, grounding, breakers, manual transfer switch, starters and overloads.

2. 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.
3. Grounding System. Test for ground system resistance at closest ground rod connected to neutral bonding location.


1.05 FIELD (NETA) TESTING

A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere:

1. Utility Meter and Panelboard:
   a. Perform Field Testing per applicable sections of NETA Standards.
   b. Perform manufacturer recommended Field Testing on motor starters.

2. Manual Transfer Switch:
   a. Perform Field Testing per NETA Standards.
   b. Perform manufacturer recommended Field Testing.

3. Cables – to be performed by Contractor:
   a. Perform Field Testing per NETA Standards.
   b. Refer to Section 16120 – Wires and Cables for additional testing.

4. Grounding System:
   a. Perform Field Testing per NETA Standards.

5. Miscellaneous Testing – to be performed by Contractor:
   a. Refer to Section 16050 – Electrical Work, General.

1.06 TESTING SEQUENCE

A. Refer to Section 16431-3.01.C for sequence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

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. Pre-Demonstration period shall include all NETA Field Testing, and manufacturer recommended testing and testing requirements listed in equipment specification sections.

END OF SECTION
SECTION 17100 - PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide all Process Control and Instrumentation Systems (PCIS) complete and operable, in accordance with the Contract Documents. The PLC and OIT shall be part of the PLC Panel which is integral to the Panelboard. The City shall provide software programming for the programmable logic controller (PLC), configuration of the local operator interface terminal (OIT), configuration of the radio and configuration of the Ethernet Switch.

B. The requirements of this Section apply to all components of the PCIS unless indicated otherwise.

C. The requirements of Division 16 apply to all components of Division 17.

D. Provide separate submittals for each facility.

E. Responsibilities:

1. Furnish the PCIS and the integration of the PCIS with other required instrumentation and control devices, including verification of operation. Provide “dummy” PLC program at Factory Acceptance Testing to verify PLC inputs and outputs to processor registers, and confirm communication network.

2. All PLC and OIT hardware, verification of PLC inputs and outputs from field device up to the PLC processor input and output register files. PLC Panel shall be complete with reactive air system including air compressor, solenoid valves, pressure transmitters and interconnecting tubing.

3. Integration of the PCIS with devices provided under this and other sections, with the objective of providing a completely integrated control system free of signal and or communication incompatibilities.

4. As a minimum perform the following work:

   a. Implementation of the PCIS.

      1) Prepare hardware and panel submittals. Include spare parts.

      2) Design, develop, and electronically draft Interconnect Diagrams, Loop Diagrams, Instrument Installation Details, Communication Block Diagram, and Control Panel drawings. Prepare drawings for submittal review and as-built record drawings. All drawings shall be done in PDF and AutoCAD format for all submittals.

      3) Interconnect Diagrams shall include information required for installation of field cables between equipment. Interconnect
Diagrams shall include cable quantities, cable sizes, cable labeling information, termination block labels, conduit sizes and conduit labels information. Show all pull boxes, handholes, j-boxes, etc. No wiring shall be terminated prior to approval of Interconnection Drawings. Interconnect Diagrams shall include same cables that are further detailed in Loop Diagrams; hence Loop Diagrams shall not be used for Interconnect Diagrams, and Interconnect Diagrams shall not be used for Loop Diagrams.

4) Loop Diagrams shall include information for each device connected to PLC input and output modules. Loop Diagrams shall be provided for all discrete and analog signals, complete from field device, thru intermediate panels as applicable to final destination of PLC module. Loop Diagrams shall include cable quantities, cable sizes, cable labeling information, termination block labels, conduit sizes and conduit labels information. Show all pull boxes, handholes, etc. If contact comes from Panelboard schematic or vendor drawing, include reference of that as-built drawing number. Provide information for each instrument on Loop Diagrams including manufacturer, model number, options, ranges, power supply and source. Provide one loop per drawing unless otherwise approved by City.

5) Procure hardware.

6) Fabricate control panels in UL 508A listed facility.

7) Provide and submit updates during the Construction phase and final approved edition of the PLC I/O List.

8) Prepare and submit the PLC Panel Factory Acceptance Test procedures.

9) Prepare and submit Pre-Demonstration Testing procedures to confirm PLC inputs and outputs to field devices are functional.

10) Submit manufacturer certifications.

11) Submit instrument installation details.

12) Submit Instrumentation Supplier certifications.

13) Prepare and submit Demonstration Testing (7 day) procedures to confirm sewage lift station is functional.

14) Submit results for review and inclusion in O&M Manuals.

15) Perform instrumentation calibration and certify instrument installation/calibration by applying calibration sticker on instrument.
16) Verify Ethernet and serial based communication networks for all connected devices, work may be done in conjunction with City programmer. Configure flowmeters.

17) Configure, document and certify all PLC and OIT hardware, PLC input and output testing, loop testing and system commissioning for readiness.

18) Work with City to verify PLC communication, control, monitoring and commands from OIT and City’s remote site SCADA system.

19) Prepare as-built drawings.

20) Prepare Operation and Maintenance Manuals in hardcopy and electronic (PDF) formants. As-built drawings shall be provided in PDF and AutoCAD formats. Include Factory and Field Test sheets in O&M Manuals.

b. Integration of the PCIS with instrumentation and control devices being provided under other sections including all vendor supplied equipment and systems;

1) Design, develop and electronically draft Interconnection Diagrams associated with equipment provided under this and other Divisions of these Specifications.

2) Resolve signal, power, or functional incompatibilities between the PCIS and interfacing devices.

1.02 CONTRACTOR SUBMITTALS

A. General: Submittals shall be furnished in accordance with Section 01105 and the following:

1. Coordinate the instrumentation work so that the complete instrumentation and control system will be provided and will be supported by accurate shop drawings and record drawings.

2. Symbology and Nomenclature: In these Contract Documents, all systems, all meters, all instruments, and all other elements are represented schematically, and are designated by symbology as derived from Instrument Society of America Standard ANSI/ISA S5.1 – Instrumentation Symbols and Identification. The nomenclature and numbers designated herein and on the Drawings shall be employed exclusively throughout shop drawings, and similar materials.
B. Shop Drawings

1. General:
   a. All shop drawings shall include the letter head or title block of the Instrumentation Supplier. The title block shall include, as a minimum, the Instrumentation Supplier’s registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing. The quantity of submittal sets shall be as indicated in Section 01105.
   b. Organization of the shop drawing submittals shall be compatible with eventual submittals for later inclusion in the O&M Manual.
   c. Shop drawing information shall be bound in standard size, 3-ring, loose leaf, vinyl plastic, hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed three (3) inches.
   d. All shop drawings shall be in hardcopy and electronic PDF along with AutoCAD drawings. Electronic submittal shall have both PDF and AutoCAD versions of all drawings.

2. Hardware Submittal: Submit each PCIS hardware submittals including:
   a. A complete index which lists each device. A separate technical brochure or bulletin shall be included with each instrument data sheet. The data sheets shall be indexed in the submittal by specification section.
   b. Instrument installation, mounting, and anchoring details for each specific instrument shall be submitted in PDF format and an electronic AutoCAD version. Each instrument shall have a dedicated 8½-inch x 11-inch detail which only pertains to the specific instrument. Each detail shall be certified by the instrument manufacturer that the proposed installation is in accordance with the instrument manufacturer's recommendations and is fully warrantable.
   c. Fully executed data sheets according to ISA-S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, for each component, together with a technical product brochure or bulletin. The technical product brochures shall be complete enough to verify conformance to all Contract Document requirements. The data sheets, as a minimum, shall show:
      1) Component functional description.
      2) Manufacturer's model number or other product designation.
      3) Instrument tag number per Contract Drawings if applicable.
4) Project location or assembly at which the component is to be installed.

5) Input and output characteristics.

6) Scale, range, units, and multiplier (if any).

7) Requirements for electric supply (if any), communication protocol (if any), signals.

8) Materials of component parts to be in contact with or otherwise exposed to process media and corrosive ambient air.

9) Special requirements or features.

10) Local supplier including contact name, phone number, and address.

d. Priced list of manufacturer recommended spare parts for all devices.

e. Priced list of spare parts for all devices.

3. Submit Drawings including: Interconnect Diagrams, Loop Diagrams, Control Panel drawings and installation details. All drawings shall be done in 11-inch x 17-inch PDF and AutoCAD, with 0.0625 minimum text height.

4. Submit PLC I/O List. Update and submit during construction phase when changes are made.

5. Test Procedure Submittals: Submit the Factory Acceptance Test procedures, Pre-Demonstration testing procedures and Demonstration period testing procedures for approval. Submit results for review and inclusion in O&M Manuals. All testing results to include a City or Engineer signature as witness.

6. Training Submittals: Submit a training plan which includes a schedule of training courses including dates, durations, and locations of each class. Provide resume of the instructor who will actually implement the plan.

C. Operation and Maintenance Manual

1. General: Information in the O&M Manual shall be based upon the approved shop drawing submittals as modified for conditions encountered in the field during the work.

2. The O&M Manuals shall be organized and contain information as outlined in specifications.

3. Signed results from all Testing shall be included in O&M Manuals.

D. As-Built Drawings

1. All such drawings shall be submitted and approved prior to beginning of Demonstration Testing.
PART 2 - PRODUCTS

2.01 GENERAL

A. Code and Regulatory Compliance: All PCIS work shall conform to the National Electrical Code. Conflicts between the requirements of the Contract Documents and any codes or referenced standards or specifications shall be brought to the attention of the Engineer.

B. Hardware Commonality: All instruments which utilize a common measurement principle (for example, float switches) shall be furnished by a single manufacturer. All panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.

C. Instrument and Loop Power: Power requirements and input/output connections for all components shall be verified. Power for transmitted signals shall, in general, originate in and be supplied by the control panel devices. The use of "2-wire" transmitters is preferred, and use of "4-wire" transmitters shall be minimized.

D. Loop Isolators and Convertors: Signal isolators shall be provided as required to ensure adjacent component impedance match where feedback paths may be generated, or to maintain loop integrity during the removal of a loop component. Dropping precision wire wound resistors shall be installed at all field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be provided where required to resolve any signal level incompatibilities or provide required functions.

E. Environmental Suitability: All outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain all instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. Provide all power wiring for these devices. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed per NEC Article 500.

F. Control Panel Power Supplies: All control panels shall be provided with redundant 24 VDC power supplies which are configured in a fault-tolerant manner to prevent interruption of service upon failure and interruption of service necessitated by the replacement of a power supply. Each redundant power supply shall be wired in parallel along with an auxiliary relay for “loop power lost” status. The PLC Panel shall contain UPS sized for 125 percent of full connected load.
2.02 OPERATING CONDITIONS

A. The PCIS shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:

1. Environment – Sewage lift station
2. Temperature Range – 32 through 115 degrees F
3. Relative Humidity – 20 through 90 percent, non-condensing

2.03 SPARE PARTS AND SPECIAL TOOLS

A. All spare parts and special tools shall be provided on site before startup commences, suitably wrapped and identified. Provide spare parts in rubber tub.

2.04 FACTORY ACCEPTANCE TESTING

A. Arrange for the manufacturers of the equipment and fabricators of control panels supplied under this Section to allow the Engineer and City to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the PLC Panel as part of Panelboard, and other pertinent systems and devices.

B. A minimum of 10 working days' notification shall be provided to the Engineer prior to witnessed testing. No shipments shall be made without the Engineer's approval.

C. PLC and OIT communication network shall be fully functional as part of PLC Panel Factory Acceptance Test (FAT). Instrumentation Supplier shall include dummy programs in PLC and OIT to verify communication, and PLC inputs and outputs to processor registers.

D. Verification of the previously submitted and approved PLC I/O List shall be done during FAT. City shall confirm instrument ranges at the FAT; make modifications to ranges as required.

2.05 FIELD TESTING

A. Arrange for the manufacturers of the equipment and fabricators of control panels supplied under this Section to facilitate in field testing.

B. Test forms shall be submitted and approved prior to testing.

C. Provide two weeks (minimum) notification of Field Tests to Engineer. Field tests shall be witnessed and signed off by the Engineer to be considered complete. Any test results without the Engineer's signature are considered invalid and will be done again.
2.06 INSTRUMENT IDENTIFICATION

A. Submit list of instruments and associated equipment, each with tag inscription and tag materials for approval by the City and the Engineer. Tags shall be engraved stainless steel plates, with 1/8-inch lettering.

B. Control Panels, racks, panel devices and all instruments shall have nameplates. Inscriptions shall be provided during submittal review stage.

PART 3 - EXECUTION

3.01 PRODUCT HANDLING

A. Shipping Precautions: After completion of shop assembly, factory test, and approval, all equipment, cabinets, and panels shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.

B. Special Instructions: Special instructions for proper field handling, storage and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.

C. Storage: Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the City. If any apparatus has been subject to possible injury by water, it shall be replaced, at no cost to the City, even if stored on premise with approval.

3.02 MANUFACTURER'S SERVICES

A. Furnish the following manufacturer's services for the instrumentation listed below provided during the Pre-Demonstration period:

1. Perform bench and field calibrations. Configuration only for flowmeter and gas detectors, no field calibrations required.

2. Submit for approval installation details for all instruments. Verify criteria prior to installation which shall effect operation such as: upstream/downstream straight pipe lengths for flow meters, stilling wells, mounting hardware, etc.

4. Coordinate and conduct testing, prepare testing sheets, and certify testing.

B. Manufacturer's services shall be furnished for the following equipment:


3.03 INSTALLATION

A. General

1. All instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 17 and the manufacturers' instructions. All instruments and equipment shall be tagged.

2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment and existing conditions. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the City exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, make such changes without additional cost to the City. Coordinate proposed equipment and instrument locations in the field with City prior to installing or submitting details.

B. Conduit, Cables, and Field Wiring

1. All conduit shall be provided under Division 16 without delay to the Work of Division 17.

2. All 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, PLC input and output wiring and other field wiring and cables shall be provided under Division 16.

C. Instrumentation Tie-Downs: All instruments, control panels, and equipment shall be anchored by methods which comply with seismic requirements applicable to the site.

D. Ancillary Devices: Provide any additional or different type connections as required by the instruments and specific installation requirements at no
additional cost to the City to provide a complete and operational system. All such additions and all such changes, including the proposed method of installation, shall be submitted to the Engineer for approval prior to commencing the work.

E. Installation Criteria and Validation: All field-mounted components and assemblies shall be installed and connected according to the requirements below:

1. Installation personnel have at least one copy of the approved shop drawings and installation detail.

2. All mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.

3. Verify the correctness of each installation, including polarity of electric power and signal connections, and making sure all process connections are free of leaks. Certify in writing that for each loop or system checked out, all discrepancies have been corrected.

4. Confirm that communication networks are properly configured and operational.

3.04 CALIBRATION

A. General: All devices provided under Division 17 shall be calibrated and ranges set, according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements. Work shall be completed during Pre-Demonstration period.

B. Calibration Points: Each instrument shall be calibrated at 0, 10, 50, 90 and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Testing Standards.

C. Field Calibration: Instruments shall be calibrated in the field to insure proper operation in accordance with the instrument loop diagrams or specification data sheets.

D. Calibration Sheets: Calibration sheets to be submitted prior to start-up of any system or subsystem. Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:

1. Project name.
2. Tag number.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Calibration range.
7. Calibration data: Input, output, and error at 10 percent, 50 percent and 90 percent of span.
8. Switch setting, contact action, and deadband for discrete elements.
9. Space for comments. Confirm conduit and cable tags are installed.
10. Space for approval sign-off by Instrumentation Supplier and date.
11. Provide sticker on instrument that it has been calibrated by supplier and ready for service.

3.05 FIELD TESTING

A. Field shall be provided by the Contractor and approved by the City and Engineer. Notify the Engineer of scheduled tests a minimum of 10 calendar days prior to the testing date. The Field testing shall be witnessed by the City and Engineer. Field testing shall not begin until NETA Field Testing per Section 16950 has been completed. Field Testing shall be completed during Pre-Demonstration period.

B. Controllers and electronic function modules shall be field tested and exercised to demonstrate correct operation. All control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses of the respective control and monitoring elements, virtual points, final control elements, and the OIT, and back to City SCADA. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be retested. Specified accuracy tolerances for each analog network are defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be as indicated by Contract requirements or by published manufacturer accuracy specifications, whenever Contract accuracy requirements are not indicated. Each analog network shall be tested by applying simulated analog or discrete inputs to the first element of an analog network. For networks which incorporate analog elements, simulated sensor inputs corresponding to 0, 10, 50, 90 and 100 percent of span shall be applied, and the resulting element outputs monitored to verify compliance to accuracy tolerance. Provisional settings shall be made on controllers and alarms during analog loop tests.

C. Loop Testing shall be provided for each instrument or device. Loop Testing shall also be provided for each PLC I/O hardwired point. Loop Testing shall be considered approved once forms have been initialed by the City or Engineer.
Loop Testing shall utilize approved Loop Diagrams as part of testing procedures and verification process.

3.06 PRE-COMMISSIONING ACTIVITIES

A. General: Pre-commissioning activities shall commence after acceptance of all Field testing and all inspections have demonstrated that the instrumentation and control system complies with all Contract requirements. Pre-commissioning shall demonstrate proper operation of all systems with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.

B. Pre-commissioning Operational Validation: Where feasible, pre-commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. All hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits.

C. Pre-commissioning Certification: Submit an instrumentation and control system pre-commissioning completion report which shall state that all Contract requirements have been met and shall include a listing of all instrumentation and control system maintenance and repair activities conducted during the pre-commissioning testing. Acceptance of the instrumentation and control system pre-commissioning testing must be provided in writing by the Engineer before the Demonstration Testing may begin.

3.07 ON-SITE SUPERVISION

A. Furnish the services of an on-site engineer or technician to supervise and coordinate installation, adjustment, testing, and start-up of the PCIS.

3.08 TRAINING

A. General: Train the City’s personnel on the maintenance, calibration and repair of all instruments provided under this Contract.

B. Instructions: The training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.

C. Duration: Each training class shall be given twice and shall be a minimum of two hours in duration and shall cover, as a minimum, operational theory, maintenance, troubleshooting/repair, and calibration; per facility. Training classes shall be provided for flow meters and combustible gas transmitters; for a total of two 2-hour classes, per facility.
D. Schedule: Training shall be performed during the pre-commissioning phase of the project. The training sessions shall be scheduled a minimum of two weeks in advance of when the courses are to be initiated. The City and the Engineer will review the course outline for suitability and provide comments that shall be incorporated.

E. Agenda: The training shall include operation and maintenance procedures, troubleshooting with necessary test equipment, and changing set points, and calibration for that specific piece of equipment.

F. Documentation: Within 10 days after the completion of each session, submit the following:
   1. A list of all City personnel that attended the session.
   2. A copy of the training materials utilized during the lesson with all notes, diagrams, and comments.

3.09 ACCEPTANCE

A. For the purpose of this Section, the following conditions shall be fulfilled before the Work is considered complete and start of Demonstration period:
   1. All submittals have been completed and approved.
   2. The PCIS has been calibrated, tested and demonstrated.
   3. Confirmation of all communication networks, including radio communication back to City SCADA system.
   4. The training has been performed.
   5. All spare parts have been delivered to the City.
   6. All punch-list items have been corrected.
   7. Revisions to the O&M Manuals that may have resulted from the field tests have been made and reviewed.
   8. All as-built and record drawings in both hard copy and electronic format have been submitted.
   9. All debris associated with installation of instrumentation has been removed.
   10. All probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition. Cleaning to include vacuuming interior of panels, wipe down of exteriors, and paint touch up as required by the City and Engineer.

END OF SECTION
SECTION 17102 - FLOW MEASURING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnish and install flow meter systems, complete and operable, with the requirements of the Contract Documents.

B. Flow meter tube with remote Flow Transmitter, to be located within PLC Panel, interconnected with manufacturer cable (no splices). Provide grounding of flow meter tube per manufacturer recommendations.

C. Coordinate installation of remote Flow Transmitter within PLC Panel.

D. The requirements of Section 17100 – Process Control and Instrumentation Systems apply to this Section.

E. Configure flowmeter. Coordinate ranges with City. City will assist with flowmeter network address assignment.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. ISA - S 5.1 Instrumentation Symbols and Identification

1.03 CONTRACTOR SUBMITTALS

A. Shop Drawings: Submit complete shop drawings of all instruments in accordance with the Section 01105, and Section 17100 – Process Control and Instrumentation Systems.

B. Installation detail of flow tube and flow meter in PLC Panel.

C. Operation and Maintenance Manuals.

D. Training outlines and trainer resume.

1.04 QUALITY ASSURANCE

A. Coordinate proposed installation with flow meter supplier to confirm sufficient upstream and downstream pipe lengths to guarantee metering accuracy.

B. Inspection and Testing Requirements: After installation, obtain the services of a technical representative to inspect and test meter for proper performance and installation. Verify accuracies.

C. Accuracy Requirements: Unless otherwise specified herein, the flow meters shall be guaranteed to register flow to an accuracy of 0.25 percent of actual flow throughout the range specified.

1.05 GUARANTEES, WARRANTIES

A. After completion furnish the supplier’s written guarantees, that the metering system will operate within the published accuracies and flow ranges and meet
these Specifications. Furnish the manufacturer's warranties as published in its literature, and submit within the O&M Manuals.

PART 2 - PRODUCTS

2.01 GENERAL

A. All devices specified herein shall conform to the requirements of Section 17100 – Process Control and Instrumentation Systems.

B. All instruments shall have stainless steel nameplates with tag number and description.

2.02 MAGNETIC FLOW MEASURING SYSTEMS

A. General: Magnetic flowmeter systems shall be of the low frequency electromagnetic induction type and produce a DC pulsed signal directly proportional to and linear with the liquid flow rate.

B. Flow meter shall include remote mounted transmitter to be located in PLC Panel of Panelboard. PLC Panel shall include duplex receptacle for plugging in flow transmitter (include cord and plug). Provide window in front door of PLC Panel to view flow transmitter display.

C. Cable from remote flow transmitter to flow tube shall be supplied with flow meter and shall be long enough to be installed without splicing.

D. Complete zero stability shall be an inherent characteristic of the flowmeter system. Flowmeter shall have pulsed contact that closes based on quantity of flows and fully programmable. Flowmeter shall include low flow cutoff. Magnetic flow metering system shall include a metering tube, transmitter and flowmeter grounding rings.

E. Metering Tube

1. Flange Type Magnetic Flowmeter Element: In-line flow element with no constrictions in flow of fluid through meter consisting of metallic tube with ANSI B16.5, Class 150, flanged ends for diameter and bolt drilling pattern. Flange material shall be compatible with the piping material and corrosion resistant. Provide grounding rings.


3. Sewage Force Main Flow tube shall be NEMA 6P, Class 1 Div 2 rated. Tag: SXXXFE001 (where XXX is station number to be provided by City). Flow meter tube diameter is shown on Contract Drawings.

4. Ground Rings: Manufacturer's standard. Interconnect ground rings to flow tube electronics housing with #12 AWG ground wire. Connect to equipment grounding conductor or ground grid.
5. Cable: Furnish manufacturer cable to connect flow tube to remote flow transmitter.

F. Remote Microprocessor-Based Transmitter

1. Micro-processor type with local flow rate indication and local flow totalization indicator, scaled in engineering units. Provide with integrated web server, Heartbeat Technology, and data logger.

2. Transmitter to be remote mounted in PLC Panel section of the Panelboard.


4. Provide with low flow cutoff configuration.

5. Power Supply: 120 VAC. Provide with cord and plug connection into enclosure mounted receptacle.

6. Provide with Ethernet/IP communication.

G. System Accuracy, including Magnetic Flowmeter Transmitter: Within 0.25 percent of actual flow rate for 10-100 percent full scale where velocity is between 0.3 and 30 feet per second.

H. Flow metering system shall be hydraulically calibrated at a facility which is traceable to the National Institute of Standards and Technologies. The calibrations procedure shall conform to the requirements of MIL-STD-45662A. A real-time computer-generated printout of the actual calibration data indicating apparent and actual flows at 0, 20, 50, 80 and 100 percent of the calibrated range shall be submitted to the Engineer at least thirty (30) days prior to shipment of the meters to the project site.

I. Manufacturer, no equal:

1. Endress & Hauser L400.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Assemble and install all equipment specified herein, in strict accordance with the manufacturer's published instructions, under the supervision of the manufacturer's representative and under the general review of the Engineer. All installations shall be accomplished by competent craftsmen in a workmanlike manner.

B. Installation of flow tube and remote transmitter to be approved by manufacturer such that rated accuracy and repeatability is met.

C. Installation shall follow submitted and approved instrument installation detail.
D. Flowmeter: The remote mounted flowmeter shall be installed in easily accessible locations for ease of reading and maintenance. Flow tubes shall be firmly supported from the floor with approved supports. Configure flowmeter including but not limited to: communication, identification, inputs, and outputs.

3.02 FIELD TESTING

A. Each item shall be subjected to an operating test over the total range of the equipment.

B. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.

C. Refer to Section 01650 – Facility Startup for further testing requirements.

D. Confirm instruments have nameplates, and connected conduits and conductors are labeled.

E. All Field Testing shall be completed during Pre-Demonstration period.

3.03 TRAINING

A. Manufacturer shall provide flowmeter training to City as specified in Section 17100 – Process Control and Instrumentation Systems. Provide two identical training sessions; each session lasting up to two hours, per facility. Identical training sessions shall not occur on the same day. All training shall be completed during Pre-Demonstration period.

END OF SECTION
SECTION 17106 - LEVEL MEASURING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnish and install all level measurement systems with associated instrumentation and controls as shown and specified herein, complete and operable, for functions including level measurement in accordance with the requirements of the Contract Documents.

B. Bypass pumping float switches shall be per this specification.

C. Reactive Air Wetwell Level measuring systems, per facility, include:

1. Air compressor with cord and plug, switched receptacle, miscellaneous connectors and tubing, to be located in PLC Panel. Provide two air tubes from PLC Panel to wetwell complete without splices.

2. Sewage Lift Station – Wet Well Primary and Back-up PVC Sch 80 air pipes with end bells located in the wetwell. Total of two air pipes.


4. Sewage Lift Station – Wet Well Primary and Back-up pressure transmitters located in PLC Panel. Total of two pressure transmitters.

D. Level Float Switches, per facility, include:

1. Sewage Lift Station – Wet Well Low-Low Pump Shutoff.


E. The requirements of Section 17100 – Process Control and Instrumentation Systems and the City’s Process Control System Standards, apply to this Section.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. ISA - S 5.1 Instrumentation Symbols and Identification

1.03 CONTRACTOR SUBMITTALS

A. Shop Drawings: Submit complete shop drawings of all instruments in accordance with the Section 01105, and Section 17100 – Process Control and Instrumentation Systems.

B. Submit installation details for each float switch, and for reactive air pipes installed in the wetwell, and for reactive air system components within PLC Panel. Submit specific details for each facility.

C. Operation and Maintenance Manuals of Reactive Air system.
1.04 QUALITY ASSURANCE

A. Inspection and Testing Requirements: After installation, obtain the services of a technical representative to inspect and test all instruments for proper performance and installation. Verify accuracies.

1.05 GUARANTEES, WARRANTIES

A. After completion, furnish to the City the supplier’s written guarantees that the measuring systems will operate to within 2% of actual level. Furnish the manufacturer’s warranties as published in its literature, and submit within the O&M Manuals.

PART 2 - PRODUCTS

2.01 GENERAL

A. All devices specified herein shall conform to the requirements of Section 17100 – Process Control and Instrumentation Systems.

B. All instruments shall have stainless steel nameplates with tag number and description.

2.02 REACTIVE AIR SYSTEMS

A. Compressors shall be Magnetek Model LGH-210-H02, rated for 100 PSIG, 120VAC, 1725 RPM, or approved equal.

B. Solenoid valves shall be 303 stainless steel, silver shading coil, NPT, normally closed, ASCO Model 8320G202, 120VAC, or approved equal.

C. Pressure transmitters shall be Rosemount 2088G1-S22A1-M7.

D. Air tubing from Panelboard to sump shall be 1/4” polyethylene tubing, black. Tubing shall Parker EB-43-0100 tube with 4TIZ, and 4NU4 fittings, or approved equal.

E. Provide 316 stainless steel fittings, Parker CPI/A-Lok, or approved equal. Air tubing inside Panelboard shall be 1/4” diameter, constructed of 316 stainless steel.

F. Submit installation details per facility with Panelboard shop drawings.

G. Coordinate PLC Panel dimensions based on submitted and approved reactive air type level measuring system.

2.03 FLOAT SWITCHES

A. Float switches shall include mechanical switch encapsulated in waterproof floating ball, supported by flexible cable. Switch shall be single pole double throw with contacts rated 100 VA up to 120VAC. Level switch system shall include stainless steel cable for securing of float switch, with weight on cable. Switches shall be mercury-free.
B. Switches shall be suitable for sewage wet well applications. Switch body shall be Teflon-coated stainless steel housing. Cord with CPE jacket shall include fine strand, #16 AWG conductors plus ground, suitable for heavy flexing service.

C. Manufacturer cable length shall allow for splicing in the above grade NEMA 7 Junction Boxes.

D. Low-Low float switches shall be normally open (closed when in pump permissive raised position). High-High switches shall be normally closed (opened when in alarm raised position).

E. Sewage wet well level switches shall include intrinsically safe barrier.

F. Float Switches shall be mercury free versions of Anchor Scientific Mini-float SM10, Hydromatic 3900, Scientific Technologies Inc. FQ Series, or approved equal. Include stainless steel cable suspension kit with anchor, weights, wall bracket, cable clamps and sufficient cable lengths.

PART 3 - EXECUTION

3.01 GENERAL

A. Level measuring systems shall be executed according to the requirements of Section 17100 – Process Control and Instrumentation Systems.

B. Installation shall follow submitted and approved instrument installation detail.

C. Provide reactive air tubing complete from PLC Panel to wetwell air pipes without splices.

D. Float switches used as pump shut-offs shall be set to stop pump just above minimum suction levels as determined by pump supplier. Float switch trigger position shall be approved by the Engineer in field. Coordinate settings with City and Engineer for low-low pump shut off.

3.02 FIELD TESTING

A. Each item shall be subjected to an operating test over the total range of the equipment. All testing shall be witnessed by the Engineer and City. Verify level switch trip setting with the Engineer and City witness.

B. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.

C. Refer to Section 01650 – Facility Startup for further testing requirements.

D. Confirm instruments have nameplates, and connected conduits and conductors are labeled.

E. Pneumatic Leakage Testing:
1. Pneumatic piping shall be air tested for leakage as a complete system. Oil aerosols shall be removed by the utilization of a coalescing filter with a filter efficiency of 1 ppm oil aerosols and filtering to 3 microns particles.

2. All joints and couplings shall be left uncovered and exposed for examination during the pneumatic test.

3. A preliminary pneumatic test not to exceed 10 psig shall be applied as a means of locating major leaks. Leakage on the bubbler air system shall be detected by the soap bubble or equivalent method. From 10 psig, the test pressure shall be increased in steps of 5 psig until the required test pressure listed in Table 1 is reached:

<table>
<thead>
<tr>
<th>Table 1 - Pneumatic Test Pressure/Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Air Level Controls</td>
</tr>
</tbody>
</table>

F. All Field Testing shall be completed during Pre-Demonstration period.

END OF SECTION
SECTION 17112 - PROCESS ANALYSIS MEASURING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDE

A. Furnish and install all process analysis measuring systems, with associated instrumentation and controls as shown and specified herein, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 17100 – Process Control and Instrumentation Systems, and the City’s Process Control System Standards, apply to this Section.

C. Coordinate installation of combustible gas and H2S gas receiver modules, with common power supply, in PLC Panel.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. ISA - S 5.1 Instrumentation Symbols and Identification

1.03 CONTRACTOR SUBMITTALS

A. Shop Drawings: Submit complete shop drawings of all instruments in accordance with Section 01105, and Section 17100 – Process Control and Instrumentation Systems.

B. Installation detail of sensor transmitters in wetwell.

C. Operation and Maintenance Manuals.

D. Training outlines and trainer resume.

1.04 QUALITY ASSURANCE

A. Inspection and Testing Requirements: After installation, obtain the services of a technical representative to inspect and test all instruments for proper performance and installation. Verify accuracies.

1.05 GUARANTEES, WARRANTIES

A. After completion, furnish to the City the supplier’s written guarantees that the metering systems will operate within the published accuracies and ranges and meet these Specifications. Furnish the manufacturer’s warranties as published in its literature, and submit within the O&M Manuals.

PART 2 - PRODUCTS

2.01 GENERAL

A. All devices specified herein shall conform to the requirements of Section 17100 – Process Control and Instrumentation Systems.
B. All instruments shall have stainless steel nameplates with tag number and description.

2.02 COMBUSTIBLE GAS AND H2S GAS TRANSMITTERS AND RECEIVERS

A. Combustible gas (LEL) and H2S gas sensor transmitters with remote receiver modules, and common power supply shall be provided to monitor and display ambient gas measured in SLS Wetwell.

B. Remote receiver modules shall be din rail mounted within PLC Panel section of Panelboard, and shall include LCD digital display with back light feature. Common power supply shall be din rail mounted.

C. Combustible gas sensor transmitter and H2S gas sensor transmitter shall be explosion proof, and include required length of manufacturer cable to interconnect sensor transmitter to receiver module.

D. Gas transmitters shall be ATI GasSens Series. Include the following, no equal:

1. H2S Receiver, Sensor Transmitter: Part No. A14/A11-24-0050-1-1-XP (0-50 PPM) with 100’ (or as required) of cable, XP.

2. LEL Receiver, Sensor Transmitter: Part No. B14/17-0100-4-C12-17-0100-1-2-XP (0-100% LEL) with 100’ (or as required) of cable, XP.

3. Power Supply: Part No. 28-0004.

PART 3 - EXECUTION

3.01 GENERAL

A. Process analysis measuring systems shall be handled, installed, calibrated, loop-tested, pre-commissioned, and performance-tested according to Section 17100 – Process Control and Instrumentation Systems. The manufacturer or qualified technician shall furnish the manufacturer's service, supervision, and training indicated by Section 17100 – Process Control and Instrumentation Systems.

3.02 INSTALLATION

A. Combustible gas transmitter and H2S gas transmitter shall be mounted remotely within PLC Panel located within Panelboard. Gas analyzing sensor elements shall be installed in SSLS Wet Well (Class 1, Division 1, Group D) per Contract Drawing Detail GD.

B. Configure combustible gas transmitter and H2S gas transmitter. Coordinate desired ranges and settings with City.

3.03 FIELD TESTING

A. Each item shall be subjected to an operating test over the total range of the equipment.
B. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.

C. Refer to Section 01650 – Facility Startup for further testing requirements.

D. Confirm instruments have nameplates, and connected conduits and conductors are labeled.

E. All Field Testing shall be completed during Pre-Demonstration period.

3.04 TRAINING

A. Provide combustible gas transmitter and H2S gas transmitter training to City as specified in Section 17100 – Process Control and Instrumentation Systems. Provide two identical training sessions; each session lasting up to two hours, per facility. Multiple training sessions shall not occur on same day. All training shall be completed during Pre-Demonstration period.

END OF SECTION
SECTION 17200 - CONTROL PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General: Provide PLC Panels as part of Panelboards complete and operable, in accordance with the Contract Documents. This section shall use the term Control Panel to mean all provided panels.

B. The requirements of Section 16485 – Local Control Stations apply to this Section.

C. The requirements of Section 17100 – Process Control and Instrumentation Systems apply to this Section.

D. Vendor supplied control panels, such as the Booster Pump Station, shall be provided in accordance with this Section.

E. The provisions of this Section apply to Section 17201 – Control Panel Instrumentation except where indicated otherwise. Refer to Section 17201 for equipment to be installed within control panels.

F. Panels shall be built by a UL 508A listed shop. Provide shop UL nameplate within panels.

1.02 CONTRACTOR SUBMITTALS

A. Shop Drawings: Submit complete shop drawings of all instruments in accordance with the Section 01105, and Section 17100 – Process Control and Instrumentation Systems.

B. Control Panel Engineering Submittal: Submit a control panel engineering submittal (CPES) for each panel. The CPES shall completely define and document the construction, finish, layout, power circuits, schematics, signal and safety grounding circuits, fuses, circuit breakers, signal circuits, internally mounted instrumentation and PLC/SCADA system components, face plate mounted instrumentation components, internal panel arrangements, and external panel arrangements.

PART 2 - PRODUCTS

2.01 GENERAL

A. All Control Panels shall have phenolic engraved nameplates with tag number and description.

B. Outdoor panels shall be padlockable.
C. The PLC Panel shall be the source of power for any 24 VDC field instrumentation.

D. PLC Panel shall be part of Panelboard. Refer to Contract Drawing for panel elevation and ratings.

E. Coordinate with flowmeter supplier and wetwell gas detector supplier for equipment to be mounted within PLC Panel.

F. Hardware within the Control Panels shall be as specified in Section 17201 – Control Panel Instrumentation and Section 17510 – PLC-Based Control System Hardware.

G. Each source of foreign voltage shall be isolated by providing disconnecting or pull-apart terminal blocks and include yellow insulating conductors.

H. PLC Panel shall have PLC discrete outputs with isolation relays wired to disconnecting terminal blocks, PLC analog inputs wired to fused terminal blocks and discrete inputs wired to disconnecting terminal blocks.

2.02 CONTROL PANELS

A. Materials

1. Panel section faces shall be No. 14 gauge minimum thickness steel for wall mounted or pedestal mounted panels. All materials shall be selected for levelness and smoothness.

2. Provide back panel in all Control Panels.

3. Construction: Dimensions shall be as required to layout equipment with sufficient clearances as required by installed components manufacturers. Provide sufficient space between terminals and wireways for reading wire labels. Elevations and horizontal spacing shall be subject to Engineer's review and approval.

4. Sump 40 will have outdoor rated, NEMA 3R, panels.

5. Sump 146 will have a Building to house only the Panelboard; hence Panelboard including the PLC Panel to be NEMA 12 rated.

B. Electrical Requirements

1. Provide conduit, wireways, switches, wire, and electrical fittings for all 115 VAC and 24V DC circuits to instruments and other electrical devices as required for a complete and operable installation.

2. Labeling and Tagging: Each terminal connection shall have a plastic plate with a terminal and instrument tag number. All wiring shall be identified with stamped tubular wire end markers. All panel mounted devices shall have
phenolic tag with inscriptions that match approved shop drawings and referenced in bill of materials.

3. Panels shall be so sized as to adequately dissipate heat generated by equipment mounted in or on the panel. Provide further environmental conditioning if required.

4. Provide a door-activated switch controlled light and a breaker protected 120-volt, 20-amp duplex receptacle within the PLC Panel.

5. Wiring, methods and materials for all panels shall be in accordance with the NEC and UL requirements. Provide din rail mounted circuit breakers for AC power distribution unless shown otherwise.

6. For grounding, panels shall be provided with a ¼-inch by 1-inch copper ground bus complete with solderless connector for one No. 4 AWG bare stranded copper cable, or as called out on Contract Drawings.

7. Power Supply:
   a. PLC Panel shall each be fed by two 120 VAC circuits supplied. One of two circuits shall operate fans, lights, heaters, etc. The other circuit shall connect to the UPS and provide uninterruptible power to controls, controllers, Ethernet switch, etc., as applicable.
   b. Unless otherwise indicated, instruments, control wiring and alarm circuits shall be 24 VDC as much as possible, powered from PLC Panel redundant 24 VDC power supplies.
   c. When instruments do not come equipped with integral fuses, provide fuses as required for the protection of individual instruments against fault currents. Fuses shall be mounted on the back of the panel in a fuse holder, and each fuse shall be identified by a service name tag. Fuses shall be as manufactured by Bussmann Manufacturing Division, Type KAW TRON, or equal.

   C. Labor and Workmanship: All panels shall be fabricated, piped, and wired by fully qualified workmen who are properly trained, experienced, and supervised.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Preparation for Shipment and Shipping
   1. All panels are to be crated for shipment using a heavy framework and skids. The panel sections shall be cushioned to protect the finish of the instruments and panel during shipment. All instruments which are shipped with the panel shall further have suitable shipping stops and cushioning material installed to protect parts which could be damaged due to
mechanical shock. Each separate panel unit shall be provided with removable lifting lugs to facilitate handling.

2. All PLC Panel factory testing shall be witnessed by the Engineer and City prior to shipping.

B. Control panels shall be installed in accordance with Section 17100 – Process Control and Instrumentation Systems.

3.02 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

A. Wiring Installation: All wires shall be run in plastic wireways except field wiring and wiring to panel-mounted components. Wiring run from components on a swing-out panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be tied with nylon wire ties and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

B. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.

C. Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.

D. Shop drawings shall show conformance to the above wiring installation requirements.

3.03 FACTORY TESTING

A. Testing shall be performed in accordance with Section 17100 – Process Control and Instrumentation Systems.

B. Factory Acceptance Testing (FAT): PLC and OIT must be programmed with dummy program provided by the PLC Panel supplier, to investigate PLC input and output registers. The City reserves the right to install PLC and OIT program during the FAT and verify program operational as part of FAT.

3.04 FIELD TESTING

A. Testing shall be performed in accordance with Section 17100 – Process Control and Instrumentation Systems.

B. Verification of SCADA communication and control must be verified as part of Field Testing.

C. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.
D. Refer to Section 01650 – Facility Startup for further testing requirements.

E. Confirm instruments have nameplates, and connected conduits and conductors are labeled.

F. All Field Testing shall be completed during Pre-Demonstration period.

END OF SECTION
PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General: Provide control panels with instrumentation as specified within, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 17100 – Process Control and Instrumentation Systems apply to this Section.

C. The requirements of Section 17200 – Control Panels apply to the Work of this Section.

D. The requirements of Section 16485 – Local Control Stations apply to the Work of this Section.

E. Refer to Section 17510 – PLC-Based Control System Hardware for PLC and OIT hardware.

F. Vendor supplied control panel components, such as the Booster Pump Station, shall be provided in accordance with this Section.

1.02 CONTRACTOR SUBMITTALS

A. Shop Drawings: Submit complete shop drawings of all instruments in accordance with the Section 01105 and Section 17100 – Process Control and Instrumentation Systems.

B. Hardware Submittals:
   1. Complete grounding requirements for Control Panel and components.
   2. Requirements for physical separation between Control System DC components and 120-volt power cables shall be indicated in layout drawings and/or installation detail drawings. A minimum separation of four inches shall be enforced between Control System 24V wiring and any control wiring carrying 120V or higher.
   3. Complete and detailed bills of materials: A bill of material list, including quantity, description, manufacturer, and part number, shall be submitted for each component.
   4. Nameplates for wiring devices and control panels.

C. UPS load calculations as part of the PLC Panel to show that the backup capacity and time meet 30 minutes of battery back up at 125 percent of full connected load.

D. Operation and Maintenance Manuals.
PART 2 - PRODUCTS

2.01 GENERAL

A. Quality Assurance:

1. The panel construction and all interior wiring shall be in strict accordance with the National Electric Code (NEC), state and local codes, and in conformance with applicable specifications of NEMA, ANSI, UL, and ICECA.

2. All panels and enclosures shall be completely fabricated, and instruments installed, wired, and plumbed at the Instrument Suppliers shop.

3. All panels and enclosures shall bear a UL label stating “suitable for use as an industrial control panel” and built by a UL-listed shop, and a shop label is included within panel.

4. Panels shall be constructed to UL 891 standards in a UL 508A certified manufacturing facility.

5. All electrical work shall be in accordance with the applicable requirements of Division 16.

6. All devices specified herein shall conform to the requirements of 17100 – Process Control and Instrumentation Systems.

B. Control Panel Electrical

1. Interior panel wiring:

a. Wiring shall be supported independently of terminations by lacing to panel support structure or by slotted flame-retardant plastic wiring channels. Wiring channels shall comply with UL 94, Type V-1. Wiring channel fill shall not exceed 40 percent of cross-section area. Only one wire per terminal block with the exception of a comb jumper in addition to the single wire.

b. Wiring shall comply with the requirements of NEC as a minimum. Power and control wiring shall be single conductor. Stranded copper, NFPA No. 70 Type MTW.

c. Plug strips with grounding type receptacles shall be provided for 120 VAC power supply connections. Each piece of equipment requiring ac power shall be provided with an NEC Type SJ cord with molded-on grounding type plug for ac power connection. Panel work shall contain no exposed connections, and adjustments to equipment shall be made without exposing these terminals. Power and control wiring operating above 80 VAC or dc shall be carried in covered channels separate from low voltage signal circuits.
d. Terminal blocks: Terminal blocks for panels, consoles, racks, and cabinets shall meet the following requirements:

1) Provide sufficient terminations to accommodate both present and future needs. Wire all spare or unused panel mounted elements to their panels’ terminal blocks. Provide the greatest of 10 percent of all connected terminals or four unused spare terminals.

2) Provide 600-volt spring type terminal blocks. Use yoke that guides all stands of wire into the terminal. Supply terminals that allow connection of wire without any preparation other than stripping. Rail mount individual terminals to create a complete assembly. Provide terminals constructed in order that jumpers can be installed with no loss of space on terminal or rail.

3) Each terminal strip shall have a unique identifying alphanumeric code at one end and a vinyl marking strip running the entire length of the terminal strip with a unique number of each terminal. Numbers shall be machine printed and 1/8-inch high. Terminal strip codes and terminal numbers shall comply with numbers listed on the wiring diagram.

4) Size all terminal block components to allow insertion of all necessary wire sizes and types. Supply terminal blocks with a marking system allowing the use of preprinted or field-marked tags.

5) Field connections shall be to separate field terminal block strips. Terminal blocks for field terminations shall be in a separate part of the panel close to where the field cables enter the panel. All discrete field terminal blocks shall be the knife switch, disconnect type isolation terminal blocks. All analog field terminal blocks shall be fused type, disconnecting terminal blocks.

6) Provide spring cage connection type terminal blocks manufactured by Wago, Weidmuller, or Phoenix.

e. Circuits shall be fused where shown or required. Fuses shall measure ¼-inch by 1¼-inches. Fuses on 120 VAC circuits shall be ceramic tube type with 25,000 amperes interrupting capacity at 125 volts and neon blown fuse indicator lamps. Fuses for 24 V DC shall be fast-acting glass tube type rated 1/8 or 1/10 amp for 4-20 and 10-50 mA loops and 3 amps for the power supply to individual instruments. Fuse holders for 120 VAC shall be draw out type and molded from melamine plastic.

f. Two ¼-inch by 3-inch copper buses shall be provided in the panels: one for signal and shield grounding and one for equipment and cabinet grounding. The signal ground bus shall be mounted on insulated stand-
offs and the entire signal ground system bonded to the cabinet ground system at a single point.

2. Signal distribution within panels:
   a. The 4 to 20 mA signals shall be distributed within panels as 4 to 20 mA signals.
   b. Signals distributed outside panels shall be isolated 4 to 20 mA signals.

3. All PLC digital inputs shall be prewired to field terminal blocks. All PLC digital outputs must be prewired through isolation relays to field terminal blocks.

2.02 DC POWER SUPPLIES
   A. Furnish redundant wired (two separate units), DC power supplies to convert 120 AC input power (UPS) to 24V DC regulated voltage output. Power supplies to be equipped for back panel mounting. Power supplies to be adjustable output voltage, LED status, two-percent mV peak to peak maximum ripple, UL listed for overload protection. Provide DC Power Supply Fail alarm to PLC. Power supplies to be wired redundant. Provide minimum 5 amp rated outputs. Provide with 25-percent spare capacity.
   B. DC Power Supplies shall be Mean Well DR-120 Series, with parallel operation allowed, or approved equal.

2.03 CONTROL DEVICES
   A. Relays:
      1. General purposes relays shall be enclosed octal plug-in units. Two- and three-pole relays shall be IDEC Series RR, or equal. Four-pole relays shall be IDEC Series RH, or equal. Relay contacts for control circuits shall be rated not less than 7.5 amperes at 120 VAC and at 30 VDC. Relays shall be UL-listed, indicating type, and push to test.
      2. Where shown, time delay functions shall be accomplished with time delay relays. Units shall be adjustable time delay relays with the number of contacts and contract arrangements, as shown. A neon status-indicating light shall be provided with each relay. Contacts shall be rated for 7.5 A at 120 VAC. Integral knob with calibrated scale shall be provided for adjustment of time delay. Initial setting shall be as shown with time delay range approximately three times the initial setting. Delay range-ability shall be at least 10:1. Timing relays shall be solid state pulse-count type utilizing a high frequency resistance-capacitance (RC) oscillator and integrated circuit counter for timing. Time delay on relays shall be IDEC Series GT3A,
or equal. Time delay off relays shall be IDEC Series GT3F (true off), or equal.

3. All relays shall have a screw terminal interface with the wiring. Terminals shall have a permanent, legible identification. Relays shall be mounted so that the terminal identifications are clearly visible and the terminals are readily accessible.

4. Latching relays shall be two-pole, 10A, 120 VAC din rail mounted. Relays shall be industrial type, dual coil. Manufacturer to be IDEC Series RR2KP, or equal.

B. Illuminated Control Indicating Lights:

1. Shall be heavy-duty, NEMA 4X, with round plastic lens, and jumbo legend plate. Each shall be push-to-test indicating light, transformer type, with LED lamps.


C. Non-illuminated Control Pushbuttons

1. Shall be heavy-duty, NEMA 4X, bootless, flush head pushbutton, momentary contact, with jumbo legend plate.


D. Two-position, three-position and four-position Selector Switches:

1. Position switches shall be maintained contact type, rated 20 A minimum at 120 VAC. Control knob shall be black, NEMA 4X, and shall show clearly the control switch position.

2. Selector switch shall be complete with jumbo legend plate, and with contact blocks.


E. E-Stop Pushbuttons:

1. Shall be heavy duty, NEMA 4X, twist to release, multiple poles, with jumbo legend plate and red pushbutton.

2.04 PLC PANEL UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. The UPS shall receive a 120 VAC, 60 Hz power input, and generate a 120 VAC, 60 Hz output signal which is protected from incoming spikes, sags, noise, brownouts, and power outages. UPS shall have a battery pack, a battery charger, an inverter, and a microprocessor-based controller to provide continuous, on-line, computer grade uninterruptible power. UPS shall maintain power to all of its loads, including non-constant loads, for a minimum of thirty minutes at a loading of 100 percent of connected load. The equipment submittal shall include sizing calculations which support the unit selected. The UPS shall be supplied with a low output voltage cutoff to prevent damage to loads when the battery power is exhausted. Provide with discrete contact output for UPS fail alarm to PLC. Provide with communication and connect to Ethernet switch. Mount on shelf to elevate above conduit entrance. Provide a two-year warranty. UPS shall power PLC Panel loads. The uninterruptible power supply shall Eaton 5PX, 1000 VA or larger. No substitutions.

2.05 PLC PANEL RADIO AND ANTENNA

A. Provide Microhard Nano Series IPn920, no equal.
B. Provide antenna cable protector, Polyphaser IS-50NX-C2, or approved equal.
C. Provide yagi type antenna, Kathrein Radome Protected Yagi Antenna, RY-900B, 890-960 Hz, 12 dB gain, no equal.

2.06 ETHERNET SWITCH

A. Ethernet Switch: Ethernet Switch shall be N-Tron 7010TX switch, no equal.
B. Provide all miscellaneous patch cords, shelves, mounting hardware, wire management systems, fans, etc. Provide labels on all equipment.

2.07 INTRINSICALLY SAFE RELAYS

A. Provide intrinsically safe relays for level switches and as required per NEC.
B. Intrinsically safe relays shall be rated for Class 1 Div 1 applications. Intrinsically safe relays shall be Phoenix Contact, Gems Sensors, or approved equal.

2.08 REACTIVE AIR SYSTEM

A. Refer to Contract Drawings and Section 17106 for Reactive Air equipment and materials to be part of PLC Panel.
B. Provide all miscellaneous connectors, valves, tubing for a complete and operational system. Provide labels on all equipment.
2.09 SPARE PARTS
   A. Provide one spare Ethernet Switch, N-Tron 7010TX.

PART 3 - EXECUTION

3.01 GENERAL
   A. Control panel instrumentation shall be executed in accordance with Section 17100 – Process Control and Instrumentation Systems and UL 508A panel requirements.

3.02 ASSEMBLY
   A. The installation of instrumentation and associated components shall following manufacturer’s instructions.
   B. Equipment shall be installed in a neat and workmanlike manner, and firmly secured to the surface on which it is mounted.

3.03 INSTALLATION
   A. Each control panel shall be set level and plumb, and shall be secured by not less than four stainless steel epoxy anchor bolts, sized and located by panel supplier and confirmed by anchoring seismic calculations as required. PLC Panel, as part of Panelboard, shall be mounted per Contract Drawing Detail EM.
   B. Control Panel Doors shall swing freely and close tightly.
   C. Exterior doors shall be padlockable.
   D. Any damage to the structure, components or finish shall be carefully repaired to the satisfaction of the Engineer.
   E. City shall provide orientation of antennas, specific for each site, upon request.

3.04 FIELD TESTING
   A. Each item shall be subjected to an operating test to verify functionality. All testing shall be witnessed by the Engineer and the City.
   B. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.
   C. Refer to Section 16120 – Wires and Cables for antenna and antenna cable testing.
   D. Refer to Section 01650 – Facility Startup for further testing requirements.
E. Confirm instruments and devices have nameplates.

F. All Field Testing shall be completed during Pre-Demonstration period.

END OF SECTION
SECTION 17510 – PLC BASED CONTROL SYSTEM HARDWARE

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. General: Furnish supervise installation, assemble, configure communications, and test the PLC-based Control System specified under this Section, and in accordance with the requirements of the Contract Documents. The PLC programming, OIT configuration, radio configuration and Ethernet Switch configuration shall be provided by the City.

B. Factory Acceptance Test: PLC Panel supplier shall provide and install a “dummy program” to Factory Test the PLC inputs and outputs to processor registers.

C. Scope of Work: Furnish, install, test and start-up the PLC Control System as specified within these Contract Documents. Select equipment and supply hardware material, after approved submittals, integrate total system, configure communication system, supervise installation, test, train, and start-up the entire Control System being furnished under this Contract. Provide assistance to the City for SCADA system testing. The Control System hardware being furnished under this Section shall be the City-standardized system.

D. Submit separate submittals for each facility.

E. Prepare and submit for approval Control System hardware shop drawings.

F. Furnish and install a complete PLC hardware system, including all peripherals and other equipment specified herein.

G. Separate process related PLC digital inputs from non-process related PLC digital inputs. Provide separately fused input groups. Provide interposing relays on PLC outputs.

H. Perform all required Control System tests, including adjustments and calibrations to ensure a fully functional system.

I. Furnish labor to perform Control System installation and start-up.

J. Furnish all required Control System tools, test equipment, spare parts, supplies, operations and maintenance manuals, and reproducible "as-built" drawings as specified herein.

K. System Responsibility: All Control System hardware shall be furnished in accordance with the Contract Document to provide a fully integrated Control System. Coordinate the Work of personnel and the Instrumentation Supplier's personnel for the installation, interconnection, testing, calibration, and operation
of all Control System equipment and coordinate the scheduling along with the
programming work of the City’s representative. Provide equipment that properly
meets the functional intent of the Contract Documents. Substitutions for Control
System functions specified are not permitted.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS.
   A. PLC-based control system hardware reference specifications, codes, and
      standards shall be provided in accordance with Section 17100 – Process
      Control and Instrumentation Systems.

1.03 CONTRACTOR SUBMITTALS
   A. Shop Drawings: Control System submittals shall be in accordance with the
      applicable requirements of Section 01105, and Section 17100 – Process
      Control and Instrumentation Systems.
   B. Submit separate submittals and O&M manuals for each facility.
   C. Hardware Submittals:
      1. A complete set of shop drawings for:
         a. All PLCs and OIT: PLCs shall be shown with their current I/O
            allocation, spare I/O allocation, maximum potential I/O based on
            available slots, and all I/O addresses.
         b. All cables required to support the communication and programming
            requirements.
   D. Operation and Maintenance Manuals: Provide O&M Manuals.

1.04 STORAGE AND HANDLING
   A. All equipment and materials delivered to the jobsite shall be stored in a location
      which shall not interfere with construction. Storage and handling shall be
      performed in a manner which shall afford maximum protection to the equipment
      and materials. Assure proper handling and on-site storage.

1.05 WARRANTY
   A. Furnish to the City the supplier’s written guarantees, that the PLC-based
      hardware system will operate and meet these Specifications. Furnish the
      manufacturer’s warranties as published in its literature, and submit within the
      O&M Manuals.
PART 2 - PRODUCTS

2.01 GENERAL

A. All materials and all Control System equipment furnished under this Contract shall be new, free from defects, of first quality, and produced by manufacturers regularly engaged in the manufacture of these products.

B. Where there are more than one item of similar equipment being furnished under this Contract, all such similar equipment shall be the product of a singular manufacturer.

2.02 PLC PANEL HARDWARE

A. Provide the following PLC Hardware, per site, based on Modicon M340 series, no equal.

1. One 12 Slot Rack – Modicon model number BMX XBP 1200
2. One Processor – Modicon model number BMX P34 2020
3. One Power Supply – Modicon model number BMX CPS 3020
4. Two Discrete Digital Input Module – Modicon model number BMX DDI 1602
5. One Discrete Digital Output Module – Modicon model number BMX DDO 1602
6. One Analog Input Module – Modicon model number BMX AMI 0810
7. One Communication Module – Modicon model number BMX NOM 0200
8. One Communication Module – Modicon model number BMX NOE 0100
9. One Communication Module – Modicon model number BMX NOC 0401
10. One Shielded Cord set – Modicon model number BMX FTW 308S
11. Two Cord sets – Modicon model number BMX FTW 301

B. Provide the following Operator Interface Terminal (OIT), based on Magelis, no equal, per site:

1. One OIT – Magelis model number HMISTU855.

C. Miscellaneous Components: The following items will be required to provide a fully functional PLC system. Additional components may be required which are not listed here.

1. Cat 6 cabling to Ethernet Switch as needed. All patch cables to be Cat 6 certified factory cables, with blue insulation.

2. Provide spare slot covers, Modicon BMX XEM 010. Leave slot next to processor open, include cover.

3. Refer to Section 17201 for radio and Ethernet switch specifications.
2.03 PLC PANEL SPARE PARTS

A. Provide the following spare parts, with quantity shown for entire project:

1. One Rack – Modicon model number BMX XBP 01200
2. One Processor – Modicon model number BMX P34 2020
3. One Power Supply – Modicon model number BMX CPS 3020
4. Two Discrete Digital Input Modules – Modicon model number BMX DDI 1602
5. Two Discrete Digital Output Modules – Modicon model number BMX DDO 1602
6. Two Analog Input Modules – Modicon model number BMX AMI 0810
7. One Communication Modules – Modicon model number BMX NOM 0200
8. One Communications Module – Modicon model number BMX NOC 0401
9. One Communications Module – Modicon model number BMX NOE 0100

PART 3 - EXECUTION

3.01 INSTALLATION

A. Per Division 17100 and manufacturer recommendations.

B. Provide spare PLC Panel parts in rubber tub at during Field Testing of PLC Panel. Rubber tub to be Rubbermaid. Provide to City.

3.02 FIELD TESTING

A. Testing shall be performed in accordance with Section 17100 – Process Control and Instrumentation Systems.

B. Verification of network communications and PLC inputs/outputs must be verified as part of Field Testing.

C. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.

D. Refer to Section 01650 – Facility Startup for further testing requirements.

E. Refer to Section 16120 – Wires and Cables for antenna and antenna cable testing.

F. Confirm wires connected to PLC are labeled.

G. All Field Testing shall be completed during Pre-Demonstration period.

END OF SECTION
SECTION 17511 - PLC I/O LIST

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide and update as required a PLC I/O List, originated from PLC Panel inputs and outputs shown on the Contract Drawings. Provide an I/O List per facility, to City for review, to modify and for final approval.

1.02 SUBMITTALS

A. Provide updates to the PLC I/O List during the construction phase. Submit PLC I/O Lists in accordance with Section 01105, and Section 17100 – Process Control and Instrumentation Systems.

B. Submit PLC I/O List per facility.

C. Separation of process and non-process devices (intrusion and motion sensors) by discrete digital input module. Provide separately fused I/O groups or interposing relays.

D. PLC I/O List must be submitted and accepted by City as “ready for Factory Acceptance Testing” at least fifteen (15) days prior to Factory Acceptance Testing. The PLC I/O List may not be “final” prior the Factory Acceptance Testing, but must be accepted as “ready for Factory Acceptance Testing” by the City programmer. If the PLC I/O List is not accepted, the Factory Acceptance Testing will be postponed.

E. Provide final approved PLC I/O List as part of PLC Control Panel's O&M Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PLANS
NOTES:
1. CONTRACTOR SHALL PROVIDE INSTALL AND CONNECT ALL WIRES TO THE PFC TERMINAL BLOCKS, RELAYS, FUSES, AND FIELD DEVICES.
2. REPLACE "???" IN TAG NUMBER WITH CORRECT IDENTIFIER NUMBER.
3. CONTRACTOR TO PROVIDE AND INSTALL HEAT SHRINKABLE WIRE LABELS WITH THE NUMBERS SHOWN ON THE PLANS.
4. THE CITY WILL PROVIDE THE PLC PROGRAM.
5. FINAL PLC CONTROL PANEL DRAWINGS BY SUPPLIER.
NOTES:

1. CONTRACTOR SHALL ENSURE INSTALL AND CONNECT ALL WIRING TO THE PLC TERMINAL BLOCKS, RELAYS, FUSES, AND FIELD DEVICES.

2. REPLACE "X" BY TAG NUMBER WITH SUMP IDENTIFIER NUMBER.

3. CONTRACTOR TO PROVIDE INSTALL HEAT SHRINKABLE WIRE LABELS WITH THE NUMBERS SHOWN ON THE PLANS.

4. THE CITY WILL PROVIDE THE PLC PROGRAM.

5. FINAL PLC CONTROL PANEL DRAWINGS BY SUPPLIER.
SINGLE LINE DIAGRAM

NOTES:

- PROVIDE A SPD ON LOAD SIDE OF TRANSFER SWITCH ISSUED WHERE RATING, LEAD LENGTH AS SHOWN AS POSSIBLE.
- PROVIDE WITH MODULAR TOP COMMUNICATION OPTION.
- REFER TO BREAKER SCHEDULE FOR 120 VAC EQUIPMENT AND LOADS.

LOAD CALCULATIONS AT 240V

<table>
<thead>
<tr>
<th>LOAD TYPE</th>
<th>HP</th>
<th>CONNECTED LOAD</th>
<th>AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sump Pump</td>
<td>5</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>Sump Pump #2</td>
<td>5</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>Booster Pump</td>
<td>1.5</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>HVAC</td>
<td></td>
<td>5.0</td>
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</tr>
<tr>
<td>SUBTOTAL</td>
<td></td>
<td>28.3</td>
<td></td>
</tr>
<tr>
<td>SIZE OF CONNECTED LOAD</td>
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</tr>
<tr>
<td>TOTAL AMPS AT 240V</td>
<td></td>
<td>41.0</td>
<td></td>
</tr>
</tbody>
</table>

J Calton Engineering
**GENERAL NOTES:**
1. PANELBOARD SHALL BE OUTDOOR RATED, DEAD FRONT REVERSIBLE DOORS. INTERIOR SWING PANELS FOR CONTROLS PARTS /ELECTRICAL PANELS. REVERSIBLE DOORS.
2. PROVIDE MANUFACTURER DRAWINGS AND PANEL SCHEDULE.

**KEY NOTES:**
- CONTROL DEVICES MOUNTED ON OR THROUGH内部 SWING PANEL
- PROVIDE NAMEPLATE INSURANCE WITH LOAD
- MOUNTED INSIDE PANEL OR ON BACK PANEL
- PROVIDE NAMEPLATE ON PANEL

**TYPE OF FIXTURE SCHEDULE**

<table>
<thead>
<tr>
<th>#</th>
<th>DESCRIPTION</th>
<th>LIGHTING FIXTURE SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LED LUMINARIE SINNER FROM ROLOYAL LIGHTING 108 WATTS</td>
<td>POLE MOUNTED</td>
</tr>
<tr>
<td>2</td>
<td>POLE FOR EXTERNAL, DRY BORE PILE</td>
<td>POLE MOUNTED</td>
</tr>
<tr>
<td>3</td>
<td>LED VAPOR TIGHT LUMINARIE</td>
<td>SURFACE MOUNTED</td>
</tr>
</tbody>
</table>

**CITY OF SACRAMENTO**

**DEPARTMENT OF UTILITIES**

**RECONSTRUCTION OF SUMPS 40 & 146**

**SUMP 40**

**UTILITY METER AND PANELBOARD EL. AND FIXTURE SCHEDULE**

**J Calton Engineering**
<table>
<thead>
<tr>
<th>CONDUIT AND CABLE SCHEDULE</th>
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<tbody>
<tr>
<td>NO.</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>SER</td>
</tr>
<tr>
<td>P001</td>
</tr>
<tr>
<td>P002</td>
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<td>P003</td>
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<td>C001</td>
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</tr>
<tr>
<td>P001</td>
</tr>
<tr>
<td>P004</td>
</tr>
<tr>
<td>C005</td>
</tr>
</tbody>
</table>

**CONDUIT AND CABLE SCHEDULE**

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**标注：**

1. MOUNT TYPE 2 LAMPS TO UNDERSIDE OF SHADE ENCLOSURE:

2. PROVIDE NEITHER PROOF SWITCHES IN PVC COATED CAST BOX.

3. PREPARE WELDING FABRICATE IN OPERABLE ENCLOSURE LIGHT AND TYPE LAMPS MOUNT 4" ABOVE CENTER OF BOX.

4. 1/2" BACK TO BACK, NOT SUPPLIED, GALVANIZED STEEL WITH 316 STAINLESS STEEL HARDWARE.
GENERAL NOTES:
1. ALL CONDUITS TO TEE NET WELL SHALL BE 3/4".
2. FIELD COORDINATE LOCATION OF INSTRUMENTS WITH INSTRUMENT LOCATION SHEET E3.4 FOR EASE OF MAINTENANCE AND REPLACEMENT.
3. NET WELL WILL BE CLASS 1 DIVISION 1 LOCATION AND CONSTRUCTION.
4. EXHAUST AIR RAW WATER HEAT EXCHANGER RESERVOIR Primarily - ABOVE GRADE C-CLASS 1
   DIVISION 1 LOCATION AND CONSTRUCTION - 4X.
5. THE IDEAL X RESERVOIR BASED ON TOTAL NET WELL CUBAGE TO BE DETERMINED AS SHOWN ARE "MINIMUM".
6. DRAWING DOES NOT REFLECT ACTUAL NET WELL CONSTRUCTION TO BE DETERMINED AS SHOWN FOR ACTUAL CONSTRUCTION.

DRAWING NOTES:
1. INSTALL "LOW-LEVEL ALARM" FLOAT SWITCH TO TOWER AT ELEVATION 00'-00" OR BARRIER NUT TIGHTEN BY MANUFACTURER (MOUNTED IN WALL).
2. INSTALL "MID-LEVEL ALARM" FLOAT SWITCH TO TOWER AT ELEVATION 00'-00".
3. PROVIDE HOLE IN TOP FOR REMOVAL FOR INSPECTION.
4. PROVIDE INSULATED WIRES AND CORDING LEADS FROM TOWER TO FLOWMETER MCB.
5. PROVIDE 1/2" PVC SDR 35 IN AIR PIPE (TOTAL OF 2) IN E16 NET WELL.
6. STAINLESS STEEL CONDUIT FROM NET WELL TO HEAD 7 ALARM BOX, SIZE CONDUIT TO BE BASED ON SUPPLIED CABLE "MINIMUM".

SECTION VIEW:
- MANHOLE CABLE
- HEATING AIR PER DETAIL ON 00'-00".
- E16-7 PRIMARY ALARM LEAD.
- E16-2 EXHAUST AIR LEAD.
- E16-2 (EXHAUST AIR LEAD)
- E16-3 (LOAD PUMP ON)
- E16-4 (LOAD PUMP OFF)
- E16-3 (LOAD PUMP ON)
- E16-5 (LOAD PUMP OFF)
- WET WELL AIR LEAD.
- HANDHELD MONITOR.
- MICROPROCESSOR ANALYZER.

FOR 8" REACTIVE AIR PELLETS AND UNIONS, SUPPORTS THIS AREA. SEE DETAIL S/0/3.

CITY OF SACRAMENTO
DEPARTMENT OF UTILITIES

RECONSTRUCTION OF SUMPS 40 & 146
SUMP 40
WET WELL SECTION

J Calton Engineering
### Conduit and Cable Schedule

<table>
<thead>
<tr>
<th>NO.</th>
<th>CODE</th>
<th>SIZE</th>
<th>CABLE SIZE AND QUANTITY</th>
<th>FROM</th>
<th>TO</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>P001</td>
<td>1.12</td>
<td>4-4/0, 3/0G</td>
<td>MGD DISTRIBUTION SYSTEM</td>
<td>UTILITY METER</td>
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</tr>
<tr>
<td>P002</td>
<td>1.12</td>
<td>4-4/0, 3/0U</td>
<td>G.H., M.P.F.</td>
<td>PUMPING MAIN (PUMP)</td>
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<td></td>
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<tr>
<td>P003</td>
<td>1.12</td>
<td>4-4/0, 3/0U</td>
<td>GENERATION RECEPTACLE</td>
<td>G.E. EMERGENCY</td>
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<td></td>
</tr>
<tr>
<td>P004</td>
<td>1.12</td>
<td>3-4/0, 1/2G, 2-4/1</td>
<td>PANELBOARD PUMP STARTER</td>
<td>BOOSTER PUMP STATION</td>
<td>CONTINUE TO SWITCH WITHIN STATION</td>
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</tr>
<tr>
<td>P005</td>
<td>1.12</td>
<td>2-2/0, 1/2G</td>
<td>PANEL BOARD</td>
<td>AREA LIGHT WITH MOTION SENSOR</td>
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<td></td>
</tr>
<tr>
<td>P006</td>
<td>1.12</td>
<td>1-4/0</td>
<td>PANEL BOARD</td>
<td>PREMISES</td>
<td></td>
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</tr>
</tbody>
</table>

### Plan View Control Building

- **KEY NOTES:**
  - **ALL CABLES AND RECEPTACLE CABLES SHALL BE INSULATED, AND BE 3/4" O.D. WITH 1/2" STEEL.**
  - **MOUNT THE E.V. AND 10" ABOVE FLOOR TO SYSTEM OF TRAFFIC.**
  - **MOUNT THE 10" LIGHTS ON CEILING.**
  - **RECEPTACLES SHALL BE MOUNTED 10" ABOVE FLOOR TO TOP OF BOX, LEAD SHEET SHALL BE 10" ABOVE FLOOR TO TOP OF BOX.**

- **PLAN VIEW CONTROL BUILDING**
As-built Plans for Sumps 40 & 146

(Seven Drawings)