The Enclosed Document Is Provided For Your Convenience.

Please Email ALL Questions:

MailTo:ContractAdministration@TampaGov.net

Please Let Us Know If You Plan To Bid

City of Tampa
Contract Administration Department
306 E. Jackson St. #280A4N
Tampa, FL 33602
(813)274-8456

CITY OF
TAMPA, FLORIDA

NOTICE TO BIDDERS, INSTRUCTIONS TO BIDDERS
PROPOSAL, BID BOND, FORM OF NOTICE OF AWARD,
AGREEMENT, PERFORMANCE BOND AND
SPECIFICATIONS

FOR

Contract 12-C-00042

HOWARD F. CURREN AWTP RAW SEWAGE PUMPING STATION IMPROVEMENTS

City of Tampa
CONTRACT ADMINISTRATION DEPARTMENT
TAMPA MUNICIPAL OFFICE BUILDING
306 E. JACKSON STREET - 4TH FLOOR NORTH
TAMPA, FLORIDA 33602

SEPTEMBER 2013

CITY OF TAMPA
CONTRACT ADMINISTRATION DEPARTMENT
306 E. Jackson Street 280A4N
Tampa, FL 33602

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BID NOTICE MEMO

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Bids will be received no later than 1:30 p.m. on the indicated Date(s) for the following Project(s):

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CONTRACT NO.: 12-C-00042; Howard F. Curren AWTP Raw Sewage Pumping Station Improvements
BID DATE: November 5, 2013 ESTIMATE: $1,400,000 SCOPE: The project comprises furnishing all labor, materials and equipment for improvements to bypassing pumping station wastewater flows, partial removal of the pumping station concrete top slab, demolishing concrete structures in the wet well, control panels and enclosures, station piping, pumps and valves; installation of mechanical bar screen and screenings' washing compactor, concrete driveway, roof structure, two new submersible pumps, HDPE piping, valves, controls, electrical, instrumentation, telecommunications. PRE-BID CONFERENCE: Tuesday, October 15, 2013, 10:00 a.m., AWTP Maintenance Building Training Room, 2700 Maritime Drive, Tampa, FL 33619. Attendance is not mandatory, but recommended. Firms must email names and companies represented for all attendees a minimum of 24 hours in advance to Richard.Birchmire@tampagov.net Mariam.Vliet@tampagov.net and Elaine.Tait@tampagov.net to obtain security clearance. Attendance is not mandatory, but recommended.

****

CONTRACT NO.: 13-C-00034; McBerry Pumping Station Rehabilitation
BID DATE: October 29, 2013 ESTIMATE: $400,000 SCOPE: The project comprises furnishing all labor, materials and equipment to demolish existing pump station and install new submersible pump station; Including but not limited to wet well, two pumps, one manhole, 60ft of 8" DIP, concrete driveway, electrical components. PRE-BID CONFERENCE: Tuesday, October 15, 2013, 1:00 p.m., on-site at 2706 E. McBerry Street, Tampa, FL 33610. Attendance is not mandatory, but recommended.

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CONTRACT NO.: 14-C-00003; Downtown Gateway Lighting Improvements at North Franklin Street and Jefferson/Orange Street at I-275 – Sheltered Market BID DATE: October 29, 2013 ESTIMATE: $275,000 SCOPE: The project comprises new LED lighting in existing landscaping beds along with wiring to be pulled through existing conduit, new conductors, contactors, electric panels and weatherproof enclosure(s) with connections to lighting and irrigation controllers.
PRE-BID CONFERENCE: Tuesday, October 15, 2013, 3:00 p.m. Attendance is not mandatory, but recommended.

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Bids will be opened in the 4th Floor Conference Room, Tampa Municipal Office Building, 306 E. Jackson Street, Tampa, Florida 33602. Pre-Bid Conference is held at the same location unless otherwise indicated. Plans and Specifications and Addenda for this work may be examined at, and downloaded from, www.demandstar.com. Backup files are available at http://www.tampagov.net/dept_contract_administration/programs_and_services/construction_project_bidding/index.asp.
Subcontracting opportunities may exist for City certified Small Local Business Enterprises (SLBEs). A copy of the current SLBE directory may be obtained at www.Tampagov.net. Phone (813) 274-8456 for assistance. Email Technical Questions to: contractadministration@tampagov.net .

LEGAL NOTICE

Sealed bids will be received by the City of Tampa no later than 1:30 p.m. on the indicated Bid Date(s) for the following Project(s):

Bids will be opened in the 4th Floor Conference Room, Tampa Municipal Office Building, 306 E. Jackson Street, Tampa, Florida 33602. Pre-Bid Conference is held at the same location unless otherwise indicated. Plans and Specifications and Addenda for this work may be examined at, and downloaded from, www.demandstar.com. Backup files are available at http://www.tampagov.net/dept_contract_administration/programs_and_services/construction_project_bidding/index.asp.
Subcontracting opportunities may exist for City certified Small Local Business Enterprises (SLBEs). A copy of the current SLBE directory may be obtained at www.Tampagov.net. Phone (813) 274-8456 for assistance. Email Technical Questions to: contractadministration@tampagov.net .

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NOTICE TO BIDDERS
CITY OF TAMPA, FLORIDA
Contract 12-C-00042; Howard F. Curren AWTP Raw Sewage Pumping Station Improvements

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., November 5, 2013, in the 4th Floor Conference Room, Tampa Municipal Office Building, 306 E. Jackson Street, Tampa, Florida, there to be publicly opened and read aloud.

The proposed work is to include, but not be limited to, bypassing pumping station wastewater flows, partial removal of the pumping station concrete top slab, demolishing concrete structures in the wet well, control panels and enclosures, station piping, pumps & valves; installation of mechanical bar screen and screenings' washing compactor, concrete driveway, roof structure, two new submersible pumps, hdpe piping, valves, controls, electrical, instrumentation, telecommunications with all associated work required for a complete project in accordance with the Contract Documents.

The Instructions to Bidders, Proposal, Form of Bid Bond, Agreement, Form of Public Construction Bond, Specifications, Plans and other Contract Documents are posted at DemandStar.com. Backup files may be downloaded from http://www.tampagov.net/dept_contract_administration/programs_and_services/construction_project_bidding/index.asp. One set may be available for reference at the office of the Contract Administration Department, Municipal Office Building, Fourth Floor North, City Hall Plaza, Tampa, Florida 33602.

Each Proposal must be submitted on the Proposal form included in the Specifications and must be accompanied by a certified check or cashier's check on a solvent bank or trust company in compliance with Section 255.051, Florida Statutes, made payable to the City of Tampa, in an amount of not less than five per cent of the total bid, or a Bid Bond, of like amount, on the form set forth in the Contract Documents, as a guarantee that, if the Proposal is accepted, the Bidder will execute the Proposed Contract and furnish Performance and Payment Bonds within twenty (20) days after receipt of Notice of Award of Contract.

The City of Tampa reserves the right to reject any or all Bids and to waive any informalities in the Bid and/or Bid Bond. Acceptance or rejection of Proposals will be made as soon as practicable after the Proposals are received, but the City reserves the right to hold Proposals for ninety (90) days from the date of Opening.

Bid Protest Procedures: Unless subsequently indicated otherwise, in a revised posting on the Department's web page for Construction Project Bidding, the City of Tampa intends to award the referenced project to the lowest bidder listed in the tabulation posted on or about the date of Bid Opening. A bidder aggrieved by this decision may file a protest not later than 4:30 P.M., five (5) business days from the first posting thereof, pursuant to City of Tampa Code Chapter 2, Article V, Division 3, Section 2-282, Procurement Protest Procedures. Protests not conforming therewith shall not be reviewed.

Communication with City Staff

Pursuant to City of Tampa Ordinance 2010-92, during the solicitation period, including any protest and/or appeal, NO CONTACT initiated by bidders or responders with City officers or employees, other than the individuals specified below is permitted:
Director of Contract Administration, David Vaughn
Contracts Management Supervisor, Jim Greiner
Contract Officer, Jody Gray
The City's Legal Department staff
The City's Contract Administration Department staff.
Technical Questions and Requests For Information should be directed to the Department via
ContractAdministration@tampagov.net

"A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list." Refer to Section 287.133 Florida Statues.

In accordance with the City of Tampa's Equal Business Opportunity Ordinance, a Goal may have been established for subcontracting with Small Local Business Enterprises, SLBEs, certified by the City. Links to further information and a list of SLBEs are on the Department's Construction Project Bidding Web page. A link to the current complete directory of SLBEs is on the Minority Business Development Office Website.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.01 GENERAL:

The proposed work is the Howard F. Curren AWTP Raw Sewage Pumping Station Improvements in the City of Tampa, as required for a complete project, as shown on the plans and detailed in the specifications. The work is located on land owned or controlled by the City of Tampa.

I-1.02 FORM PREPARATION AND PRESENTATION OF PROPOSALS: Replace the second sentence with the following: Submission of the entire specification book is not required.

I-1.03 ADDENDA – Section I-2.03 is replaced with the following: No interpretation of the meaning of the Plans, Specifications, or other Contract Documents will be made to any Bidder orally.

Every request for such interpretation must be in writing, addressed to the City of Tampa, Contract Administration Department, 306 E. Jackson St., 4th Floor, Tampa, Florida 33602 and then emailed to ContractAdministration@tampagov.net. To be given consideration, such request must be received at least seven (7) days prior to the date fixed for the opening of the Proposals. Any and all such interpretations and any supplemental instructions will be in the form of written addenda which, if issued, will be posted on DemandStar.Com and on the Department's web page, with notice given to all prospective bidders at the respective fax numbers or e-mail addresses furnished, for such purposes. Failure of any Bidder to receive any such addenda shall not relieve said Bidder from any obligation under his Proposal as submitted. All addenda so issued shall become part of the Contract Documents.

I-1.04 SIGNATURE OF BIDDERS: Section I-2.07 is replaced with the following:

Proposals must be signed in ink by the Bidder with signature in full. When firm is a Bidder, the Proposal shall be signed in the name of the firm by one or more partners. When a corporation is a bidder the officer signing shall set out the corporate name in full beneath which he shall sign his name and give the title of his office. The Proposal shall also bear the seal of the corporation attested by its secretary.

If the bidder referred to in Section I-2.07 is a corporation, it must submit; upon request, a copy of its filed Articles of Incorporation. In addition, if the bidder was incorporated in another state, it must establish that it is authorized to do business in the State of Florida. If the bidder is using a fictitious name, it must submit upon request, proof of registration of such name with the Clerk of the Circuit Court of the Country where its principal place of business is. Failure to submit what is required is grounds to reject the bid of that bidder.

I-1.05 TIME FOR COMPLETION:

The work shall be arranged to be completed in accordance with a progress schedule approved by the Construction Engineer.

The time for completion of this project, referred in Article 4.01 of the Agreement, shall be 360 consecutive calendar days. The period for performance shall start from the date indicated in the Notice To Proceed.

I-1.06 LIQUIDATED DAMAGES:

The amount of liquidated damages, referred to in Article 4.06 of the Agreement, for completion of this project shall be $500.00 per calendar day.

I-1.07 BASIS OF AWARD OF CONTRACT:

The basis of award referred to in Item I-2.11 of Instructions to Bidders shall be the greatest amount of work, which can be accomplished within the funds available as budgeted. The award may be made on the basis of the total bid, base bid, alternates(s) if any, unit bids if any, or any combination thereof deemed to be in the best interest of the City.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

Unless all bids are rejected, the award will be made within 90 days after opening proposals.

I-1.08 GROUND BREAKING CEREMONY:

Arrangement may be made by the City in coordination with the Contractor, for construction to commence with a Ground Breaking Ceremony. Details will be discussed at the pre-construction conference.

I-1.09 INSURANCE:

The insurance required for this project shall be as indicated on Pages beginning with INS-1. Before commencing work, the Contractor shall provide the evidence of the insurance required on a Certificate of Insurance accompanied by evidence of authority to bind the insurance company or companies such as agents license, power of attorney, or letter of authority.

I-1.10 EQUAL BUSINESS OPPORTUNITY PROGRAM / SLBE / REQUIREMENTS

In accordance with the City of Tampa's Equal Business Opportunity Ordinance, a goal of 15% has been established for subcontracting with Small Local Business Enterprises, (SLBEs), certified by the City. The goal is based upon the availability of the firms listed on the Goal Worksheet and as posted in the "SLBEs" link under this Contract's notice on the Department's Construction Project Bidding web page.

BIDDERS MUST SOLICIT ALL SLBEs ON THAT LIST and provide documentation of emails, faxes, phone calls, letters, or other communication with the firms as a first step to demonstrate Good Faith Efforts to achieve the goal. The list is formatted to facilitate e-mail solicitations to the listed firms by copying and pasting e-mail addresses.

Bidders may explore other opportunities for subcontracting with SLBEs by consulting the current directory of all certified SLBEs posted on the Minority Business Development Office web page.

GOOD FAITH EFFORT COMPLIANCE PLAN REQUIRED - When a Goal has been established, the Bidder must submit, with its bid, completed to the fullest extent possible, a Good Faith Effort Compliance Plan using the form GFECP contained herein. Additional documentation is required whenever an SLBE subcontractor's low quote is not utilized. Supplemental information or documentation concerning the Bidder's Compliance Plan may be required prior to award as requested by the City.

DIVERSITY MANAGEMENT INITIATIVE, DMI, DATA REPORTING FORMS REQUIRED - Bidders must submit, with its bid, "DMI-Solicited" forms listing all subcontractors solicited and "DMI-Utilized" forms listing all subcontractors to be utilized. Supplemental forms, documentation, or information may be submitted at bid time or as requested by the City.

After an award, "DMI-Payments" forms are to be submitted with payment requests to report payments to subcontractors.

Bidders may visit the Minority Business Development Office's web page at TampaGov.net for other information about the SLBE program, FAQ's, and the latest SLBE directory of certified firms.

I-1.11 BID SECURITY:

Surety companies shall have a rating of not less than B+ Class VI as evaluated in the most recently circulated Best Key rating Guide Property-Liability.

I-1.12 PUBLIC CONSTRUCTION BOND:

The Bidder who is awarded the Contract will be required to furnish a Public Construction Bond upon the forms provided herein, each equal to 100 percent of the Contract price, such Bonds to be issued and executed by (a) surety company(ies) acceptable to the City of Tampa and licensed to underwrite contracts in the State of Florida.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.13 AGREEMENT
Section 2 – Powers of the City's Representatives
Add the following:
Article 2.05 CITY'S TERMINATION FOR CONVENIENCE:

The City may, at any time, terminate the Contract in whole or in part for the City's convenience and without cause. Termination by the City under this Paragraph shall be by a notice of termination delivered to the Contractor, specify the extent of termination and the effective date.

Upon receipt of a notice of termination, the Contractor shall immediately, in accordance with instructions from the City, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph:

(a) cease operations as specified in the notice;
(b) place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete continued portions of the Contract;
(c) terminate all subcontracts and orders to the extent they relate to the Work terminated;
(d) proceed to complete the performance of Work not terminated; and
(e) take actions that may be necessary, or that the City may direct, for the protection and preservation of the terminated Work.

The amount to be paid to the Contract by the City because of the termination shall consist of:

(a) for costs related to work performed on the terminated portion of the Work prior to the effective date including termination costs relative to subcontracts that are properly chargeable to the terminated portion of the Work.
(b) the reasonable costs of settlement of the Work terminated, including accounting, legal, clerical and other expenses reasonable necessary for the preparation of termination settlement proposals and supporting data; additional costs of termination and settlement of subcontracts excluding amounts of such settlements; and storage, transportation, and other costs incurred which are reasonably necessary for the preservation, protection or disposition of the terminated Work; and
(c) a fair and reasonable profit on the completed Work unless the Contractor would have sustained a loss on the entire Contract had it been completed.

Allowance shall be made for payments previously made to the Contractor for the terminated portion of the Work, and claims which the City has against the Contractor under the Contract, and for the value of materials supplies, equipment or other items that are part of the costs of the Work to be disposed of by the Contractor.

I-1.14 Section 5 – subcontracts and Assignments, Article 5.01, Page A-7, Last Paragraph:
Change "…twenty-five (25) percent… "to fifty-one (51) percent…"

Section 10-Payments, Article .05 Partial Payments, 1st Paragraph, 1st Sentence:
Change "…fair value of the work done, and may apply for…" to "…fair value of the work done, and shall apply for…"

I-1.15 Contractors must utilize the U.S. Department of Homeland Security's E-Verify Systems to verify the employment eligibility of all persons employed during the term of the contract to perform employment duties within the State of Florida and all persons, including subcontractors, assigned by the contractor to perform work pursuant to the contract.

I-1.16 GENERAL PROVISIONS; G-2.02 Copies Furnished to Contractor: Replace the first paragraph with the following:

The Contractor shall acquire for its use copies of the plans and specifications as needed. The documents may be downloaded from the City's web site, at
http://www.tampagov.net/dept_contract_administration/programs_and_services/construction_project_bidding/index.asp

I-1.17 PAYMENT DISPUTE RESOLUTION

Any dispute pertaining to pay requests must be presented to the City pursuant to Executive Order 2003-1.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.18 SCRUTINIZED COMPANIES.

For Contracts $1,000,000 and greater, if the City determines the Contractor submitted a false certification under Section 287.135(5) of the Florida Statutes, or if the Contractor has been placed on the Scrutinized Companies with Activities in the Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, the City shall either terminate the Contract after it has given the Contractor notice and an opportunity to demonstrate the City's determination of false certification was in error pursuant to Section 287.135(5)(a) of the Florida Statutes, or maintain the Contract if the conditions of Section 287.135(4) of the Florida Statutes are met.

I-1.19 FLORIDA'S PUBLIC RECORDS LAW

4.33.3 The City of Tampa is a public agency subject to Chapter 119, Florida Statutes. In accordance with Florida Statutes, 119.0701, if applicable, Contractor shall comply with Florida's Public Records Law. Specifically, the Contractor shall:

1. Keep and maintain public records that ordinarily and necessarily would be required by the City in order to perform the service;

2. Provide the public with access to such public records on the same terms and conditions that the City would provide the records and at a cost that does not exceed that provided in Chapter 119, Florida Statutes, or as otherwise provided by law;

3. Ensure that public records that are exempt or that are confidential and exempt from public record requirements are not disclosed except as authorized by law;

4. Meet all requirements for retaining public records and transfer to the City, at no cost, all public records in possession of the contractor upon termination of the contract and destroy any duplicate public records that are exempt or confidential and exempt. All records stored electronically must be provided to the City in a format that is compatible with the information technology systems of the agency.

4.33.4 The failure of Contractor to comply with the provisions set forth in this Article shall constitute a Default and Breach of this award and the City shall enforce the Default in accordance with the provisions set forth in the DEFAULT/RE-AWARD section of this document.

SECTION 2
GENERAL INSTRUCTIONS

I-2.01 BIDDER'S RESPONSIBILITY
Before submitting Proposals, Bidders shall carefully examine the entire site of the proposed work and adjacent premises and the various means of approach and access to the site, and make all necessary investigations to inform themselves thoroughly as to the facilities necessary for delivering, placing and operating the necessary construction equipment, and for delivering and handling materials at the site, and inform themselves thoroughly as to all difficulties involved in the completion of all the work in accordance with the Contract Documents.

Bidders must examine the Plans, Specifications, and other Contract Documents and shall exercise their own judgment as to the nature and amount of the whole of the work to be done, and for the bid prices must assume all risk of variance, by whomsoever made, in any computation or statement of amounts or quantities necessary to complete the work in strict compliance with the Contract Documents.

Elevations of the ground are shown on the Plans and are believed to be reasonably correct, but are not guaranteed to be absolutely so and are presented only as an approximation. Bidders shall satisfy themselves as to the correctness of all elevations.

The City may have acquired, for its own use, certain information relating to the character of materials, earth formations, probable profiles of the ground, conditions below ground, and water surfaces to be encountered at the site of the proposed work. This information, if it exists, is on file at the offices of the Department of Public Works and Bidders will be permitted to see and examine this information for whatever value they consider it worth. However, this information is not guaranteed, and Bidders should satisfy themselves by making borings or test pits, or by such other methods as they may prefer, as to the character, location, and amounts of water, peat, clay, sand, quicksand, gravel, boulders, conglomerate, rock, gas or other material to be encountered or work to be performed.

Various underground and overhead structures and utilities are shown on the plans. The location and dimensions of such structures and utilities, where given, are believed to be reasonably correct, but do not purport to be absolutely so. These structures and utilities are plotted on the Plans for the information of the Bidders, but information so given is not to be construed as a representation or assurance that such structures will be found or encountered as plotted, or that such information is complete or accurate.

I-2.02 FORM, PREPARATION AND PRESENTATION OF PROPOSALS
Each Proposal shall be submitted upon the Proposal Form and in accordance with the instructions included herein. The Proposal Form must not be detached herefrom. All blank spaces for bid prices must be filled in, in both words and figures, with the unit or lump sum prices, or both, for which the Proposal is made. The computed total price for each unit price Contract Item shall be determined by multiplying the estimated quantity of the item, as set forth in the Proposal Form, by the corresponding unit price bid for such item. The resulting product shall be entered in the appropriate blank space under the column headed "Computed Total Price for Item". The lump sum price bid for each lump sum price Contract Item shall also be entered in the column headed "Computed Total Price for Item". If a Proposal contains any omissions, erasures, alterations, additions, or items not called for in the itemized Proposal, or contains irregularities of any kind, such may constitute sufficient cause for rejection of the Proposal. In case of any discrepancy in the unit price or amount bid for any item in the Proposal, the price as expressed in written words will govern. In no case is the Agreement Form to be filled out or signed by the Bidder.

In the case of certain jobs bid Lump Sum a "Schedule of Unit Prices" must be filled out as an attachment to the Lump Sum proposal. These prices may be used as a guide for the negotiation of change orders, at the City's option.

The proposal must be signed and certified and be presented on the prescribed form in a sealed envelope on/or before the time and at the place stated in the Notice of Bidders, endorsed with the name of the person, firm or corporation presenting it, the date of presentation, and the title of the work for which the Proposal is made.

Unless the apparent low bidder is now engaged in or has recently completed contract work for the City of Tampa, he, if requested, shall furnish to the City, after the opening of bids and prior to award, a summary statement of record of construction experience over the past three (3) years with proper supporting evidence, and, if required by the City, shall also furnish a list of equipment and other facilities pertinent to and available for the proper execution of the proposed work, and a statement of financial resources to the extent necessary to establish ability to carry on the proposed work. The City may make further investigations as considered necessary with respect to responsibility of the Bidder to whom it appears may be awarded the Contract.

If forwarded by mail, the sealed envelope containing the Proposal, endorsed as directed above, must be enclosed in another envelope addressed as specified in the Notice to Bidders and sent by registered mail.

I-2.03 ADDENDA AND INTERPRETATIONS
No interpretation of the meaning of the Plans, Specifications, or other Contract Documents will be made to any Bidder orally.

Every request for such interpretation must be in writing, addressed to the Contract Administration Department, Tampa Municipal Office Building, 4th Floor North, City Hall Plaza, Tampa, Florida 33602. To be given consideration, such request must be received at least seven (7) days prior to the date fixed for the opening of the Proposals. Any and all such interpretations and any supplemental instructions will be in the form of written addenda which, if issued, will be sent by certified mail, with return receipt requested, to all prospective bidders at the respective addresses furnished, for such purposes, not later than three (3) working days prior to the date fixed for the opening of the Proposals, and if requested, a copy will be delivered to the prospective bidder's representative. Failure of any Bidder to receive any such addenda shall not relieve said Bidder from any obligation under his Proposal as submitted. All addenda so issued shall become part of the Contract Documents.

I-2.04 BID SECURITY
Each Proposal must be accompanied by a certified or cashier's check issued by a solvent bank or trust company and payable at sight to the City of Tampa, in compliance with Section 255.051 Florida Statutes, or a Bid Bond upon the form provided herein, in an amount of not less than five percent of the sum of the computed total amount of the Bidder's Proposal as a guarantee that if the Proposal is accepted, the Bidder will execute and fill in the proposed Contract and Public Construction Bond within twenty (20) days after notice of award of the Contract. Certified checks shall have all necessary documentary revenue stamps attached if required by law. Surety on Bid Bonds shall be a duly authorized surety company authorized to do business in the State of Florida, and all such Bonds shall be issued or countersigned by a local resident producing agent, and satisfactory evidence of the authority of the person or persons executing such Bond to Execute the same shall be submitted with the Bond. Bid Bonds shall be issued by a surety company acceptable to the City.

Within ten (10) days after the opening of Proposals, the bid security of all but the three lowest Bidders will be returned. The bid security of the remaining two Bidders whose Proposals are not accepted will be

returned within ten (10) days after the execution of the Contract, or, if no such Contract has been executed, within ninety (90) days after the date of opening Proposals. The bid security of the Bidder whose Proposal is accepted will be returned only after he has duly executed the Contract and furnished the required Public Construction Bond and insurance.

Should it be necessary for the City to retain the bid security and said bid security is in the form of checks, the checks of these Bidders will be returned if replaced by Bid Bonds in an amount equal to the amount of the checks of such Bidders in such form and issued by a surety company acceptable to the City.

A Bidder may withdraw his Proposal before the time fixed for the opening of Proposals, without prejudice to himself, by communicating his purpose, in writing, to the Mayor and City Council, and when his communication is received, the Proposal will be handed to him or his authorized agent unopened. No Bidder may withdraw his Proposal within ninety (90) days after the day of opening Proposals.

The Bidder whose Proposal is accepted shall enter into a written contract, upon the Agreement form included herein, for the performance of the work and furnish the required Public Construction Bond within twenty (20) days after written notice by the City of Award of Contract has been served on such Bidder personally or after receipt of the written notice by registered mail to such Bidder at the address given in his Proposal.

If the Bidder to whom a Contract is awarded refuses or neglects to execute it or fails to furnish the required Public Construction Bond within twenty (20) days after receipt by him of the Notice of Award of Contract, the amount of his bid security shall be forfeited and shall be retained by the City as liquidated damages, and not as a penalty, it being now agreed that said sum is a fair estimate of the amount of damages that the City will sustain in case said Bidder fails to enter into a Contract and furnish the required Public Construction Bond. If a Bid Bond was furnished, the full amount of the Bond shall become due and payable as liquidated damages caused by such failure. The full amount of the bid security shall be forfeited as liquidated damages without consideration of the fact that an award may be less than the full amount of the Bidder's Proposal, excepting that the award shall be within the conditions of said Proposal relating to the basis of consideration for an award. No plea of mistake in the bid or misunderstanding of the conditions of forfeiture shall be available to the Bidder for the recovery of his deposit or as a defense to any action based upon the neglect or refusal to execute a contract.

I-2.05 LAWS AND REGULATIONS
The Bidder who is awarded the Contract must comply with all laws of the State of Florida, and all applicable Ordinances of the City of Tampa respecting labor and compensation and with all other statutes, ordinances, rules and regulations applicable and having the force of law.

I-2.06 PUBLIC CONSTRUCTION BOND
The Bidder who is awarded the Contract will be required to furnish a Public Construction Bond upon the form provided herein, equal to 100 percent of the Contract price, such Bond to be executed by a surety company acceptable to the City of Tampa and licensed to underwrite contracts in the State of Florida. Surety companies shall have a rating of not less than: B+ Class VI as evaluated in the most recently circulated BEST'S KEY RATING GUIDE PROPERTY-LIABILITY.

I-2.07 SIGNATURE AND QUALIFICATIONS OF BIDDERS
Proposals must be signed in ink by the Bidder with signature in full. When a firm is a Bidder, the Proposal shall be signed in the name of the firm by one or more of the partners. When a corporation is a Bidder the officer signing shall set out the corporate name in full beneath which he shall sign his name and give the title of his office. The Proposal shall also bear the seal of the corporation attested by its secretary. Anyone signing the Proposal as agent must file with it legal evidence of his authority to do so.

Bidders who are nonresident corporations shall furnish to the City a duly certified copy of their permit to transact business in the State of Florida, signed by the Secretary of State, within ten days of the notice to do so. Such notice will be given to Bidders who are nonresident corporations, to whom it appears an award will be made, and the copy of the permit must be filed with the City before the award will be made. Failure to promptly submit this evidence of qualification to do business in the State of Florida may be basis for rejection of the Proposal.

I-2.08 REJECTION OF PROPOSALS
The City reserves the right to reject any Proposal if investigation of the Bidder fails to satisfy the City that such Bidder is properly qualified to carry out the obligations and to complete the work contemplated therein. Any or all Proposals will be rejected if there is reason to believe that collusion exists among Bidders. Proposals will be considered irregular and may be rejected if they show serious omissions, alterations in form, additions not called for, conditions or unauthorized alternates, or irregularities of any kind. The City reserves the right to reject any or all Proposals and to waive such technical errors as may be deemed best for the interests of the City.

I-2.09 QUANTITIES ESTIMATED ONLY
The estimate of quantities of the various items of work and materials, if set forth in the Proposal Form, is approximate only and is given solely to be used as a uniform basis for the comparison of Proposals. The quantities actually required to complete the Contract work may be less or more than so estimated, and if awarded a Contract for the work specified, the Contractor agrees that he will not make any claim for damages or for loss of profits because of a difference between the quantities of the various classes of work assumed for comparison of Proposals and quantities of work actually performed. The City further reserves the right to vary the quantities in any amount.

I-2.10 COMPARISON OF PROPOSALS
Except jobs bid on a "One Lump Sum" basis, proposals will be compared on the basis of a total computed price arrived at by taking the sum of the estimated quantity of each time and the corresponding unit price of each item, and including any lump sum prices on individual items.

The computed total prices for individual Contract Items and the total computed price for the entire Contract, as entered by the Bidder in the Proposal Form, are for convenience only and are subject to correction in the tabulation and computation of the Proposals.

I-2.11 BASIS OF AWARD
The Contract will be awarded, if at all, to the lowest responsible Bidder or Bidders, as determined by the City and by the terms and conditions of the Contract Documents. Unless all bids are rejected, the award will be made within ninety (90) days after the opening of Proposals. The successful Bidder will be required to possess, or obtain, a valid City Occupational License.

I-2.12 INSURANCE REQUIRED
The successful Bidder and his subcontractors will be required to procure and pay for insurance covering the work in accordance with the provisions of Article 6.02 of the Agreement as indicated on special instructions pages beginning with INS-1.

I-2.13 NO ASSIGNMENT OF BID
No Bidder shall assign his bid or any rights thereunder.

I-2.14 NONDISCRIMINATION IN EMPLOYMENT
Contracts for work under this Proposal will obligate the contractors and subcontractors not to discriminate in employment practices.

Bidders must, if requested, submit with their initial bid a signed statement as to whether they have previously performed work subject to the President's Executive Order Nos. 11246 and 11375.
Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the Contract.

Successful Bidders must, if requested, submit a list of all subcontractors who will perform work on the project and written,

signed statement from authorized agents of the labor pools with which they will or may deal for employees on the work together with supporting information to the effect that said labor pools practices and policies are in conformity with Executive Order No. 11246 and that said labor pools will affirmatively cooperate in or offer no hindrance to the recruitment, employment and equal treatment of employees seeking employment and performing work under the Contract, or a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish them prior to the award of the Contract.

I-2.15 LABOR STANDARDS
The Bidder's attention is directed to the Contract Provisions of the Labor Standards for federally assisted projects which may be attached to and made a part of the Agreement.

I-2.16 NOTICE TO LABOR UNIONS
If applicable, the successful Bidder will be required to provide Labor Unions and other organizations of workers a completed copy of the form entitled "Notice to Labor Unions or Other Organizations of Workers", and such form may be made a part of the Agreement.

I-2.17 NOTICE TO PROSPECTIVE FEDERALLY-ASSISTED CONSTRUCTION CONTRACTORS
A Certification of Nonsegregated Facilities, as required by the May 9, 1967, Order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted to said Secretary prior to the award of a federally-assisted construction and Contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause. The form of certification may be bound herein following the form of Bid Bond.

Contractors receiving federally-assisted construction Contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of the following notice to prospective subcontractor for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause:

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT
FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

"A Certification of Nonsegregated Facilities, as required by the May 9, 1967, Order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause."

"Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide from the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause."

The United States requires a pre-award conference if a proposed construction contract exceeds one million dollars to determine if the the prospective contractor is in compliance with the Equal Employment Opportunity requirements of Executive Order 11246 of September 24, 1965. In such instances, a meeting may be scheduled at which the prospective contractor must specify what affirmative action he has taken or proposed to take to assure equal employment opportunity which must be approved by the United States before award of the contract will be authorized.

Bidders must be prepared to submit an Equal Employment Opportunity (EEO) plan at a pre-award conference. The plan must include bidding opportunities offered by the Bidder to minority subcontractors.

On October 13, 1971, President Nixon issued Executive Order 11246 emphasizing the government's commitment to the promotion of minority business enterprise. Accordingly, the United States is firmly committed to the utilization of available resources to support this important program. U.S. agencies are most interested in realizing minority participation on the subject. Achieving equal employment opportunity compliance is required through Executive Order 11246. WE cannot emphasize too strongly that minority subcontractors be extended subcontractors bidding opportunities as but one step in your affirmative action policy.

Due to the importance of this contract, U.S. Agencies may conduct an EEO Conference prior to the award of the Contract. It is suggested that the responsive Bidder confirm the minority subcontractors he contacted for bids or quotations in his EEO plan submitted at the conference.

I-2.18 EEO AFFIRMATIVE ACTION REQUIREMENTS
By the submission of a Proposal, each Bidder acknowledges that he understands and will agree to be bound by the equal opportunity requirements of Federal regulations which shall be applicable throughout the performance of work under any contract awarded pursuant to solicitation. Each Bidder agrees that if awarded a contract, he will similarly bind contractually each subcontractor. In policies, each Bidder further understands and agrees that if awarded a contract, he must engage in Affirmative Action directed to promoting and ensuring equal employment opportunity in the work force used under the contract (and he must require contractually the same effort of all subcontractors whose subcontracts exceed $100,000). The Bidder understands and agrees that "Affirmative Action" as used herein shall constitute a good faith effort to achieve and maintain minority employment in each trade in the on-site work force used on the project. * * * * * * * END of SECTION * * * * * * *

CITY OF TAMPA INSURANCE REQUIREMENTS

During the life of the award/contract the Awardee/Contractor shall provide, pay for, and maintain insurance with companies authorized to do business in Florida, with an A.M. Best rating of B+ (or better) Class VII (or higher), or otherwise be acceptable to the City if not rated by A.M. Best. All insurance shall be from responsible companies duly authorized to do business in the State of Florida.

All commercial general liability insurance policies (and Excess or Umbrella Liability Insurance policies, if applicable) shall provide that the City is an additional insured as to the operations of the Awardee/Contractor under the award/contract including the additional insured endorsement, the subrogation wavier endorsement, and the Severability of Interest Provision. In lieu of the additional named insured requirement, if the Awardee/Contractor's company has a declared existing policy which precludes it from including additional insureds, the City may permit the Contractor to purchase an Owners and Contractors Protective Liability policy. Such policy shall be written in the name of the City at the same limit as is required for General Liability coverage. The policy shall be evidenced on an insurance binder which must be effective from the date of issue until such time as a policy is in existence and shall be submitted to the City in the manner described below as applicable to certificates of insurance.

The insurance coverages and limits required must be evidenced by a properly executed Acord 25 Certificate of Insurance form or its equivalent. Each Certificate must be personally manually signed by the Authorized Representative of the insurance company shown in the Certificate with proof that he/she is an authorized representative thereof. Thirty days' written notice must be given to the City of any cancellation, intent not to renew, or reduction in the policy coverages, except in the application of the aggregate liability limits provisions. Should any aggregate limit of liability coverage be reduced, it shall be immediately increased back to the limit required by the contract. The insurance coverages required herein are to be primary to any insurance carried by the City or any self-insurance program thereof.

The following coverages are required:

A. Commercial General Liability Insurance shall be provided on the most current Insurance Services Office (ISO) form or its equivalent. This coverage must be provided to cover liability arising from premises and operations, independent contractors, products and completed operations, personal and advertising injury, contractual liability, and XCU exposures (if applicable). Completed operations liability coverage shall be maintained for a minimum of one-year following completion of work. The amount of Commercial General Liability insurance shall not be less than the amount specified.

(a) $1,000,000 per occurrence and a $2,000,000 general aggregate for projects valued at $2,000,000 or less. General aggregate limit for projects over that price shall equal or exceed the price of the project. An Excess or Umbrella Liability insurance policy can be provided to meet the required limit. Risk Management may be contacted for additional information regarding projects of this nature.

B. Automobile Liability Insurance shall be maintained in accordance with the laws of the State of Florida, as to the ownership, maintenance, and use of all owned, non-owned, leased, or hired vehicles. The amount of Automobile Liability Insurance shall not be less than the amount specified.

(a) $500,000 combined single limit each occurrence bodily injury & property damage- for projects valued at $100,000 and under

(b) $1,000,000 combined single limit each occurrence bodily injury & property damage – for projects valued over $100,000

C. Worker's Compensation and Employer's Liability Insurance shall be provided for all employees engaged in the work under the contract, in accordance with the Florida Statutory Requirements. The amount of the Employer's Liability Insurance shall not be less than:

(a) $500,000 bodily injury by accident and each accident, bodily injury by disease policy limit, and bodily injury by disease each employee – for projects valued at $100,00 and under
(b) $1,000,000 bodily injury by accident and each accident, bodily injury by disease policy limit, and bodily injury by disease each –for projects valued over $100,000

D. Excess Liability Insurance or Umbrella Liability Insurance may compensate for a deficiency in general liability, automobile, or worker's compensation insurance coverage limits. If the Excess or Umbrella policy is being provided as proof of coverage, it must name the City of Tampa as an additional insured **(IF APPLICABLE).**

E. Builder's Risk Insurance, specialized policy designed to cover the property loss exposures that are associated with construction of buildings. The amount of coverage should not be less than the amount of the project. **(IF APPLICABLE).**

F. Installation Floater- a builder's risk type policy that covers specific type of property during its installation, is coverage required for highly valued equipment or materials such as compressors, generators, or other machinery that are not covered by the builder's risk policy **(IF APPLICABLE).**

G. Longshoreman's & Harbor Worker's Compensation Act/Jones Act coverage shall be maintained for work being conducted upon navigable water of the United States. The limit required shall be the same limit as the worker's compensation/employer's liability insurance limit **(IF APPLICABLE).**

H. Professional Liability shall be maintained against claims of negligence, errors, mistakes, or omissions in the performance of the services to be performed and furnished by the Awardee/Contractor or any of its subcontractors when it acts as a DESIGN PROFESSIONAL. The amount of coverage shall be no less than amount specified **(IF APPLICABLE).**

(a) $1,000,000 per incident and general aggregate. Note all claims made policies must provide the date of retroactive coverage.

The City may waive any or all of the above referenced insurance requirements based on the specific nature of goods or services to be provided under the award/contract.

ADDITIONAL INSURED - The City must be included as an additional insured by on the general and (Excess or Umbrella liability policies) if applicable. Alternatively, the Contractor may purchase a separate owners protective liability policy in the name of the City in the specified amount as indicated in the insurance requirements.

CLAIMS MADE POLICIES - If any liability insurance is issued on a claims made form, Contractor agrees to maintain uninterrupted coverage for a minimum of one year following completion and acceptance of the work either through purchase of an extended reporting provision, or through purchase of successive renewals with a retroactive date not later than the beginning of performance of work for the City. The retroactive date must be provided for all claims made policies.

CANCELLATION/NON-RENEWAL - Thirty (30) days written notice must be given to the City of any cancellation, intent to non-renew or material reduction in coverages (except aggregate liability limits). However, ten (10) days notice may be given for non-payment of premium. Notice shall be sent to the City of Tampa Department of Public Works, 306 E. Jackson Street, Tampa, FL 33602.

NUMBER OF POLICIES - General and other liability insurance may be arranged under single policies for the full amounts required or by a combination of underlying policies with the balance provided by an excess or umbrella liability insurance policy.

WAIVER OF SUBROGATION - Contractor waives all rights against City, its agents, officers, directors and employees for recovery of damages to the extent such damage is covered under the automobile or excess liability policies.

SUBCONTRACTORS - It is the Contractor's responsibility to require all subcontractors to maintain adequate insurance coverage.

PRIMARY POLICIES - The Contractor's insurance is primary to the City's insurance or any self insurance program thereof.

RATING - All insurers shall be authorized to do business in Florida, and shall have an A.M. Best rating of B+ (or better), Class VII (or higher), or otherwise be acceptable to the City if not rated by A.M. Best.

DEDUCTIBLES - The Contractor is responsible for all deductibles. In the event of loss which would have been covered but for the presence of a deductible, the City may withhold from payment to Contractor an amount equal to the deductible to cover such loss should full recovery not be obtained under the insurance policy.

INSURANCE ADJUSTMENTS - These insurance requirements may be increased, reduced, or waived at the City's sole option with an appropriate adjustment to the Contract price.

Document updated on 12/22/2009 by RLD (Risk Management)

City of Tampa MBD Office

Underutilized WMBEs

9/24/13

CONCRETE (SIDEWALKS, DRIVEWAYS, FORM & FINISH)

E.S. Concrete Services, Inc. **Federal**
59-3119582
726 East Harbor Dr. South
St. Petersburg, FL 33705
Phone (727) 821-5029
Fax (727) 821-5029
Minority African American
Contact Enoris Sly
E-mail enorisslysr@yahoo.com

MIMS Construction Company **Federal**
59-3442318
P.O. Box 681554
Orlando, FL 32868-1554
Phone (407) 298-6936
Fax (407) 290-1217
Minority African American
Contact Lyndell Mims
E-mail lyndell1111@cs.com

Paragon Building Contractors, Inc. **Federal**
59-2464751
1201 W. Waters Ave.
Tampa, FL 33604
Phone (813) 935-1600
Fax (813) 932-1108
Minority African American
Contact Al Davis
E-mail paragonb@tampabay.rr.com

Denson Construction, Inc. **Federal**
59-3571944
P.O. Box 3081
Plant City, FL 33564
Phone (863) 709-1001
Fax (863) 709-1071
Minority African American
Contact Ralph (Pete) Denson
E-mail Pete@denson-construction.com

L.S. Curb Service, Inc. **Federal**
59-3252745
4206 James L. Redman Pkwy
Plant City, FL 33567
Phone (813) 737-1524
Fax (813) 650-8654
Minority African American
Contact Leaford Shakes
E-mail lshakes@tampabay.rr.com

Powell Concrete, LLC **Federal**
83-0467921
1410 Swift Ct.
Kissimmee, FL 34759
Phone (863) 438-4454
Fax (863) 496-1227
Minority African American
Contact Earl Powell
E-mail powellconcrete1@yahoo.com

City of Tampa MBD Office

Underutilized WMBEs

9/24/13

ELECTRICAL EQUIPMENT AND SUPPLIES

Genesis VII, Inc. **Federal**
59-2952211
1605 White Dr.
Titusville, FL 32780
Phone (321) 383-4813
Fax (321) 383-3247
Minority African American
Contact Robert Jordan
E-mail robert.jordan@genesisvii.com

Milena International, Inc. **Federal**
27-5032416
5004 E. Fowler Ave, Suite C-152
Tampa, FL 33617
Phone (904) 553-3645
Fax (877) 223-6902
Minority African American
Contact Raoul Thomas
E-mail raoul@milenasupply.com

ELECTRICAL SERVICES

Brown & Brown Electric, Inc. **Federal**
59-2283934
6555 N.W. 9th Ave. S-205
Ft. Lauderdale, FL 33310-5003
Phone (954) 938-8986
Fax (954) 938-9272
Minority African American
Contact Winston Brown
E-mail winston@brownandbrownelectric.com

Acktel Electric Company, Inc. **Federal**
59-3579225
P.O. Box 52292
Jacksonville, FL 32201-2292
Phone (904) 356-1274
Fax (904) 356-1374
Minority African American
Contact Sedley Huey
E-mail acktelel@bellsouth.net

All-In-One Electric, Inc. **Federal**
04-3689273
1201 W Waters Ave.
Tampa, FL 33604
Phone (813) 849-6331
Fax (813) 514-0473
Minority African American
Contact Rodney Jones
E-mail allinoneelectric@msn.com

Romero & Gray Electric, Inc. **Federal**
57-1164017
6001 Johns Rd.
Tampa, FL 33634
Phone (813) 881-1876
Fax (813) 249-4840
Minority African American
Contact Alfredo Romero
E-mail mgray@rg-electric.com
E-mail jdpinc@tampabay.rr.com

Prime Electric, LLC **Federal**
20-1137443
1229 W. Main St
Leesburg, FL 34748
Phone (352) 728-5966
Fax (352) 728-5921
Minority African American
Contact Wylie Hamilton
E-mail wylie@primeelectricllc.net

City of Tampa MBD Office

Underutilized WMBEs

9/24/13

PIPE AND PIPE FITTINGS

Suca Pipe Supply, Inc. **Federal**
59-2499571
P.O. Box 272482
Tampa, FL 33618
Phone (813) 249-7902
Fax (813) 249-7384
Minority African American
Contact Secedrick McIntyre
E-mail slmau44@yahoo.com

DRD Enterprises, LLC **Federal**
20-4675317
4104 Yellowwood Dr.
Valrico, FL 33594
Phone (813) 476-9933
Fax (866) 850-1332
Minority African American
Contact Devon Deenah
E-mail ddeenah@drdenterprise.com

Terrell Industries, Inc. **Federal**
65-0530148
2067 1st Avenue N
St. Petersburg, FL 33713
Phone (727) 823-4424
Fax (727) 823-3977
Minority African American
Contact Grady Terrell
E-mail gterrell@verizon.net

Suca Pipe Supply, Inc. One **Federal**
26-3669556
4910 Lowell Road
Tampa, FL 33624
Phone (813) 249-7902
Fax (813) 249-7384
Minority African American
Contact Ashley McIntyre
E-mail mactwinau1@yahoo.com

City of Tampa MBD Office

SLBE Goal Setting Firms Report

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CONCRETE (SIDEWALKS, DRIVEWAYS, FORM & FINISH)

Castco Construction, Inc. **Federal Number** 59-2548614

9001 126th Ave. North
Largo, FL 33773

Phone (727) 585-4714
Fax (727) 585-5091
E-mail cconstr@tampabay.rr.com

Minority Small Business
Contact Israel Castro

E.S. Concrete Services, Inc. **Federal Number** 59-3119582

726 East Harbor Dr. South
St. Petersburg, FL 33705

Phone (727) 821-5029
Fax (727) 821-5029
E-mail enorisslysr@yahoo.com

Minority Small Business
Contact Enoris Sly

Parking Lot Striping Service **Federal Number** 59-1522393

P.O. Box 11005
Tampa, FL 33680

Phone (813) 623-1454
Fax (813) 664-0140
E-mail lindaplss@aol.com

Minority Small Business
Contact Fernando Llop

Tampa Bay Construction & Engineering, Inc. **Federal Number** 59-3713572

10503 Palm Cove Ave
Tampa, FL 33647

Phone (813) 984-9898
Fax (813) 907-0980
E-mail aerchid@tbcei.com

Minority Small Business
Contact Ahmad Erchid

Chet Netherly, LLC d/b/a Anything in Concrete **Federal Number** 20-3926235

246 W Canal Drive
Palm Harbor, FL 34684

Phone (727) 945-7035
Fax (727) 934-0568
E-mail netherlyWCAN@aol.com

Minority Small Business
Contact Chet Netherly

Velez Concrete Construction, Inc. **Federal Number** 83-0373603

3926 E. Eden Roc Circle
Tampa, FL 33634

Phone (813) 493-4762
Fax (813) 882-3455
E-mail velezconcrete@verizon.net

Minority Small Business
Contact John Velez

Tagarelli Construction, Inc. **Federal Number** 59-3339407

P.O. Box 681
Tarpon Springs, FL 34689

Phone (727) 937-6171
Fax (727) 937-6172
E-mail tagarelli@verizon.net

Minority Small Business
Contact Michael Tagarelli

City of Tampa MBD Office

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CONCRETE (SIDEWALKS, DRIVEWAYS, FORM & FINISH)

Mend It Asphalt & Concrete Services, Inc. **Federal Number** 59-3274522

4915 15th Avenue South
Gulfport, FL 33707

Phone (727) 327-7784
Fax (727) 327-4504
E-mail menditasphaltconcrete@yahoo.com

Minority Small Business
Contact Robert Mendez

CMK Construction, Inc. **Federal Number** 20-1609262

2053 Mountain Ash Way
New Port Richey, FL 34655

Phone (727) 243-9234
Fax (727) 848-2026
E-mail manny@cmkconstructioninc.com

Minority Small Business
Contact Manuel Kavouklis

Powell Concrete, LLC **Federal Number** 83-0467921

1410 Swift Ct.
Kissimmee, FL 34759

Phone (863) 438-4454
Fax (863) 496-1227
E-mail powellconcrete1@yahoo.com

Minority Small Business
Contact Earl Powell

Velocity Construction, Inc. **Federal Number** 74-3082984

1320 E. 137th Ave
Tampa, FL 33613

Phone (813) 624-2117
Fax (800) 807-0314
E-mail bconnor@tampabay.rr.com

Minority Small Business
Contact William Connor

ARC Development, Inc. **Federal Number** 20-0826206

5311 S. Falkenburg Rd., Ste. D-20
Tampa, FL 33619-0037

Phone (813) 952-3250
Fax (813) 952-3260
E-mail Rick@ARC-Fl.com

Minority Small Business
Contact Richard Coyer

Kilgore Construction, LLC **Federal Number** 26-3771464

11697 Walsingham Rd.
Largo, FL 33778

Phone (727) 755-2294
Fax (727) 581-5724
E-mail jo@kilgorellc.com

Minority Small Business
Contact Harold Kilgore

City of Tampa MBD Office

SLBE Goal Setting Firms Report

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CONCRETE (SIDEWALKS, DRIVEWAYS, FORM & FINISH)

Tampa Bay Construction Group **Federal Number** 26-4797153

12651 North Dale Mabry Hwy, Suite 272568
Tampa, FL 33688

Phone (813) 402-8827 **Minority** Small Business
Fax (813) 388-4554 **Contact** Joy Iurato
E-mail get-it-done@mytbcgroup.com

JMJ Site Development, Inc **Federal Number** 27-3413832

P.O. Box 1095
Lithia, FL 33547

Phone (813) 927-2484 **Minority** Small Business
Fax **Contact** Jeff Joaquin
E-mail jmjsitedevelopment@gmail.com

ELECTRICAL EQUIPMENT AND SUPPLIES

Icon Supply, Inc **Federal Number** 59-3243571

P.O. Box 272423
Tampa, FL 33688-2423

Phone (813) 936-2030 **Minority** Small Business
Fax (813) 936-9268 **Contact** Norma Tempest
E-mail ICONUSA@tampabay.rr.com

Integrated Design of Central Florida **Federal Number** 59-2203868

180 Scarlet Blvd.
Oldsmar, FL 34677

Phone (316) 209-8342 **Minority** Small Business
Fax (813) 925-0299 **Contact** Walter Wiseman
E-mail wallyses@aol.com

Milena International, Inc. **Federal Number** 27-5032416

5004 E. Fowler Ave, Suite C-152
Tampa, FL 33617

Phone (904) 553-3645 **Minority** Small Business
Fax (877) 223-6902 **Contact** Raoul Thomas
E-mail raoul@milenasupply.com

ELECTRICAL SERVICES

Apollo Construction & Engineering Services, Inc. **Federal Number** 59-2811166

P.O. Box 5848
Sun City Center, FL 33571-5848

Phone (813) 645-4926 **Minority** Small Business
Fax (813) 645-3351 **Contact** Thomas Kamprath
E-mail tkamprath@apollo-construction.com

City of Tampa MBD Office

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ELECTRICAL SERVICES

Gaylord / Miller Electric Corp — **Federal Number** 59-1631953

602 North Oregon Avenue
Tampa, FL 33606

Phone (813) 254-4681
Fax (813) 254-9473
E-mail james.gmelectric@verizon.net

Minority Small Business
Contact James A. Tepper

All-In-One Electric, Inc. — **Federal Number** 04-3689273

1201 W Waters Ave.
Tampa, FL 33604

Phone (813) 849-6331
Fax (813) 514-0473
E-mail allinoneelectric@msn.com

Minority Small Business
Contact Rodney Jones

Romero & Gray Electric, Inc. — **Federal Number** 57-1164017

6001 Johns Rd.
Tampa, FL 33634

Phone (813) 881-1876
Fax (813) 249-4840
E-mail mgray@rg-electric.com

Minority Small Business
Contact Alfredo Romero

JDP Electric, Inc. — **Federal Number** 59-3511620

6600 N. Florida Avenue
Tampa, FL 33604

Phone (813) 234-4004
Fax (813) 236-0394
E-mail jdpinc@tampabay.rr.com

Minority Small Business
Contact Jeffrey Priede

Cousins Electrical Contracting, Inc. — **Federal Number** 20-1736062

P. O. Box 320534
Tampa, FL 33679

Phone (813) 907-5323
Fax (813) 994-1047
E-mail couselec@aol.com

Minority Small Business
Contact Marilee Cousins

Mandy Electric, Inc. — **Federal Number** 59-2914874

9353 E. Fowler Ave.
Thonotosassa, FL 33592

Phone (813) 264-9234
Fax (813) 333-9701
E-mail lhernandez@mandyselectric.com

Minority Small Business
Contact Armando Hernandez

Ralph A. Philbrook, III LLC — **Federal Number** 61-1460231

3316 Bainbridge Dr.
Holiday, FL 34691

Phone (727) 847-3766
Fax (727) 845-3567
E-mail philbrook3llc@aol.com

Minority Small Business
Contact Ralph Philbrook III

City of Tampa MBD Office

SLBE Goal Setting Firms Report

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ELECTRICAL SERVICES

Crevello Electric, Inc. **Federal Number** 59-3559003

3305 N. Stanley Rd.
Plant City, FL 33565

Phone (813) 986-6106
Fax (813) 986-9633
E-mail crevelloelectric@gmail.com

Minority Small Business
Contact Bill Crevello

Electrical Handyman Services **Federal Number** 27-2406369

7046-B West Hillsborough Ave
Tampa, FL 33634

Phone (813) 901-8185
Fax (813) 884-5060
E-mail ehs915@aol.com

Minority Small Business
Contact Jose Cruz

SJM Electric Corporation **Federal Number** 20-4183090

333 North Falkenburg Rd, Suite B201
Tampa, FL 33619

Phone (813) 684-7459
Fax (813) 654-0420
E-mail tami@sjmelectric.com

Minority Small Business
Contact Scott Mroczkowski

YES Electric, LLC **Federal Number** 27-1341928

2412 E. 7th Avenue
Tampa, FL 33605

Phone (813) 447-2531
Fax
E-mail yeselectric@tampabay.rr.com

Minority Small Business
Contact George Pages

JBC Builders & Electric, Inc. **Federal Number** 08-0054484

5001 N. Nebraska Avenue, Suite A
Tampa, FL 33603

Phone (813) 232-5000
Fax (813) 232-3555
E-mail jbc@tampabay.rr.com

Minority Small Business
Contact Gerald Martinez

Suarez Electric Systems, Inc. **Federal Number** 35-2377948

817 Bannockburn Ave
Tampa, FL 33617

Phone (813) 988-4678
Fax (813) 344-5604
E-mail jimsuarez@aol.com

Minority Small Business
Contact James Suarez

Best Price Electric Service, LLC **Federal Number** 27-1211988

P.O. Box 6516
Seffner, FL 33583

Phone
Fax (813) 409-3154
E-mail BestPriceElectricServ@hotmail.com

Minority Small Business
Contact Frank Fleites

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 9/24/2013

ELECTRICAL SERVICES

Manatee Electric, Inc. **Federal Number** 59-3454485

845 Thompson Road
Lithia, FL Fl

Phone (813) 645-7000 **Minority** Small Business
Fax (813) 654-7568 **Contact** John Babuka
E-mail john@reliableelectricusa.com

Slentz Electric, Inc. **Federal Number** 59-1996013

1202 Gary Ave
Ellenton, FL 34222

Phone (941) 722-9227 **Minority** Small Business
Fax (941) 722-3318 **Contact** George Perry
E-mail georgeperry2@gmail.com

Aguila Electrical Services, Inc. **Federal Number** 20-0818128

8928 N. Newport Avenue
Tampa, FL 33604

Phone (813) 368-9323 **Minority** Small Business
Fax (813) 884-4092 **Contact** Jael Aguila
E-mail sales@aguilaelectrical.com

A American Electrical Contractor, Inc. **Federal Number** 59-2603773

9170 126th Avenue N
Largo, FL 33773

Phone (727) 588-0126 **Minority** Small Business
Fax (727) 588-9170 **Contact** Mark Comerford
E-mail mark.aaec@yahoo.com

Rhythms Electric Corporation **Federal Number** 27-3150153

433 37th Ave NE
St. Petersburg, FL 33704

Phone (727) 460-8779 **Minority** Small Business
Fax **Contact** Mathew Krchmar
E-mail rhythmselectric@me.com

TAMCO Electric, Inc. **Federal Number** 59-1396630

P.O. Box 579
Tampa, FL 33614

Phone (813) 986-3472 **Minority** Small Business
Fax (813) 986-5979 **Contact** Steven Moates
E-mail atrujill@tampabay.rr.com

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 9/24/2013

METALS, ALL TYPES

Rejas Iron Works, LLC **Federal Number** 26-4701980

104 W. Hanlon St.
Tampa, FL 33604

Phone (813) 237-1442
Fax (813) 315-6151
E-mail miguel@rejasironworks.com

Minority Small Business
Contact Miguel Martinez

Tampa Metal Works, Inc. **Federal Number** 59-2831881

6601 N 50th Street
Tampa, FL 33610

Phone (813) 628-9223
Fax (813) 628-0653
E-mail tampametalworks@verizon.net

Minority Small Business
Contact Charles Allen

PIPE AND PIPE FITTINGS

Suca Pipe Supply, Inc. **Federal Number** 59-2499571

P.O. Box 272482
Tampa, FL 33618

Phone (813) 249-7902
Fax (813) 249-7384
E-mail slmau44@yahoo.com

Minority Small Business
Contact Secedrick McIntyre

Reich Construction Services, Inc. **Federal Number** 59-3557617

P.O. Box 1047
Largo, FL 33779-1047

Phone (727) 235-1460
Fax
E-mail mimi.reich@yahoo.com

Minority Small Business
Contact Mary-Irene Reich

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2 Meyer Corp. **Federal Number** 56-2384669

6308 Lake Sunrise Dr.
Apollo Beach, FL 33572

Phone (813) 645-3150
Fax (813) 645-5634
E-mail Renatonjr@aol.com

Minority Small Business
Contact Melissa Gugliotti

DRD Enterprises, LLC **Federal Number** 20-4675317

4104 Yellowwood Dr.
Valrico, FL 33594

Phone (813) 476-9933
Fax (866) 850-1332
E-mail ddeenah@drdenterprise.com

Minority Small Business
Contact Devon Deenah

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 9/24/2013

PIPE AND PIPE FITTINGS

Larsen Civil Construction LLC — **Federal Number** 20-3567884

10456 66th Street
Pinellas Park, FL 33782

Phone (727) 547-8100
Fax (727) 547-8101
E-mail jim@larsencivil.com

Minority Small Business
Contact Benjamin Larsen

Mar Supply Co. — **Federal Number** 27-0206845

2851 8th St.
Englewood, FL 34224

Phone (941) 286-3240
Fax (941) 214-8215
E-mail info@marsupplyco.com

Minority Small Business
Contact Raul Corona

Terrell Industries, Inc. — **Federal Number** 65-0530148

2067 1st Avenue N
St. Petersburg, FL 33713

Phone (727) 823-4424
Fax (727) 823-3977
E-mail gterrell@verizon.net

Minority Small Business
Contact Grady Terrell

Suca Pipe Supply, Inc. One — **Federal Number** 26-3669556

4910 Lowell Road
Tampa, FL 33624

Phone (813) 249-7902
Fax (813) 249-7384
E-mail mactwinau1@yahoo.com

Minority Small Business
Contact Ashley McIntyre

SLBE Contract Goal

Goal
15%

Instructions Regarding Use of the SLBE Goal Setting List

Bidders must solicit a subcontracting bid from ALL of the firms listed on the SLBEs list provided on the City's web site, and provide documentation of emails, faxes, phone calls, letters, or other communication with the firms a first step in demonstrating Good-Faith Efforts to achieve the goal set for SLBE participation on this contract.

The list is formatted to facilitate e-mailing of a solicitation to the listed firms by copying and pasting the email addresses.

The SLBE participation Goal is based upon the availability of the certified firms indicated on the attached list. The Goal and Requirements of the City's Equal Business Opportunity Program are stated in the Bid/Contract Document, Specifications.

Procurement Guidelines To Implement Minority & Small Business Participation

Underutilized WMBE Primes by Industry Category

FORMAL PROCUREMENT

Construction	Construction-Related	Professional	Non-Professional	Goods
Black	Asian	Black	Black	Black
Hispanic	Native Am.	Hispanic	Asian	Hispanic
Native Am.	Woman	Asian	Native Am.	Asian
Woman		Native Am.		Native Am.
		Woman		Woman

Underutilized WMBE Sub-Contractors / Sub-Consultants

SUB WORK

Construction	Construction-Related	Professional	Non-Professional	Goods
Black	Black	Black	Black	Black
	Asian	Hispanic	Asian	Asian
	Native Am.	Asian	Native Am.	Native Am.
	Woman	Native Am.		Woman
		Woman		

Policy

The Guidelines apply to formal procurements and solicitations. WMBE participation will be narrowly-tailored.

Index

- Black = Black/African-American Business Enterprise
- Hispanic = Hispanic Business Enterprise
- Asian = Asian Business Enterprise
- Native Am. = Native American Business Enterprise
- Woman = Woman Business Enterprise (Caucasian)

Industry Categories

Construction is defined as: new construction, renovation, restoration, maintenance of public improvements and underground utilities.
Construction-Related Services are defined as: architecture, professional engineering, landscape architecture, design build, construction management services, or registered surveying and mapping.
Professional Services are defined as: attorney, accountant, medical doctor, veterinarian, miscellaneous consultant, etc.
Non-Professional Services are defined as: lawn maintenance, painting, janitorial, printing, hauling, security guard, etc.
Goods are defined as: all supplies, materials, pipes, equipment, machinery, appliances, and other commodities.

MBD Form-70

SOLICITATION FOR SUBCONTRACTOR QUOTES

From:
OUR COMPANY NAME:
TELEPHONE NUMBER:
ADDRESS:
FAX NUMBER:
E-MAIL ADDRESS:

To Subcontractor:

Our firm is in the process of preparing a bid for a **City of Tampa Contract**. Please accept this notice as our request for quotes for the scope of work identified below. Please respond to this request by filling in the information below and returning via e-mail or fax to the address or number provided. Please contact us if you need any assistance in obtaining bonding, lines of credit, insurance, assistance in obtaining necessary equipment, supplies, materials, participation in a City-sponsored mentor-protégé program, or if you have any questions.

Plans and Specs for this project are posted at:
http://www.tampagov.net/dept_contract_administration/programs_and_services/construction_project_bidding/

CONTRACT NO.:
CONTRACT NAME:
CITY'S BID OPENING DATE:
DEADLINE FOR YOUR SUBCONTRACTOR BID OR RESPONSE:
SPECIFIC SCOPE OF WORK:

Please complete and submit with your subcontract bid or response:
YOUR FIRM'S NAME:
MAILING ADDRESS:
CITY:
STATE:
ZIP:
FAX NUMBER:
E-MAIL ADDRESS:
__Yes, my company is interested in quoting this project for the following items of work:

__No, my company will not quote this project for the following reason(s):

(Sample Suggested Sub Solicitation 3-9-9 Tampa MBDO)

Contract 12-c-00042; Howard F. Curren AWTP Raw Sewage Pumping Station Improvements

PROPOSAL

To the Mayor and City Council of the City of Tampa, Florida:

Name of Bidder _____

_____
Business Phone Number and Email Address

_____
Business Name and Mailing Address

_____
Phone Number and Name of Contact Regarding Permits

_____
Contractor/Qualifiers Name and Federal Identification Number

Date of Proposal _____

(If Bidder is a firm, fill in the following blanks):

Names and Residential Addresses of Partners

_____

_____

(If Bidder is a corporation, fill in the following blanks):

Organized under the laws of the State of _____

Names and Address of President

_____

_____

Name and Address of Vice President

_____

_____

Name and Address of Secretary

_____

_____

Names and Address of Treasurer

_____

_____

The above-named Bidder affirms and declares:

(1) That the Bidder is of lawful age and that no other person, firm or corporation has any interest in this Proposal or in the Contract proposed to be entered into.

(2) That this Proposal is made without any understanding, agreement or connection with any other person, firm, or corporation making Proposal for the same purposes, and is in all respects fair and without collusion or fraud.

(3) That the Bidder is not in arrears to the City of Tampa, upon debt or contract, and is not a defaulter, as surety or otherwise, upon any obligation to the City of Tampa.

(4) That no officer or employee or person whose salary is payable in whole or in part from the City Treasury is, shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this Proposal, or in the performance of the Contract, or in the supplies, materials, or equipment and work or labor to which it relates, or in any portion of the profits thereof.

(5) That the Bidder has carefully examined the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials and the kinds and extent of equipment and other facilities needed for the performance of the work, the general and local conditions and all difficulties to be encountered, and all other items which may, in any way, affect the work or its performance.

(6) That the Bidder

_____ Has; Treasury Number _____

_____ Has not
(Check applicable box)

previously performed work under the President's Executive Order Nos. 11246 and 11375.

(7) That the undersigned, as Bidder, also declares that he has carefully examined and fully understands all the component parts of the Contract Documents and agrees that he will execute the Contract and finish the required Performance Bond and will completely perform the work in strict accordance with the terms of the Contract and the Contract Documents therein referred to for the following prices, to wit:

Contract Item No.	Estimated Quantity	Description and Price in Words	Computed Total Price for Item in Figures
BASE BID	LS	The work includes the furnishing of all labor, equipment, and material for the bypassing pumping station wastewater flows, partial removal of the pumping station concrete top slab, demolishing concrete structures in the wet well, control panels and enclosures, station piping, pumps & valves; installation of mechanical bar screen and screenings' washing compactor, concrete driveway, roof structure, two new submersible pumps, hdpe piping, valves, controls, electrical, instrumentation, telecommunications, any Contingency Allowances that may be listed in Section SP-60, and with all associated work required for a complete project in accordance with the Contract Documents. _____ _____ dollars and _____ cents (BASE BID) LS	$_____

Computed Total Price In Words:

_____

_____ dollars and _____ cents.

Computed Total Price in Figures: $_____

The bidder acknowledges that the following addenda have been received and that the changes covered by the addendum(s) have been taken into account in this proposal: #1 ___ #2 ___ #3 ___ #4___ #5___.

The bidder acknowledges the requirements of the City of Tampa's Equal Business Opportunity Program.

Bidder acknowledges that included in the various items of the proposal and the Total Bid Price are costs for complying with the Florida Trench Safety Act (90096), (Laws of Fla.) effective October 1, 1990. The bidder further identifies the costs to be summarized below:

	Trench Safety Measure (Description)	Unit of Measure (LF, SY)	Unit Quantity	Unit Cost	Extended Cost
A.	_____	_____	_____	_____	_____
B.	_____	_____	_____	_____	_____
C.	_____	_____	_____	_____	_____
D.	_____	_____	_____	_____	_____

Total Cost $_____

Signed _____

Failure to complete the above may result in the bid being declared non-responsive.

Accompanying this Proposal is a certified check, cashier's check or Bid Bond (form included herein must be used) on the form at least five (5) percent of the total amount of the Proposal which check shall become the property of the

_____ of _____
(Name of Bank or Surety) (City & State)

City of Tampa, or which bond shall become forthwith due and payable to the City of Tampa, if this Proposal shall be accepted by the City of Tampa and the undersigned shall fail to execute a contract with and to furnish the required Performance Bond and Payment Bond to the City of Tampa within twenty (20) days after the date of receipt of written Notice of Award by the City of Tampa to the undersigned so to do.

Dated _____, 2013

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Signature)

_____
(Title)

Where Bidder is a Corporation:

Attest:

_____
Secretary

AFFIX
CORPORATE
SEAL

(ACKNOWLEDGMENT OF PRINCIPAL)

STATE OF)
) SS:
COUNTY OF)

For a Corporation:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2013 by _____ of _____, a _____ corporation, on behalf of the corporation. He/she is ___ personally known or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

For an Individual:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2013 by _____ who is ___ personally known to me or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

For a Firm:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2013 by _____ who signed on behalf of the said firm. He/she is ___ personally known or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

_____

Good Faith Effort Compliance Plan for Small Local Business Subcontracting

City of Tampa - Equal Business Opportunity Program

Contract _____ **Bid Date** _____

Bidder _____

Signature _____ **Date** _____

Name _____ **Title** _____

The following Compliance Plan is a true report of Good Faith Efforts made to accomplish subcontracting goals for Small Local Business Enterprises, SLBEs, on the referenced contract:

□ **The goal for SLBE participation has been met or exceeded. See the DMI form reporting subcontractors to be utilized.**
(Check Box, if appropriate; the remainder of the Compliance Plan need not be reported.)

□ **The goal for SLBE participation has not been met. The following is a recap of Good Faith Efforts made:**
(Check applicable boxes below. Enclose additional documents, and/or add remarks below as needed.)

(1) Soliciting through reasonable and available means the interest of SLBEs that have the capability to perform the work of the contract. The Bidder or Contractor must solicit this interest within sufficient time to allow the SLBEs to respond. The Bidder or Contractor must take appropriate steps to follow up initial solicitations with interested SLBEs. □ See DMI report forms for subcontractors solicited. □ See enclosed supplemental data on solicitation efforts. □ Remarks:

(2) Providing interested SLBEs with adequate information about the plans, specifications, and requirements of the contract, including addenda, in a timely manner to assist them in responding to the solicitation. □ See enclosed sample solicitation. □ Remarks:

(3) Negotiating in good faith with interested SLBEs that have submitted bids. Documentation of negotiation must include the names, addresses, and telephone numbers of SLBEs that were solicited; the date of each such solicitation; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why agreements could not be reached with SLBEs to perform the work. That there may be some additional costs involved in soliciting and using SLBEs is not a sufficient reason for a contractor's failure to meet the goals, as long as such costs are reasonable. Bidders are not required to accept higher quotes in order to meet the goal. □ DMI subcontractor-utilized forms reflect successful negotiations □ This project is of a low-bid nature and negotiations are limited to clarifications of scope and specifications. □ See enclosed document. □ Remarks:

(4) Not rejecting SLBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The SLBEs standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations are not legitimate causes for rejecting or not soliciting bids to meet the goals. □ Not applicable. □ See attached explanation for rejection of a low-bidding subcontractor's bid. □ Remarks:

(5) Making a portion of the work available to SLBE subcontractors and suppliers and to select those portions of the work or material consistent with the available SLBE subcontractors and suppliers, so as to facilitate meeting the goal. □ Sub-Contractors were allowed to bid on their own choice of work or trade without restriction to a pre-determined portion. □ See enclosed comments. □ Remarks:

(6) Making good faith efforts, despite the ability or desire of a Bidder or Contractor to perform the work of a contract with its own organization. A Bidder or Contractor who desires to self-perform the work of a contract must demonstrate good faith efforts unless the goal has been met. □ Sub-Contractors were not prohibited from submitting bids on work not usually sub-contracted. □ Remarks:

(7) Selecting portions of the work to be performed by SLBEs in order to increase the likelihood that the goals will be met. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate SLBE participation, even when the Bidder or Contractor might otherwise prefer to perform these work items with its own forces. □ Sub-Contractors were allowed to bid on their own choice of work or trade without restriction to a pre-determined portion. □ Sub-Contractors were not prohibited from submitting bids on work not usually sub-contracted. □ See enclosed comments. □ Remarks:

(8) Making efforts to assist interested SLBEs in obtaining bonding, lines of credit, or insurance as required by the city or contractor. □ See enclosed sample solicitation □ see enclosed document. □ Remarks:

(9) Making efforts to assist interested SLBEs in obtaining necessary equipment, supplies, materials, or related assistance or services, including participation in a City-sponsored mentor-protégé program. □ See enclosed sample solicitation. □ See enclosed document. □ Remarks:

(10) Effectively using the services of the City and other organizations that provide assistance in the recruitment and placement of SLBEs. □ See enclosed document. □ The following services were used:

Other Supporting Good Faith Efforts: □ See enclosed document. □ Remarks:

Compliance Plan: Guidance For Meeting Good Faith Efforts

1. All firms on the SLBE Goal Setting List must be solicited and documentation provided for email, fax, letters, phone calls, and other communication with the listed firms. The DMI Solicited and DMI-Utilized forms must be completed for all firms solicited or utilized. Other opportunities for subcontracting may be explored by consulting the City of Tampa and/or Hillsborough County certification listings of SLBE's.

2. Solicitation of SLBEs, via written or electronic notification, should provide specific information on the services needed, where plans can be reviewed and assistance offered in obtaining these, if required. Solicitations should be typically be sent a week or more before the bid date. Sample copies of the bidder's solicitations should be provided.

3. With any quotes received, a follow-up should be made whenever needed to confirm scope of work. For any SLBE low quotes rejected, an explanation should be provided detailing negotiation efforts.

4. If a low bid SLBE is rejected or deemed unqualified the contractor must provide an explanation and supporting documentation for this decision.

5. Prime should break down portions of work into economical feasible opportunities for subcontracting. The SLBE directory can be useful in identifying additional subcontracting opportunities and firms not listed in the "SLBE Goal Setting Firms List."

6. Contractor should not preclude SLBEs from bidding on any part of work, even if the Contractor can self-perform the work.

7. Contractor should avoid relying solely on subcontracting out work where availability is not sufficient to attain pre-determined goal.

8. In its solicitations, the Bidder should offer assistance to SLBEs in obtaining bonding, insurance, etc, if required of subcontractors by the City or Prime Contractor.

9. In its solicitation, the Bidder should offer assistance in obtaining equipment for a specific job to SLBEs, if needed.

10. Contractor should use the services offered by such agencies as the Minority Business Development Office of the City of Tampa, Hillsborough County and the NAACP Empowerment Center for the recruitment and placement of SLBEs.

City of Tampa –DMI -Schedule of All Sub-(Contractors/Consultants/Suppliers) Solicited

(FORM MBD-10)

Contract No.:_____ Contract Name:_____

Contractor Name:_____ Address:_____

Federal ID:_____Phone:_____ Fax:_____ Email:_____

[] No Firms were contacted/solicited for this contract.

[] No Firms were contacted because:_____

[] See attached documents with supplemental information.

NIGP Code General Categories: Buildings = 909, General = 912, Heavy = 913, Trades = 914, Architects = 906, Engineers & Surveyors = 925, Supplier = 912-77

This DMI Schedule Must Be Submitted with the Bid or Proposal (Do Not Modify This Form)

S = SLBE W=WMBE Federal ID	Company Name Address Phone & Fax	Type of Ownership (F=Female M=Male) BF BM = African Am. HF HM = Hispanic Am. AF AM = Asian Am. NF NM = Native Am. CF CM = Caucasian	Trade or Services NIGP Code (listed above)	Contact Method L=Letter F=Fax E=Email P=Phone	Quote or Resp. Rec'd Y/N

It is hereby certified that the information provided is an accurate and true account of contacts and solicitations for sub – contracting opportunitieson this contract. ***This form must be completed and submitted with the bid or proposal***.Modifying or failing to sign DMI forms may result in Non-Compliance and/or deemed non-responsive.

Signed:_____ Name/Title:_____ Date:_____

Note: Detailed Instructions for completing this form are on the next page

Instructions for completing The Sub-(Contractors/Consultants/ Suppliers) Solicited Form (Form MBD-10)

This form must be submitted with all bids or proposals. All subcontractors (regardless of ownership or size) solicited and subcontractors from whom unsolicited quotations were received must be included on this form. The instructions that follow correspond to the headings on the form required to be completed.Note: Ability or desire to self-perform all work shall not exempt the prime from Good Faith Efforts when Goal has been established.

- **Contract No.** This is the number assigned by the City of Tampa for the bid or proposal.
- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid or proposal.
- **Contractor Name.** The name of your business.
- **Address.** The physical address of your business.
- **Federal ID.**FIN. A number assigned to your business for tax reporting purposes.
- **Phone.** Telephone number to contact business.
- **Fax.** Fax number for business.
- **Email.** Provide email address for electronic correspondence.
- **No Firms were contacted/solicited for this contract.** Checking the box indicates that a pre-determined Subcontract Goal was not set by the City resulting in your business not using subcontractors and will self-perform all work. If during the performance of the contract you employ subcontractors, the City must pre-approve subcontractors. Use of the "Sub-(Contractors/Consultants/Suppliers) Payments" form must be submitted with your invoices. Note: Certified SLBE or WMBE firms bidding as Primes are not exempt from outreach and solicitation of subcontractors.
- **No Firms were contacted because.** Provide brief explanation why no firms were contacted/solicited.
- **See attached documents.**Check box, if after you have completed the DMI Form in its entirety, you are providing any additional documentation relating to the form.All DMI data not submitted on the MBD Form-10 must be in the same format and have all requested data from MBD Form-10 included.

The following instructions are for information of any and all subcontractors solicited.

- **"S" = SLBE, "W" = WMBE.** Enter "**S**" for firms Certified by the City as Small Local Business Enterprises and/or "**W**" for firms Certified by the City as Women/Minority Business Enterprise.
- **Federal ID.**FIN. A number assigned to a business for tax reporting purposes. This information is critical in proper identification of the subcontractor.
- **Company Name, Address, Phone & Fax**. Provide company information for verification of payments.
- **Type of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business.
- **Trade, Services, or Materials** Indicate the trade, service, or material provided by the subcontractor. NIGP codes are listed at top section of document.
- **Contact Method L=letter, F=fax, E=Email, P=Phone.** Indicate with letter the method of soliciting for bid.
- **Quote or Resp. (response) Rec'd (received) Y/N**. Indicate "Y" Yes if you received a quotation or if you received a response to your solicitation. Indicate "N" No if you received no response to your solicitation from the subcontractor.

If any additional information is required or you have any questions, you may call the Minority Business Development Office at (813) 274-5522.

City of Tampa –DMI Schedule of Sub-(Contractors/Consultants/Suppliers) to be Utilized

(FORM MBD-20)

Contract No.:_____ Contract Name:_____

Contractor Name:_____ Address:_____

Federal ID:_____Phone:_____ Fax:_____ Email:_____

[ ] See attached documents.

[ ] No Subcontracting (of any kind) will be performed on this contract.

NIGP Code General Categories: Buildings = 909, General = 912, Heavy = 913, Trades = 914, Architects = 906, Engineers & Surveyors = 925, Supplier = 912-77

This DMI Schedule Must Be Submitted with the Bid or Proposal (Do Not Modify This Form)

Enter "S" for firms Certified as Small Local Business Enterprises, "W" for firms Certified as Women/Minority Business Enterprise

S = SLBE W=WMBE Federal ID	Company Name Address Phone & Fax	Type of Ownership (F=Female M=Male) BF BM = African Am. HF HM = Hispanic Am. AF AM = Asian Am. NF NM = Native Am. CF CM = Caucasian	Trade, Services, or Materials NIGP Code Listed above	Amount of Quote. Letter of Intent if available.	Percent of Scope/Contract %

Total Subcontract/Supplier Utilization $_____

Total SLBE Utilization $ _____

Total WMBE Utilization $ _____

Percent SLBE Utilization of Total Bid/Proposal Amt. _____% Percent WMBE Utilization of Total Bid/Proposal Amt. _____%

It is hereby certified that the following information is a true and accurate account of utilization for sub-contracting opportunities on this contract. ***This form must be completed and submitted with the bid or proposal.*** Modifying or failing to sign DMI forms may result in Non-Complianceand/or deemed non-responsive.

Signed:_____ Name/Title:_____ Date:_____

Note: Detailed Instructions for completing this form are on the next page.

Instructions for completing The Sub-(Contractors/Consultants/ Suppliers) to be Utilized Form

(Form MBD-20)

This form must be submitted with all bids or proposals. All subcontractors projected to be utilized must be included on this form.

- **Contract No.** This is the number assigned by the City of Tampa for the bid or proposal.
- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid or proposal.
- **Contractor Name.** The name of your business.
- **Address.** The physical address of your business.
- **Federal ID.**FIN. A number assigned to your business for tax reporting purposes.
- **Phone.** Telephone number to contact business.
- **Fax.** Fax number for business.
- **Email.** Provide email address for electronic correspondence.
- **No Subcontracting (of any kind) will be performed on this contract.** Checking box indicates your business will not use subcontractors when no Subcontract Goal has been set by the City, but will self-perform all work. When subcontractors are utilized during the performance of the contract, the "Sub-(Contractors/Consultants/Suppliers) Payments" form must be submitted with your invoices. Note: Certified SLBE or WMBE firms bidding as Primes are not exempt from outreach and solicitation of subcontractors.
- **See attached documents.** Check if you have provided any additional documentation relating to the utilization of subcontractors.
-

The following instructions are for information of Any and All subcontractors to be utilized.

- **Federal ID.**FIN. A number assigned to a business for tax reporting purposes. This information is critical in proper identification of the subcontractor.
- **"S" = SLBE, "W" = WMBE.** Enter "**S**" for firms Certified by the City as Small Local Business Enterprises and/or "**W**" for firms Certified by the City as Women/Minority Business Enterprise.
- **Company Name, Address, Phone & Fax**. Provide company information for verification of payments.
- **Type of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business.
- **Trade, Services, or Materials (NIGP code if Known)** Indicate the trade, service, or material provided by the subcontractor. NIGP codes are available at http:/www.tampagov.net/mbd.
- **Amount of Quote, Letters of Intent** (required for both SLBEs and WMBEs)
- **Percent of Work/Contract.** Indicate the percent of the total contract price the subcontract(s) represent.
- **Total Subcontract/Supplier Utilization.** – Provide total dollar amount of all subcontractors/suppliers projected to be used for the contract. (Dollar amounts may not apply to CCNA proposals.)
- **Total SLBE Utilization.** Provide total dollar amount for all projected SLBE subcontractors/Suppliers used for this contract. (Dollar amounts may not apply to CCNA proposals.)
- **Total WMBE Utilization.** Provide total dollar amount for all projected WMBE subcontractors/Suppliers used for this contract. (Dollar amounts may not apply to CCNA proposals.)
- **Percent SLBE Utilization.** Total amount allocated to SLBEs divided by the total bid amount. (Dollar amounts may not apply to CCNA proposals.)
- **Percent WMBE Utilization.** Total amount allocated to WMBEs divided by the total bid/proposal amount. (Dollar amounts may not apply to CCNA proposals.)

If any additional information is required or you have any questions, you may call the Minority Business Development Office at (813) 274-5522.

TAMPA BID BOND
Contract 12-c-00042; Howard F. Curren AWTP Raw Sewage Pumping Station Improvements

KNOW ALL MEN BY THESE PRESENTS, that we, _____

_____

(hereinafter called the Principal) and _____

(hereinafter called the Surety) a Corporation chartered and existing under the laws of the State of _____, with its principal offices in the City of _____, and authorized to do business in the State of Florida, are held and firmly bound unto the City of Tampa, a Municipal Corporation of Hillsborough County, Florida, in the full and just sum of 5% of the amount of the (Bid) (Proposal) good and lawful money of the United States of America, to be paid upon demand of the City of Tampa, Florida, to which payment will and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally and firmly these presents.

WHEREAS, the Principal is about to submit, or has submitted to the City of Tampa, Florida, a Proposal for the construction of certain facilities for the City designated Contract 12-c-00042, Howard F. Curren AWTP Raw Sewage Pumping Station Improvements.

WHEREAS, the Principal desires to file this Bond in accordance with law, in lieu of a certified Bidder's check otherwise required to accompany this Proposal.

NOW, THEREFORE: The conditions of this obligation are such that if the Proposal be accepted, the Principal shall, within twenty (20) days after the date of receipt of written Notice of Award, execute a contract in accordance with the Proposal and upon the terms, conditions and price set forth therein, in the form and manner required by the City of Tampa, Florida and execute a sufficient and satisfactory Performance Bond and Payment Bond payable to the City of Tampa, Florida in an amount of one hundred percent (100%) of the total contract price, in form and with security satisfactory to said City, then this Bid Bond obligation is to be void; otherwise to be and remain in full force and virtue in law, and the Surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the aforesaid City, upon demand, the amount thereof, in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed this _____ day of _____,2013.

Principal _____

BY _____

TITLE _____

BY _____

TITLE _____

Countersigned:
(SEAL)

_____
Local Resident Producing Agent

_____
Local Resident Producing Agent's Address

_____
Name of Local Agency

_____
The addition of such phrases as "not to exceed" or like import shall render the (Bid) (Proposal)non-responsive.

AGREEMENT

For furnishing all labor, materials and equipment, together with all work incidental thereto, necessary and required for the performance of the work for the construction of Contract 12-c-00042 in accordance with your Proposal dated _____, amounting to a total of $_____ as completed in accordance with subsections I-2.09 and I-2.10 of the Instruction to Bidders.

THIS AGREEMENT, made and entered into in triplicate, this ____ day of _____, 2013, between the City of Tampa, Florida, hereinafter called the City, and hereinafter called the Contractor.

WITNESSETH that, in consideration of the mutual stipulations, agreements, and covenants herein contained, the parties hereto have agreed and hereby agree with each other, the Party of the First Part for itself, its successors and assigns, and the Party of the Second Part for itself, or himself, or themselves, and its successors and assigns, or his or their executors, administrators and assigns, as follows:

Contract 12-c-00042; Howard F. Curren AWTP Raw Sewage Pumping Station Improvements, shall include, but not be limited to, bypassing pumping station wastewater flows, partial removal of the pumping station concrete top slab, demolishing concrete structures in the wet well, control panels and enclosures, station piping, pumps & valves; installation of mechanical bar screen and screenings' washing compactor, concrete driveway, roof structure, two new submersible pumps, hdpe piping, valves, controls, electrical, instrumentation, telecommunications with all associated work required for a complete project in accordance with the Contract Documents.

Contract Documents referred to in Article 1.01 of this Agreement also includes this volume, applicable standard drawings, the plans and any provisions referred to whether actually attached or not.

TAMPA AGREEMENT

SECTION 1
GENERAL

ARTICLE 1.01 THE CONTRACT

Except for titles, subtitles, headings, running headlines, and tables of contents (all of which are printed herein merely for convenience), the following, except for such portions thereof as may be specifically excluded, constitute the Contract:

The Notice to Bidders;
The Instructions to Bidders, including Special Instructions and General Instructions;
The Proposal;
The Bid Bond;
The Certification of Nonsegregated Facilities;
The Notice of Award;
The Agreement;
The Performance Bond;
The Notice To Proceed;
The Specifications, including the General Provisions, the Workmanship and Materials, the Specific Provisions or the Contract Items
The Plans;
All Supplementary Drawings Issued after award of the Contract;
All Addenda issued by the City prior to the receipt of proposals;
All provisions required by law to be inserted in this Contract, whether actually inserted or not.

ARTICLE 1.02 DEFINITIONS

The following words and terms, or pronouns used in their stead, shall, wherever they appear in this Contract, be construed as follows, unless different meaning is clear from the context:

(a)"City" shall mean the City of Tampa, Florida, represented by its Mayor and City Council, Party of the First Part, or such other City official as shall be duly empowered to act for the City on matters relating to this Contract.

(b)"Contractor" shall mean the Party of the Second Part hereto, whether corporation, firm or individual, or any combination thereof, and its, their, or his successors, personal representatives, executors, administrators, and assigns, and any person, firm or corporation who or which shall at any time be substituted in the place of the Party of the Second Part under this Contract.

(c)"Engineer" shall mean the Director of the Department or his duly authorized representative.

(d)"Consultant" shall mean the engineering or architectural firm or individual employed by the City to consult with and advise the City in the construction of the project.

(e)"Surety" shall mean any person, firm or corporation that has executed as Surety the Contractor's Performance Bond securing the performance of this Contact.

(f)"The Work" shall mean everything expressly or implied required to be furnished and done by the Contractor under the Contract, and shall include both Contract Work and Extra Work.

(g)"Contract Work" shall mean everything expressly or implied required to be furnished and done by the Contractor by any one or more of the Contract parts referred to in Article 1.01 hereof, except Extra Work, as hereinafter defined; it being understood that, in case of any inconsistency in or between any part or parts of this Contract, the Engineer shall determine which shall prevail.

(h)"Contract" or "Contract Documents" shall mean each of the various part of the Contract referred to in Article 1.01 hereof, both as a whole and severally.

(i)"Extra Work" shall mean work other than that required either expressly or implied by the contract in its present form.

(j)"Plans" shall mean only those drawings specifically referred to as such in these documents, or in any Addendum. Drawings issued after the execution of the Contract to explain further, or to illustrate, or to show changes in the work, will be known as "Supplementary Drawings" and shall be binding upon the Contractor with the same force as the Plans.

(k)"Specifications" shall mean all of the directions, requirements, and standards of performance applying to the work, as hereinafter detailed and designated as such, or which may be issued in an addendum.

(l)"Addendum or Addenda" shall mean the additional contract provisions issued in writing prior to the receipt of bids.

(m)"Notice" shall mean written notice. Notice shall be served upon the Contractor, either personally or by leaving the said notice at his residence or with any employee found on the work, or addressed to the Contractor at the residence or place of business given in his proposal and deposited in a postpaid wrapper in any post office box regularly maintained by the United States Post Office.

(n)"Project" shall mean the entire improvement package or related work. The "project" may consist of several different, but related, contracts.

(o)"Site" shall mean, and be limited to, the area upon or in which the Contractor's operations are carried on and such other appropriate areas as may be designed as such by the Engineer.

(p)"Subcontractor" shall mean any person, firm, or corporation, other than employees of the Contractor, who or which contracts with the Contractor to furnish, or actually furnishes labor, or labor and materials, or labor and equipment or labor, materials, and equipment at the site.

(q)Whenever in the Contract the words "directed", "required", "permitted", "ordered", "designated", "prescribed", and words of like import are used, they shall imply the direction, requirement, permission, order, designation, or prescription of the Engineer; and "approved", "acceptable", "satisfactory", "in the judgement of", and words of like import shall mean approved by, or acceptable to, or satisfactory to, or in the judgment of the Engineer.

(r)Whenever in the Contract the word "day" is used, it shall mean calendar day.

(s)"Final Acceptance" shall mean acceptance of the

work as evidenced by an official resolution of the City. Such acceptance shall be deemed to have taken place only if and when an approving resolution has been adopted by the City Council. The final acceptance shall be signed only after the City has assured itself by tests, inspection, or otherwise, that all of the provisions of the Contract have been carried out to its satisfaction.

(t)"Eastern Standard Time" shall be construed as the time being observed in the City on the day proposals are received or other documents issued or signed.

SECTION 2
POWERS OF THE CITY'S REPRESENTATIVES

ARTICLE 2.01 THE ENGINEER

It is covenanted and agreed that the Engineer, in addition to those matters elsewhere herein expressly made subject to his determination, direction, or approval, shall have the power, subject to such express provisions and limitations herein contained as are not in conflict herewith, and subject to review by the Mayor and City Council:

(a)To monitor the performance of the work.

(b)To determine the amount, kind, quality, sequence, and location of the work to be paid for hereunder and, when completed, to measure such work for payment.

(c)To determine all questions of an engineering character in relation to the work, to interpret the Plans, Specifications and Addenda.

(d)To determine how the work of this Contract shall be coordinated with the work of other contractors engaged simultaneously on this project.

(e)To make minor changes in the work as he deems necessary, provided such changes do not result in a net increase in the cost to the City or to the Contractor of the work to be done under the Contract.

(f)To amplify the Plans, add explanatory information and furnish additional Specifications and Drawings consistent with the intent of the Contract Documents.

The power of the Engineer shall not be limited to the foregoing enumeration, for it is the intent of this Contract that all of the work shall be subject to his determinations and approval, except where the determination or approval of someone other than the Engineer is expressly called for herein and except as subject to review by the Mayor and City Council. All orders of the Engineer requiring the Contractor to perform work as Contract work shall be promptly obeyed by the Contractor.

The Engineer shall not, however, have the power to issue an extra work order, and the performance of such work on the order of the Engineer without previously obtaining written confirmation thereof from the Mayor in accordance with Article 7.02 hereof may constitute a waiver of any right to extra compensation therefor. The Contractor is warned that the Engineer has no power to change the terms and provisions of this Contract, except minor changes where such change results in no net increase in the Contract Price.

ARTICLE 2.02 DIRECTOR

The Director of the Department in addition to those matters expressly made subject to his determination, direction or approval in his capacity as "Engineer", shall also have the power:

(a)To review any and all questions in relation to this Contract and its performance, except as herein otherwise specifically provided, and his determination upon such review shall be final and conclusive upon the Contractor.

(b)With the approval of the Mayor and City Council to authorize modifications or changes in the Contract so as to require: (1) the performance of extra work, or (2) the omission of Contract work whenever he deems it in the interest of the City to do so, or both.

(c)To suspend the whole or any part of the work whenever, in his judgment, such suspension is required: (1) in the interest of the City generally, or (2) to coordinate the work of the various Contractors engaged on this project, or (3) to expedite the completion of the entire project, even though the completion of this particular Contract may be thereby delayed, without compensation to the Contractor for such suspension other than extending the time for the completion of the work, as much as it may have been, in the opinion of the City, delayed by such a suspension.

(d)If, before the final acceptance of all the work contemplated herein, it shall be deemed necessary to take over, use, occupy, or operate any part of the completed or partly completed work, the Engineer shall have the right to do so and the Contractor will not, in any way, interfere with or object to the use, occupation, or operation of such work by the City after receipt of notice in writing from the Engineer that such work or part thereof will be used by the City on and after the date specified in such notice. Such taking over, use, occupancy or operation of any part of the completed or partially completed work shall not constitute final acceptance or approval of any such part of the work.

ARTICLE 2.03 NO ESTOPPEL

The City shall not, nor shall any department, officer, agent, or employee thereof, be bound, precluded, or estopped by any determination, decision, acceptance, return, certificate, or payment made or given under or in connection with this Contract by any officer, agent or employee of the City at any time either before or after final completion and acceptance of the work and payment therefor: (a) from showing the true and correct classification, amount, quality, or character of the work done, or that any determination, decision, acceptance, return certificate or payment is untrue, incorrect or improperly made in any particular, or that the work or any part thereof does not in fact conform to the requirements of the Contract Documents, and (b) from demanding and recovering from the Contractor any overpayments made to him or such damages as it may sustain by reason his failure to comply with the requirements of the Contract of Documents, or both.

ARTICLE 2.04 NO WAIVER OF RIGHTS

Neither the inspection, nor any order, measurements or certificate of the City or its employees, officers, or agents, nor by any order of the City for payment of money, nor any money, nor payments for or acceptance of the whole or any part of the work by the City, nor any extension of time, nor any changes in the Contract, Specifications or Plans, nor any possession by the City or its employees shall operate as a

waiver of any provisions of this Contract, nor any power herein provided nor shall any waiver of any breach of this Contract be held as a waiver of any other subsequent breach.

Any remedy provided in this Contract shall be taken and construed as cumulative, namely, in addition to each and every other suit, action, or legal proceeding. The City shall be entitled as of right to an injunction against any breach of the provisions of this Contract.

SECTION 3
PERFORMANCE OF WORK

ARTICLE 3.01 CONTRACTOR'S RESPONSIBILITY
The Contractor shall do all the work and furnish, at his own cost and expense, all labor, materials, equipment, and other facilities, except as herein otherwise provided, as may be necessary and proper for performing and completing the work under this Contract. The Contractor shall be responsible for the entire work until completed and finally accepted by the City.

The work shall be performed in accordance with the true intent and meaning of the Contract Documents. Unless otherwise expressly provided, the work must be performed in accordance with the best modern practice, with materials as specified and workmanship of the highest quality, all as determined by and entirely to the satisfaction of the Engineer.

Unless otherwise expressly provided, the means and methods of construction shall be such as the Contractor may choose, subject, however, to the approval of the Engineer. Only adequate and safe procedure, methods, structures and equipment shall be used. The Engineer's approval or the Engineer's failure to exercise his right thereon shall not relieve the Contractor of obligations to accomplish the result intended by the Contract, nor shall such create a cause of action for damages.

ARTICLE 3.02 COMPLIANCE WITH LAWS
The Contractor must comply with all local, State and Federal laws, rules, ordinances and regulations applicable to this Contract and to the work done hereunder, and must obtain, at his own expense, all permits, licenses or other authorization necessary for the prosecution of the work.

No work shall be performed under this Contract on Sundays, legal holidays or after regular working hours without the express permission of the Engineer. Where such permission is granted, the Engineer may require that such work be performed without additional expense to the City.

ARTICLE 3.03 INSPECTION
During the progress of the work and up to the date of final acceptance, the Contractor shall, at all times, afford the representatives of the City, the Florida Department of Environmental Regulation, and if applicable, the Federal Environmental Protection Agency and the Federal Department of Labor every reasonable, safe and proper facility for inspecting the work done or being done at the site. The inspection of any work shall not relieve the Contractor of any of his obligations to perform proper and satisfactory work as herein specified. Finished or unfinished work found not to be in strict accordance with the Contract shall be replaced as directed by the Engineer, even though such work may have been previously approved and payment made therefor.

The City shall have the right to reject materials and workmanship which are defective or require their correction. Rejected work and materials must be promptly removed from the site, which must at all times be kept in a reasonably clean and neat condition.

Failure or neglect on the part of the City to condemn or reject bad or inferior work or materials shall not be construed to imply an acceptance of such work or materials, if it becomes evident at any time prior to the final acceptance of the work by the City. Neither shall it be construed as barring the City at any subsequent time from the recovery of damages of such a sum of money as may be needed to build anew all portions of the work in which inferior work or improper materials were used, wherever found.

Should it be considered necessary or advisable by the City at any time before final acceptance of the entire work to make examinations of work already completed, by removing or tearing out all or portions of such work, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and material for that purpose. If such work is found to be defective in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the cost of examination and restoration of the work shall be considered an item of extra work to be paid for in accordance with the provisions of Article 7.02 hereof.

ARTICLE 3.04 PROTECTION
During performance and until final acceptance, the Contractor shall be under an absolute obligation to protect the finished and unfinished work against any damage, loss, or injury. The Contractor shall take proper precaution to protect the finished work from loss or damage, pending completion and the final acceptance of all the work included in the entire Contract, provided that such precaution shall not relieve the Contractor from any and all liability and responsibility for loss or damage to the work occurring before final acceptance by the City. Such loss or damage shall be at the risk of and borne by the Contractor, whether arising from acts or omissions of the Contractor or others. In the event of any such loss or damage, the Contractor shall forthwith repair, replace, and make good the work without extension of time therefor, except as may be otherwise provided herein.

The provisions of this Article shall not be deemed to create any new right of action in favor of third parties against the Contractor or the City.

ARTICLE 3.05 PRESERVATION OF PROPERTY

The Contractor shall preserve from damage all property along the line of the work, or which is in the vicinity of or is in anywise affected by the work, the removal or destruction of which is not called for by the Plans. This applies, but is not limited, to the public utilities, trees, lawn areas, building monuments, fences, pipe and underground structures, public streets (except natural wear and tear of streets resulting from legitimate use thereof by the Contractor), and wherever such property is damaged due to the activities of the Contractor, it shall be immediately restored to its original condition by the Contractor and at his own expense.

In case of failure on the part of the Contractor to restore such property, or make good such damage or injury, the City may, upon forty-eight (48) hour written notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from any monies due or which may become due the Contractor under this Contract. Nothing in this clause shall prevent the Contractor from receiving proper compensation for the removal, damage, or replacement of any public or private property not shown on the Plans, when this is made necessary by alteration of grade or alignment authorized by the Engineer, provided that such property has not been damaged through fault of the Contractor, his employees or agents.

ARTICLE 3.06 BOUNDARIES
The Contractor shall confine his equipment, apparatus, the storage of materials, supplies and apparatus of his workmen to the limits indicated on the plans, by law, ordinances, permits or direction of the Engineer.

ARTICLE 3.07 SAFETY AND HEALTH REGULATIONS
The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91- 596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL91-54).

ARTICLE 3.08 TAXES
All taxes of any kind and character payable on account of the work done and materials furnished under this Contract shall be paid by the Contractor and shall be deemed to have been included in his bid. The laws of the State of Florida provide that sales and use taxes are payable by the Contractor upon the tangible personal property incorporated in the work and such taxes shall be paid by the Contractor and shall be deemed to have been included in his bid.

ARTICLE 3.09 ENVIRONMENTAL CONSIDERATIONS
The Contractor, in the performance of the work under this Contract, shall comply with all Local, State and Federal laws, statutes, ordinances, rules and regulations applicable to protection of the environment; and, in the event he violates any of the provisions of same, he shall be answerable to the Local, State and Federal agencies designated by law to protect the environment. In the event the City receives, from any of the environmental agencies, a citation which is occasioned by an act or omission of the Contractor or his subcontractor or any officers, employees or agents of either, it is understood and agreed that the Contractor shall automatically become a party-respondent under said citation; and the City immediately shall notify the Contractor and provide him with a copy of said citation.

The Contractor shall comply with the requirements of the citation and correct the offending conditions(s) within the time stated in said citation and further shall be held fully responsible for all fines and/or penalties.

SECTION 4
TIME PROVISIONS

ARTICLE 4.01 TIME OF START AND COMPLETION
The Contractor must commence work within thirty (30) days subsequent to the date of the receipt of the "Notice to Proceed" by the City unless otherwise provided in the Specific Provisions and Special Instructions. Time being of the essence of this Contract, the Contractor shall thereafter prosecute the work diligently, using such means and methods of construction as well as secure its full completion in accordance with the requirements of the Contract Documents no later than the date specified therefor, or on the date to which the time for completion may be extended.

The Contractor must complete the work covered by this Contract in the number of consecutive calendar days set forth in the Instructions to Bidders, unless the date of completion is extended pursuant to the provisions of Article 4.05 hereof. The period for performance shall start from the date of signing of this Agreement by the City.

The actual date of completion will be established after a final inspection as provided in Article 4.07 hereof.

ARTICLE 4.02 PROGRESS SCHEDULE
To enable the work to be laid out and prosecuted in an orderly and expeditious manner, the Contractor shall submit to the Engineer a proposed progress schedule within fifteen (15) days after the award of this Contract.

The schedule shall state the Contract starting date, time for completion and date of completion and shall show the anticipated time of starting and completion of each of the various operations to be performed under this Contract, together with all necessary and appropriate information regarding sequence and correlation of work and an estimated time required for the delivery of all materials and equipment required for the work. The proposed schedule shall be revised as directed by the Engineer until finally approved by him, and, after such approval, shall be strictly adhered to by the Contractor. The approved progress schedule may be changed only with the written permission of the Engineer.

If the Contractor shall fail to adhere to the approved progress schedule or the schedule as revised, he shall promptly adopt such other or additional means and methods of construction as will make up for the time lost, and will assure completion in accordance with the contract time.

ARTICLE 4.03 APPROVAL REQUESTS
From time to time, as the work progresses and in the sequence indicated by the approved schedule, the Contractor must submit to the Engineer a specific request, in writing, for each item of information or approval required of him by the Contract. These requests must be submitted sufficiently in advance of the date upon which the information or approval is actually required by the Contractor to allow for the time the Engineer may take to act upon such submissions or resubmissions. The Contractor shall not have any right to an extension of time on account of delays due to his failure to submit his requests for the required information or the required approval in accordance with these requirements.

ARTICLE 4.04 COORDINATION WITH OTHER CONTRACTORS
During progress of the work, other Contractors may be engaged in performing other work on this project or on other projects on the site. In that event, the Contractor shall coordinate the work to be done hereunder with the work of such other Contractors in such manner as the Engineer may direct.

ARTICLE 4.05 EXTENSION OF TIME
If such an application is made, the Contractor shall be entitled to an extension of time for delay in completion of the work should the Contractor be obstructed or delayed in the commencement, prosecution or completion of any part of said work by any act or delay of the City, or by acts or omissions of other Contractors on this project, or by a riot, insurrection, war, pestilence, acts of public authorities, fire, lightning, hurricanes, earthquakes, tornadoes, floods, extremely abnormal and excessive inclement weather as indicated by the records of the local weather bureau for a five-year period preceding the date of the Contract, or by strikes, or other causes, which causes of delay mentioned in this Article, in the opinion of the City, are entirely beyond the expectation and control of the Contractor.

The Contractor shall, however, be entitled to an extension of time for such causes only for the number of days of delay which the City may determine to be due solely to such causes and only to the extent that such occurrences actually delay the completion of the project and then only if the Contractor shall have strictly complied with all of the requirements of Articles 4.01, 4.02, 4.03 and 4.04 hereof. It is hereby understood that the determination by the Engineer as to the order and sequence of the work shall not in itself constitute a basis for extension of time.

The determination made by the City on an application for an extension of time shall be binding and conclusive on the Contractor.

Delays caused by failure of the Contractor's materialmen, manufacturers, and dealers to furnish approved working drawings, materials, fixtures, equipment, appliances, or other fittings on time or failure of subcontractors to perform their work shall not constitute a basis of extension of time.

The Contractor agrees to make no claim for damages for delay in the performance of this Contract occasioned by any act or omission to act of the City or any of its representatives or because of any injunction which may be brought against the City or its representatives and agrees that any such claim shall be fully compensated for by an extension of time to complete performance of the work as provided herein.

ARTICLE 4.06 LIQUIDATED DAMAGES
It is mutually agreed between the parties that time is the essence of this Contract and that there will be on the part of the City considerable monetary damage in the event the Contractor should fail to complete the work within the time fixed for completion in the Contract or within the time to which such completion may have been extended.

The amount per day set forth in the Instructions to Bidders is hereby agreed upon as the liquidated damages for each and every calendar day that the time consumed in completing the work under this Contract exceeds the time allowed.

This amount shall, in no event, be considered as a penalty or otherwise than as the liquidated and adjusted damages to the City because of the delay and the Contractor and his Surety agree that the stated sum per day for each such day of delay shall be deducted and retained out of the monies which may become due hereunder and if not so deductible, the Contractor and his Surety shall be liable therefor.

ARTICLE 4.07 FINAL INSPECTION
When the work has been completed in accordance with the requirements of the Contract and final cleaning up performed, a date for final inspection of the work by the Engineer shall be set by the Contractor in a written request therefor, which date shall be not less than ten (10) days after the date of such request. The work will be deemed complete as of the date so set by the Contractor if, upon such inspection, the Engineer determines that no further work remains to be done at the site.

If such inspection reveals interms of work still to be performed, however, the Contractor shall promptly perform them and then request a reinspection. If, upon such inspection, the Engineer determines that the work is complete, the date of final completion shall be deemed to be the last day of such reinspection.

SECTION 5
SUBCONTRACTS AND ASSIGNMENTS

ARTICLE 5.01 LIMITATIONS AND CONSENT
The Contractor shall not assign, transfer, convey, sublet or otherwise dispose of this Contract or of his right, title, or interest therein, or his power to execute such Contract, or to assign any monies due or to become due thereunder to any other person, firm or corporation unless the previous written consent of the City shall first be obtained thereto and the giving of any such consent to a particular subcontract or assignment shall not dispense with the necessity of such consent to any further or other assignment.

Before making any subcontract, the Contractor must submit a

written statement to the Engineer, giving the name and address of the proposed contractor, the portion of the work and materials which he is to perform and furnish and any other information tending to prove that the proposed subcontractor has the necessary facilities, skill, integrity, past experience and financial resources to perform the work in accordance with the terms and conditions of this Contract.

If the City finds that the proposed subcontractor is qualified, the Contractor will be notified in writing. The City may revoke approval of any subcontractor when such subcontractor evidences an unwillingness or inability to perform his work in strict accordance with these Contract Documents. Notice of such revocation of approval will be given in writing to the Contractor.

The Contractor will promptly, upon request, file with the City a conformed copy of the subcontract. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of these Contract Documents, insofar as applicable to the work of subcontractors, and to give the Contractor the same power as regards terminating any subcontracts that the City may exercise over the Contractor under provisions of these Contract Documents.

The Contractor shall be required to perform with his own forces at least twenty-five (25) percent of the work, unless written consent to subcontract a greater percentage of the work is first obtained from the City.

ARTICLE 5.02 RESPONSIBILITY
The approval by the City of a subcontractor shall not relieve the Contractor of any of his responsibilities, duties, and liabilities hereunder. The Contractor shall be solely responsible to the City for the acts or defaults or omissions of his subcontractor and of such subcontractor's officers, agents, and employees, each of whom shall for all purposes be deemed to be the agent or employee of the Contractor. Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor and the City.

SECTION 6
SECURITY AND GUARANTY

ARTICLE 6.01 CONTRACT SECURITY
The Contractor shall execute and deliver to the City a Performance Bond on the form as provided herein, in an amount at least equal to one hundred (100) percent of the full Contract price, such Bond to be executed by a surety company acceptable to the City. The surety on such Performance Bond shall be a surety company duly authorized to do business in the State of Florida, and the Bond shall be issued or countersigned by a local resident producing agent of such surety company who is a resident of the State of Florida, regularly commissioned and licensed in said State, and satisfactory evidence of the authority of the person or persons executing such Bond shall be submitted with the Bond. The Performance Bond shall serve as security for the faithful performance of this Contract, including maintenance and guaranty provisions, and for the payment of all persons performing labor and furnishing materials in connection with the Contract. The premiums on the Performance Bond shall be paid by the Contractor.

If, at any time, the City shall become dissatisfied with any surety or sureties then upon the Performance Bond, or if for any other reason such bond shall cease to be adequate security for the City, the Contractor shall, within five days after notice so to do, substitute an acceptable Bond in such form and sum and signed by such other sureties as may be satisfactory to the City. The premiums on such Bond shall be paid by the Contractor. No further partial payments shall be deemed due or shall be made until the new sureties have qualified.

ARTICLE 6.02 CONTRACTORS INSURANCE
Insurance required shall be as indicated on Special Instructions pages beginning with "INS-1"

ARTICLE 6.03 AGAINST CLAIMS AND LIENS
The City may withhold from the Contractor as much as any approved payments to him as may, in the opinion of the City, be necessary to secure (a) just claims of any persons supplying labor or materials to the Contractor or any of his subcontractors for the work then due and unpaid; (b) loss due to defective work not remedied, or (c) liability, damage, or loss due to injury to persons or damages to the work or property of other contractors, subcontractors, or others, caused by the act or neglect of the Contractor or of any of his subcontractors. The City shall have the right, as agent for the Contractor, to apply any such amounts so withheld in such manner as the City may deem proper to satisfy such claims or to secure such protection. Such application of such money shall be deemed payments for the account of the Contractor.

ARTICLE 6.04 MAINTENANCE AND GUARANTY
The Contractor hereby guarantees all the work furnished under this Contract against any defects in workmanship and materials for a period of one year following the date of final acceptance of the work by the City. Under this guarantee, the Contractor hereby agrees to make good, without delay, at his own expense, any failure of any part of the work due to faulty materials or manufacture, construction, or installation, or the failure of any equipment to perform satisfactorily all the work put upon it within the limits of the Contract Documents, and further, shall make good any damage to any part of the work caused by such failure. It is hereby agreed that the Performance Bond shall fully cover all guarantees contained in this Article.
It is also agreed that all warranties, expressed or implied, inure to the benefit of the City and are enforceable by the City.

SECTION 7
CHANGES

ARTICLE 7.01 MINOR CHANGES
The City reserves the right to make such additions, deductions, or changes to this Contract from time to time as

it deems necessary and in a manner not materially affecting the substance thereof or materially changing the price to be paid in order to carry out and complete more fully and perfectly the work herein agreed to be done and performed. This Contract shall in no way be invalidated by any such additions, deductions, or changes, and no claim by the Contractor shall be made for any loss of anticipated profits thereby.

Construction conditions may require that minor changes be made in the location and installation of the work and equipment to be furnished and other work to be performed hereunder, and the Contractor when ordered by the Engineer, shall make such adjustments and changes in said locations and work as may be necessary, without additional cost to the City, provided such adjustments and changes do not alter the character, quantity of cost of the work as a whole, and provided further that Plans and Specifications showing such adjustments and changes are furnished to the Contractor by the City within a reasonable time before any work involving such adjustment and changes is begun. The Engineer shall be the sole judge of what constitutes a minor change for which no additional compensation shall be allowed.

ARTICLE 7.02 EXTRA WORK

The City may at any time by a written order and without notice to the sureties require the performance of such extra work as it may find necessary or desirable. An order for extra work shall be valid only if issued in writing and signed by the Mayor and the work so ordered must be performed by the Contractor.

The amount of compensation to be paid to the Contractor for any extra work as so ordered shall be determined as follows:

(a)By such applicable unit prices, if any, as are set forth in the Proposal; or

(b)If no such unit prices are set forth then by a lump sum or other unit prices mutually agreed upon by the City and the Contractor; or

(c)If no such unit prices are set forth in the Proposal and if the parties cannot agree upon a lump sum or other unit prices then by the actual net cost in money to the Contractor of the extra work performed, which cost shall be determined as follows:

(1) For all labor and foreman in direct charge of the authorized operations, the Contractor shall receive the current local rate of wages to be agreed upon, in writing, before starting such work for each hour that said labor and foremen are actually engaged thereon, to which shall be added an amount equal to 25 percent of the sum thereof which shall be considered and accepted as full compensation for general supervision, FICA taxes, contributions under the Florida Unemployment Compensation Act, insurance, bond, subcontractor's profit and overhead, the furnishing of small tools and miscellaneous equipment used, such as picks, shovels, hand pumps, and similar items.

(2) For all materials used, the Contractor shall receive the actual cost of such materials delivered at the site or previously approved delivery point as established by original receipted bills. No percentage shall be added to this cost.

(3) For special equipment and machinery such as power-driven pumps, concrete mixers, trucks, and tractors, or other equipment, required for the economical performance of the authorized work, the Contractor shall receive payment based on the average local area rental price for each item of equipment and the actual time of its use on the work. No percentage shall be added to this sum.

(4) Records of extra work done under this procedure shall be reviewed at the end of each day by the Contractor or his representative and the Engineer. Duplicate copies of accepted records shall be made and signed by both Contractor or his representative and the Engineer, and one copy retained by each.

Request for payment for approved and duly authorized extra work shall be submitted in the same form as Contract work or in the case of work performed under paragraph (c) (1) above upon a certified statement supported by receipted bills. Such statement shall be submitted for the current Contract payment for the month in which the work was done.

ARTICLE 7.03 DISPUTED WORK

If the Contractor is of the opinion that any work required, necessitated, or ordered violates the terms and provisions of this Contract, he must promptly notify the Engineer, in writing, of his contentions with respect thereto and request a final determination thereof. If the Engineer determines that the work in question is Contract work and not extra work or that the order complained of is proper, he will direct the Contractor to proceed and the Contractor shall promptly comply. In order, however, to reserve his right to claim compensation for such work or damages resulting from such compliance, the Contractor must, within five (5) days after receiving notice of the Engineer's determination and direction, notify the City in writing that the work is being performed or that the determination and direction is being complied with under protest. Failure of the Contractor to notify shall be deemed as a waiver of claim for extra compensation or damages therefor.

Before final acceptance by the City, all matters of dispute must be adjusted to the mutual satisfaction of the parties thereto. Final determinations and decisions, in case any questions shall arise, shall constitute a condition precedent to the right of the Contractor to receive the money therefor until the matter in question has been adjusted.

ARTICLE 7.04 OMITTED WORK

The City may at any time by a written order and without notice to the sureties require the omission of such Contract work as it may find necessary or desirable.

An order for omission of work shall be valid only if signed by the Mayor and the work so ordered must be omitted by the Contractor. The amount by which the Contract price shall be reduced shall be determined as follows:

(a) By such applicable unit prices, if any, as are set forth in the Contract; or

(b) By the appropriate lump sum price set forth in the Contract; or

(c) By the fair and reasonable estimated cost to the City

of such omitted work as determined by the Engineer and approved by the City.

SECTION 8
CONTRACTOR'S EMPLOYEES

ARTICLE 8.01 CHARACTER AND COMPETENCY
The Contractor and his subcontractors shall employ upon all parts of the work herein contracted for only competent, skillful, and trustworthy workers. Should the Engineer at any time give notice, in writing, to the Contractor or his duly authorized representative on the work that any employee in his opinion is incompetent, unfaithful, disorderly, careless, unobservant of instructions, or in any way a detriment to the satisfactory progress of the work, such employee shall immediately be dismissed and not again allowed upon the site.

ARTICLE 8.02 SUPERINTENDENCE
The Contractor shall give his personal supervision to the faithful prosecution of the work and in case of his absence shall have a competent, experienced, and reliable supervisor or superintendent, acceptable to the Engineer on the site who shall follow without delay all instructions of the Engineer in the prosecution and completion of the work and every part thereof, in full authority to supply workers, material, and equipment immediately. He shall keep on hand at all times copies of the Contract Documents.

ARTICLE 8.03 EMPLOYMENT OPPORTUNITIES
The Contractor shall, in the performance of the work required to be done under this Contract, employ all workers without discrimination regarding race, creed, color, sex or national origin and must not maintain or provide facilities that are segregated on the basis of race, color, creed or national origin.

ARTICLE 8.04 RATES OF WAGES
On federally assisted projects, the rates of wages to be paid under this Contract shall not be less than the rates of wages set forth in Section 12 of this Agreement.

On other projects, no wage rate determination is included. Florida's Prevailing Wage Law (Section 215.19, Florida Statutes) was repealed effective April 25, 1979.

ARTICLE 8.05 PAYROLL REPORTS
The Contractor and each subcontractor shall, if requested to do so, furnish to the Engineer a duly certified copy of his payroll and also any other information required by the Engineer to satisfy him that the provisions of the law as to the hours of employment and rate of wages are being observed.

Payrolls shall be prepared in accordance with instructions furnished by the City and on approved forms. The Contractor shall not carry on his payroll any persons not employed by him. Subcontractor's employees shall be carried only on the payrolls of the employing subcontractor.

SECTION 9
CONTRACTOR'S DEFAULT

ARTICLE 9.01 CITY'S RIGHT AND NOTICE
It is mutually agreed that: (a) if the Contractor fails to begin work when required to do so, or (b) if at any time during the progress of the work it shall appear to the Engineer that the Contractor is not prosecuting the work with reasonable speed, or is delaying the work unreasonably and unnecessarily, or (c) if the force of workmen or quality or quantity of material furnished are not sufficient to insure completion of the work within the specified time and in accordance with the Specifications hereto attached, or (d) if the Contractor shall fail to make prompt payments for materials or labor or to subcontractors for work performed under the Contract, or (e) if legal proceedings have been instituted by others than the City in such manner as to interfere with the progress of the work and may subject the City to peril of litigation or outside claims of (f) if the Contractor shall be adjudged a bankrupt or make an assignment for the benefit of creditors, or (g) if in any proceeding instituted by or against the Contractor an order shall be made or entered granting an extension of time of payment, composition, adjustment, modification, settlement or satisfaction of his debts or liabilities, or (h) if a receiver or trustee shall be appointed for the Contractor or the Contractor's property, or (i) if the Contract or any part thereof shall be sublet without the consent of the City being first obtained in writing, or (j) if this Contract or any right, monies, or claim thereunder shall be assigned by the Contractor, otherwise than as herein specified, or (k) if the Contractor shall fail in any manner of substance to observe the provisions of this Contract, or (l) if any of the work, machinery, or equipment shall be defective, and shall not be replaced as herein provided, or (m) if the work to be done under this Contract shall be abandoned, then such fact or conditions shall be certified by the Engineer and thereupon the City without prejudice to any other rights or remedies of the City, shall have the right to declare the Contractor in default and so notify the Contractor by a written notice, setting forth the ground or grounds upon which such default is declared and the Contractor must discontinue the work, either as a portion of the work or the whole thereof, as directed.

ARTICLE 9.02 CONTRACTOR'S DUTY UPON DEFAULT
Upon receipt of notice that his Contract is in default, the Contractor shall immediately discontinue all further operations on the work or such part thereof, and shall immediately quit the site or such part thereof, leaving untouched all plant, materials, equipment, tools, and supplies.

ARTICLE 9.03 COMPLETION OF DEFAULTED WORK
The City, after declaring the Contractor in default, may then have the work completed or the defective equipment or machinery replaced or anything else done to complete the work in strict accordance with the Contract Documents by such means and in such manner, by Contract with or without public letting, or otherwise, as it may deem advisable,

utilizing for such purpose without additional cost to the City such of the Contractor's plant, materials, equipment, tools, and supplies remaining on the site, and also such subcontractors as it may deem advisable.

The City shall reimburse all parties, including itself, for the expense of such completion, including liquidated damages, if any, and the cost of reletting. The City shall deduct this expense from monies due or to become due to the Contractor under this Contract, or any part thereof, and in case such expense is more than the sum remaining unpaid of the original contract price, the Contractor and his sureties shall pay the amount of such deficiency to the City.

ARTICLE 9.04 PARTIAL DEFAULT
In case the City shall declare the Contractor in default as to a part of the work only, the Contractor shall discontinue such part, shall continue performing the remainder of the work in strict conformity with the terms of the Contract, and shall in no way hinder or interfere with any other contractor or person whom the City may engage to complete the work as to which the Contractor was declared in default.

SECTION 10
PAYMENTS

ARTICLE 10.01 PRICES
For the Contractor's complete performance of the work, the City will pay and the Contractor agrees to accept, subject to the terms and conditions hereof, the lump sum prices or unit prices in the Contractor's Proposal and the award made therein, plus the amount required to be paid for any extra work ordered under Article 7.02 hereof, less credit for any work omitted pursuant to Article 7.04 hereof. Under unit price items, the number of units actually required to complete the work under the Contract may be more than stated in the Proposal. The Contractor agrees that no claim will be made for any damages or for loss of profits because of a difference between the quantities of the various classes of work assumed and stated in the Proposal Form as a basis for comparing Proposals and the quantities of work actually performed.

The sum as awarded for any lump sum Contract or lump sum Contract Item shall represent payment in full for all of the various classes of work, including materials, equipment, and labor necessary or required to complete, in conformity with the Contract Document, the entire work shown, indicated or specified under the lump sum Contract or lump sum Contract Item.

The amount as awarded as a unit price for any unit price Contact Item shall represent payment in full for all the materials, equipment, and labor necessary to complete, in conformity with the Contract Documents, each unit of work shown, specified, or required under the said unit price Contract Item.

No payment other than the amount as awarded will be made for any class of work included in a lump sum Contract Item or a unit price Contract Item, unless specific provision is made therefor in the Contract Documents.

ARTICLE 10.02 SUBMISSION OF BID BREAKDOWN
Within fifteen (15) days after the execution of this Contract, the Contractor must submit to the Engineer in duplicate an acceptable breakdown of the lump sums and unit prices bid for items of the Contract, showing the various operations to be performed under the Contract, as described in the progress schedule required under Article 4.02 hereof, and the value of each of such operations, the total of such items to equal the total price bid. The Contractor shall also submit such other information relating to the bid prices as may be required and shall revise the bid breakdown as directed. Thereafter, the breakdown may be used for checking the Contractor's applications for partial payments hereunder but shall not be binding upon the City or the Engineer for any purpose whatsoever.

ARTICLE 10.03 REPORTS, RECORDS AND DATA
The Contractor shall furnish to the Engineer such schedules of quantities and costs, progress schedules, reports, invoices, delivery tickets, estimates, records, and other data as the Engineer may request concerning work performed or to be performed and the materials furnished under the Contract.

ARTICLE 10.04 PAYMENTS BY CONTRACTOR
The Contractor shall pay (a) for all transportation and utility services not later than the 20th day of the calendar month following that in which such services are rendered, (b) for all materials, tools, and equipment delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of his subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors, to the extent of each subcontractor's interest therein; and proof of such payments or releases therefor shall be submitted to the Engineer upon request.

ARTICLE 10.05 PARTIAL PAYMENTS
On or about the first of each month, the Contractor shall make and certify an estimate, on forms prescribed by the City, of the amount and fair value of the work done, and may apply for partial payment therefor. The Contractor shall revise the estimate as the Engineer may direct. When satisfactory progress has been made, and shows that the value of the work completed since the last payment exceeds one percent (1%) of the total Contract price in amount, the Engineer will issue a certificate that such work has been completed and the value thereof. The City will then issue a voucher to the Contractor in accordance with the following schedule:

FOR CONTRACT AMOUNTS UNDER $250,000
(A)In the amount of ninety percent (90%) of the value of the work completed as certified until construction is one hundred percent (100%) complete (operational or beneficial occupancy), the withheld amount may be reduced below ten percent (10%), at the Engineer's option, to only that amount necessary to assure completion.

FOR CONTRACT AMOUNTS OVER $250,000

(A)In the amount of ninety percent (90%) of the value of the work completed as certified until construction is fifty percent (50%) complete.

(B)When the dollar value, as determined by the Engineer, of satisfactorily completed work in place is greater than fifty percent (50%) of the original contract price, vouchers for partial payment will be issued by the City to the Contractor in the amount of one hundred percent (100%) of the value of the work, above 50%, completed as certified for that payment period.

(C)If the Contractor has performed satisfactorily and the work is substantially complete (operational or beneficial occupancy) the withheld amount may be reduced, at the Engineer's option, to only that amount necessary to assure completion.

In addition to the Conditions set forth in (A), (B), and (C) above, payments will always be less any sums that may be retained or deducted by the City under the terms of any of the contract documents and less any sums that may be retained to cover monetary guarantees for equipment, materials or progress performance.

Payment on estimates made on or about the first of the month may be expected on or about the 20th of the month.

Unless specified otherwise in the Contract Items, the delivered cost of equipment and nonperishable materials suitably stored at the site of the work and tested for adequacy may be included in the Contractor's application for partial payment provided, however, that the Contractor shall furnish evidence satisfactory to the City that the Contractor is the unconditional owner and in possession of such materials or equipment. The amount to be paid will be 90 percent of the invoice cost to the Contractor which cost shall be supported by receipted bills within 30 days of the date of payment by the City to the Contractor. Such payment shall not relieve the Contractor from full responsibility for completion of the work and for protection of such materials and equipment until incorporated in the work in a permanent manner as required by the Contract Documents.

Before any payment will be made under this Contract, the Contractor and every subcontractor, if required, shall deliver to the Engineer a written, verified statement, in satisfactory form, showing in detail all amounts then due and unpaid by such Contractor or subcontractor to all laborers, workmen, and mechanics, employed by him under the Contract for the performance of the work at the site thereof, for daily or weekly wages, or to other persons for materials, equipment, or supplies delivered at the site of the work during the period covered by the payment under consideration.

ARTICLE 10.06 FINAL PAYMENT

Under determination of satisfactory completion of the work under this Contract as provided in Article 4.07 hereof, the Engineer will prepare the final estimate showing the value of the completed work. This estimate will be prepared within 30 days after the date of completion or as soon thereafter as the necessary measurements and computations can be made. All prior certificates and estimates, being approximate only, are subject to correction in the final estimate and payment.

When the final estimate has been prepared and certified by Engineer, he will submit to the Mayor and City Council the final certificate stating that the work has been completed and the amount based on the final estimate remaining due to the Contractor. The City will then accept the work as fully completed and will, not later than 30 days after the final acceptance, as defined in Article 1.02, of the work done under this Contract, pay the Contractor the entire amount so found due thereunder after deduction of all previous payments and all percentages and amounts to be kept and retained under provisions of this Contract; provided, however, and it is understood and agreed that, as a precedent to receiving final payment, the Contractor shall submit to the City a sworn affidavit that all bills for labor, service, materials, and subcontractors have been paid and that there are no suits pending in connection with this work. The City, at its option, may permit the Contractor to execute a separate surety bond in a form satisfactory to the City. The surety bond shall be in the full amount of the suit or suits.

Neither the final payment nor any part of the retained percentage shall be paid until the Contractor, if required, shall furnish the City with a complete release from any should remain unsatisfied after all payments are made, the Contractor shall refund to the City all monies which the City may be compelled to pay in discharging such claim, including incidental costs and attorney's fees.

ARTICLE 10.07 ACCEPTANCE OF FINAL PAYMENT

The acceptance by the Contractor, or by anyone claiming by or through him, of the final payment shall operate as and shall be a release to the City and every officer and agent thereof from any and all claims and liability to the Contractor for anything done or furnished in connection with the work or project and for any act or neglect of the Contractor or of any others relating to or affecting the work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this Contract or the Performance Bond.

SECTION 11
MISCELLANEOUS PROVISIONS

ARTICLE 11.01 CONTRACTOR'S WARRANTIES

In consideration of, and to induce the award of this contract to him, the Contractor represents and warrants:

(a)That he is not in arrears to the City upon debt or contract, and he is not a defaulter, as surety, contractor, or otherwise.

(b)That he is financially solvent and sufficiently experienced and competent to perform the work.

(c)That the work can be performed as called for by the Contract Documents.

(d)That the facts stated in his proposal and the information given by him are true and correct in all respects.

(e)That he is fully informed regarding all the conditions affecting the work to be done and labor and materials to be

furnished for the completion of this Contract, and that his information was secured by personal investigation and research.

ARTICLE 11.02 PATENTED DEVICES, MATERIAL AND PROCESSES

It is mutually understood and agreed that Contract prices include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the work. Whenever the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall indemnify and save harmless the City, its officers, agents and employees from any and all claims for infringement by reason of the use of any such patented design, device, tool, material, equipment, or process, to be performed under the Contract, and shall indemnify the said City, its officers, agents, and employees for any costs, expenses, and damages which may be incurred by reason of such infringement at any time during the prosecution or after completion of the work.

ARTICLE 11.03 SUITS AT LAW

In case any action at law or suit in equity may or shall be brought against the City or any of its officers, agents, or employees for or on account of the failure, omission, or neglect of the Contractor or his subcontractors, employees, or agents, to do or perform any of the covenants, acts, matters, or things by this Contract undertaken to be done or performed by the Contractor of his subcontractors, employees, or agents, or from any injuries done to property or persons and caused by the negligence or alleged negligence of the Contractor of his subcontractors, employees, or agents, or in any other manner arising out of the performance of this Contract, then the Contractor shall immediately assume and take charge of the defense of such actions or suits in like manner and to all intents and purposes as if said actions or suits have been brought directly against the Contractor, and the Contractor shall also indemnity and save harmless the City, its officers, agents, and employees from any and all loss, cost or damage whatever arising out of such actions or suits, in like manner and to all intents and purposes as if said actions or suits have been brought directly against the Contractor.

The Contractor shall and does hereby assume all liability for and agrees to indemnify the City or its Engineer against any or all loss, costs, damages, and liability for any or by reason of any lien, claims or demands, either for materials purchased or for work performed by laborers, mechanics, and others and from any damages, costs, actions, or causes of action and judgement arising from injuries sustained by mechanics, laborers, or other persons by reason of accidents or otherwise, whether caused by the carelessness or inefficiency or neglect of said Contractor, his subcontractors, agents, employees, workmen or otherwise.

ARTICLE 11.04 CLAIMS FOR DAMAGES

If the Contractor shall claim compensation for any damage sustained, other than for extra or disputed work covered by Article 7.02 and 7.03 hereof, by reason of any act or omission of the City, its agents, or any persons, he shall, within five days after sustaining such damage, make and deliver to the Engineer a written statement of the nature of the damage sustained and of the basis of the claim against the City. On or before the 15th of the month succeeding that in which any damage shall have been sustained, the Contractor shall make and deliver to the Engineer an itemized statement of the details and amounts of such damage, duly verified by the Contractor. Unless such statements shall be made delivered within the times aforesaid, it is stipulated that and all claims for such compensation shall be forfeited and invalidated, and the Contractor shall not be entitled to payment on account of such claims.

ARTICLE 11.05 NO CLAIMS AGAINST INDIVIDUALS

No claim whatsoever shall be made by the Contractor against any officer, agent, employee of the City for, or on account of, anything done or omitted to be done in connection with this Contract.

ARTICLE 11.06 LIABILITY UNAFFECTED

Nothing herein contained shall in any manner create any liability against the City on behalf of any claim for labor, services, or materials, or of subcontractors, and nothing herein contained shall affect the liability of the Contractor or his sureties to the City or to any workmen or materialsmen upon bond given in connection with this Contract.

ARTICLE 11.07 INDEMNIFICATION PROVISIONS

Whenever there appears in this Agreement, or in the other Contact Documents made a part hereof, an indemnification provision within the purview of Chapter 725.06, Laws of Florida, the monetary limitation on the extent of the indemnification under each such provision shall be One Million Dollars or a sum equal to the total Contract price, whichever shall be the greater.

ARTICLE 11.08 UNLAWFUL PROVISIONS DEEMED STRICKEN

If this contract contains any unlawful provisions not an essential part of the Contract and which shall not appear to have a controlling or material inducement to the making thereof, such provisions shall be deemed of no effect and shall, upon notice by either party, be deemed stricken from the Contract without affecting the binding force of the remainder.

ARTICLE 11.09 LEGAL PROVISIONS DEEMED INCLUDED

Each and every provision of any law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein and if, through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon application of either party the Contract shall forthwith be physically amended to make such insertion.

ARTICLE 11.10 DEATH OR INCOMPETENCY OF CONTRACTOR

In the event of death or legal incompetency of a Contractor who shall be an individual or surviving member of a contracting firm, such death or adjudication of incompetency

shall not terminate the Contract, but shall act as default hereunder to the effect provided in Article 9.01 hereof and the estate of the Contractor and his surety shall remain liable hereunder to the same extent as though the Contractor had lived. Notice of default, as provided in Article 9.01 hereof, shall not be required to be given in the event of such death or adjudication of incompetency.

ARTICLE 11.11 NUMBER AND GENDER OF WORDS

Whenever the context so admits or requires, all references herein in one number shall be deemed extended to and including the other number, whether singular or plural, and the use of any gender shall be applicable to all genders.

ARTICLE 11.12 ACCESS TO RECORDS

Representatives of Federal Agencies, if applicable, and the State of Florida shall have access to the work whenever it is in preparation of progress. On federally assisted projects the Federal Agency, the Comptroller General of the United States, or any authorized representative shall have access to any books, documents, papers, and records of the Contractor which are pertinent to the project for the purpose of making audit, examination, excerpts, and transcription thereof.

SECTION 12
LABOR STANDARDS

ARTICLE 12.01 LABOR STANDARDS

The Contractor shall comply with all of the regulations set forth in "Labor Standards Provisions for Federally Assisted Construction Contracts", which may be attached, and any applicable Florida Statutes.

ARTICLE 12.02 NOTICE TO LABOR UNIONS

If required, the Contractor shall provide Labor Unions and other organizations of workers, and shall post, in a conspicuous place available to employees or applicants for employment, a completed copy of the form entitled "Notice to Labor Unions or Other Organizations of Workers" attached to and made a part of this Agreement.

ARTICLE 12.03 SAFETY AND HEALTH REGULATIONS

The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91- 596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54). Nothing in these Acts shall be construed to supersede or in any manner affect any worker's compensation law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, diseases, or death of employees arising out of, or in the course of, employment.

ARTICLE 12.04 EEO AFFIRMATIVE ACTION REQUIREMENTS

The Contractor understands and agrees to be bound by the equal opportunity requirements of Federal regulations which shall be applicable throughout the performance of work under this Contract. The Contractor also agrees to similarly bind contractually each subcontractor. In policies, the Contractor agrees to engage in Affirmative Action directed at promoting and ensuring equal employment opportunity in the work force used under the Contract (and the Contractor agrees to require contractually the same effort of all subcontractors whose subcontractors exceed $100,000). The Contractor understands and agrees that "Affirmative Action" as used herein shall constitute a good faith effort to achieve and maintain minority employment in each trade in the on-site work force used on the Contract.

ARTICLE 12.05 PREVAILING RATES OF WAGES

Florida's prevailing wage law was repealed effective April 25, 1979.

For Federally assisted projects, appropriate prevailing wage rate determinations are indicated on pages beginning with WR-1.

* * * * * * *

IN WITNESS THEREOF, the parties have hereunto set their hands and seals, and such of them as are corporation have caused these present to be signed by their duly authorized officers.

CITY OF TAMPA, FLORIDA

_____
Bob Buckhorn, Mayor
(SEAL)

ATTEST:

_____
City Clerk

Approved as to Form:

The execution of this document was authorized by Resolution No. _____

_____
Justin R. Vaske, Assistant City Attorney

Contractor

By:_____
(SEAL)

Title:

ATTEST:

_____
Secretary

STATE OF)
) SS:
COUNTY OF)

For a Corporation:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2013 by _____ of _____, a _____ corporation, on behalf of the corporation. He/she is ___ personally known or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

For an Individual:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2013 by _____ who is ___ personally known to me or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

For a Firm:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2013 by _____ who signed on behalf of the said firm. He/she is ___ personally known or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

_____

PUBLIC CONSTRUCTION BOND

Bond No. (enter bond number)_____

Name of Contractor:_____

Principal Business Address of Contractor:_____

_____

Telephone Number of Contractor:_____

Name of Surety (if more than one list each):_____

_____

Principal Business Address of Surety:_____

_____

Telephone Number of Surety:_____

Owner is The City of Tampa, Florida

Principal Business Address of Owner: 306 E Jackson St, Tampa, FL 33602

Contract Administration Department (280A4N)

Telephone Number of Owner: 813/274-8456

Contract Number Assigned by City to contract which is the subject of this bond:_____

Legal Description or Address of Property Improved or Contract Number is:_____

_____

_____

_____

General Description of Work and Services:_____

_____

_____

_____

KNOW ALL MEN BY THESE PRESENTS That we, _____

_____
(Name of Contractor)

as Principal, hereinafter called CONTRACTOR, of the State of _____, and

_____(Name of Surety)
a corporation organized and existing under and by virtue of the laws of the State of _____, and regularly authorized to do business in the State of Florida, as SURETY, are held and firmly bound unto the City of Tampa, a municipal corporation organized and existing under the laws of the State of Florida, hereinafter called Owner, in the penal sum of _____Dollars and _____Cents ($_____), lawful money of the United States of America, for the payment whereof well and truly to be made, we bind ourselves, our heirs, executors, and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the contract dated _____, _____, 20___, between Principal and Owner for construction of _____, the contract being made a part of this bond by reference, in the time and in the manner prescribed in the contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1) (Section 713.01), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in the contract; and

3. Pays Owner all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that Owner sustains because of a default by Principal under the contract; and

4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this bond is void; otherwise it remains in full force.

5. Contractor and Surety acknowledge that the Work for which this bond has been issued may be one of several such contract documents for a group of projects. This bond does not secure covenants to pay for or to perform design services survey or program management services. The Owner/Obligee is expected to reasonably account for damages that are caused to Owner with respect to Principal's (Contractor's) default in performance of the scope of the Work incorporated by reference into the bond, and notwithstanding any contractual or common law remedy permitted to Owner as against Contractor, the obligation of Surety for any damages under this bond shall be determined by the cost of completion of the Work less the contract balance unpaid upon default of Contractor for the Work plus liquidated damages at the rate of $500.00 per day for delays by the Contractor and/or Surety in reaching substantial completion.

6. The notice requirements for claimants and conditions for entitlement to payment set forth in Section 255.05, Fla. Stat. and the limitations period to actions upon Section 255.05, Fla. Stat. bonds apply to claimants seeking payment from surety under this bond. Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05, Florida Statutes.

7. The Surety, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the contract documents or other Work to be performed hereunder, or the specifications referred to therein shall in any way affect its obligations under this bond, and it does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to Work or to the specifications.

8. The above SURETY states that it has read all of the Contract Documents made by the CONTRACTOR with the CITY, hereto attached, and the terms and conditions of the contract and work, and is familiar therewith and in particular those portions of the Agreement concerning the guaranty of such CONTRACTOR for a period of one year following the date of the final acceptance of the completed work under the Contract by the CITY, all of which this BOND includes.

DATED ON _____, 20___

_____
(Name of Principal)

_____
(Principal Business Address)

By _____

Title _____

_____
Telephone Number of Principal

Countersignature:

_____
(Name of Local Agency)

_____
(Address of Resident Agent)

By _____

Title _____

_____
Telephone Number of Local Agency

_____
(Name of Surety)

_____
(Surety Address)

By _____
(As Attorney in Fact)*

_____
Telephone Number of Surety

Accepted by City of Tampa:

By _____
Bob Buckhorn, Mayor

Date: _____ 20____

Approved as to legal sufficiency:

By _____
Assistant City Attorney

Date: _____, 20____

*(As Attorney in Fact) attach Power of Attorney and Current Certificate with Original Signature

SPECIFICATIONS
GENERAL PROVISIONS

SECTION 1
SCOPE AND INTENT

G-1.01 DESCRIPTION
The work to be done consists of the furnishing of all labor, materials and equipment, and the performance of all work included in this Contract.

G-1.02 WORK INCLUDED
The Contractor shall furnish all labor, superintendence, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and other means of construction necessary or proper for performing and completing the work. He shall obtain and pay for all required permits. He shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Engineer, and in strict accordance with the Contract Documents. The Contractor shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.

The cost of incidental work described in these General Provisions, for which there are no specific Contract Items, shall be considered as part of the overhead cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefor.

The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his plant and equipment, prior approval of the Engineer notwithstanding.

G-1.03 PUBLIC UTILITY INSTALLATIONS AND STRUCTURES
Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the City, other governmental bodies or privately owned by individuals, firms, or corporations, and used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water or other public or private property which may be affected by the work.

The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.

The Contractor shall protect all public utility installations and structures from damage during the work. Access across any buried public utility installation or structure shall be made only in such locations and by means approved by the Engineer. The Contractor shall so arrange his operations as to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor which are shown on the Plans or have been located in the field by the utility shall be repaired by the Contractor, at his expense, as directed by the Engineer. No separate payment shall be made for such protection or repairs to public utility installations or structures.

Public utility installations or structures owned or controlled by the City or other governmental body which are shown on the Plans to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as a part of the general cost of doing the work and shall be included in the prices bid for the various Contract Items. No separate payment shall be made therefor.

Where public utility installations or structures owned or controlled by the City or other governmental body are encountered during the course of the work, and are not indicated on the Plans or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement or rebuilding is necessary to complete the work under this Contract, such work shall be accomplished by the utility having jurisdiction or such work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided for in Article 7.02 of the Agreement.

The Contractor shall, at all times in performance of the work, employ approved methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of public utility installations and structures; and shall, at all times in the performance of the work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end.

All City and other governmental utility departments and other owners of public utilities, which may be affected by the work, will be informed in writing by the Engineer within two weeks after the execution of the Contract or Contracts covering the work. Such notice will set out, in general, and direct attention to, the responsibilities of the City and other governmental

utility departments and other owners of public utilities for such installations and structures as may be affected by the work and will be accompanied by one set of Plans and Specifications covering the work under such Contract or Contracts.

In addition to the general notice given by the Engineer, the Contractor shall give written notice to all City and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight (48) hours in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the "Underground Utility Notification Center for Excavators (Call Candy)".

The maintenance, repair, removal, relocation, or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the Engineer.

SECTION 2
PLANS AND SPECIFICATIONS

G-2.01 PLANS
The Plans referred to in the Contract Documents bear the general project name and number as shown in the Notice To Bidders.

When obtaining data and information from the Plans, figures shall be used in preference to scaled dimensions, and large scale drawings in preference to small scale drawings.

G-2.02 COPIES FURNISHED TO CONTRACTOR
After the Contract has been executed, the Contractor will be furnished with five sets of paper prints, the same size as the original drawings, of each sheet of the Plans and five copies of the Specifications. Additional copies of the Plans and Specifications, when requested, may be furnished to the Contractor at cost of reproduction.

The Contractor shall furnish each of the subcontractors, manufacturers, and material suppliers such copies of the Contract Documents as may be required for his work.

G-2.03 SUPPLEMENTARY DRAWINGS
When, in the opinion of the Engineer, it becomes necessary to explain more fully the work to be done or to illustrate the work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer and five paper prints thereof will be given to the Contractor.

The Supplementary Drawings shall be binding upon the Contractor with the same force as the Plans. Where such Supplementary Drawings require either less or more than the estimated quantities of work, credit to the City or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

G-2.04 CONTRACTOR TO CHECK PLANS AND DATA
The Contractor shall verify all dimensions, quantities, and details shown on the Plans, Supplementary Drawings, Schedules, Specifications, or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions as full instructions will be furnished by the Engineer, should such errors or omissions be discovered. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

G-2.05 SPECIFICATIONS
The specifications consist of four parts, the General Provisions, the Technical Specifications, the Special Provisions and the Contract Items. The General Provisions and Technical Specifications contain general requirements which govern the work. The Special Provisions and the Contract Items modify and supplement these by detailed requirements for the work and shall always govern, whenever there appears to be conflict.

G-2.06 INTENT
All work called for in the Specifications applicable to this Contract, but not shown on the Plans in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Plans or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

SECTION 3
WORKING DRAWINGS

G-3.01 SCOPE
The Contractor shall promptly prepare and submit layout, detail and shop drawings to insure proper construction, assembly, and installation of the work using those materials and methods as hereafter specified under the Technical Specifications, Special Provisions and Contract Items.

These drawings shall accurately and distinctly present the following:

a. All working and erection dimensions.
b. Arrangements and sectional views.
c. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
d. Kinds of materials and finishes.
e. Parts listed and description thereof.

Drawings for mechanical equipment shall present, where applicable, such data as dimensions, weight and performance characteristics. These data shall show conformance with the performance characteristics and other criteria incorporated in the Plans and Specifications.

Each drawing shall be dated and shall contain the name of the project, Division number and description, the technical specifications section number, names of equipment or materials and the location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material. The Engineer will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.

The Contractor shall review all working drawing submittals before transmitting them to the Engineer to determine that they comply with requirements of the Specifications. Drawings which are incomplete or are not in compliance with the Contract Documents shall not be submitted for processing by the Engineer. The Contractor shall place his stamp of approval on all working drawings submitted to the Engineer to indicate compliance with the above.

G-3.02 APPROVAL
If the working drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of submittal; otherwise approval of such submittals shall not constitute approval of the departure. Approval of the drawings shall constitute approval of the subject matter thereof only and not of any structure, material, equipment, or apparatus shown or indicated.

The approval of drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such drawings, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract and not indicated on the drawings. No work called for by working drawings shall be done until such drawings have been approved by the Engineer.

The procedure in seeking approval of the working drawings shall be as follows:

1.The Contractor shall submit four complete sets of drawings and other descriptive data together with one copy of a letter of transmittal to the Engineer for approval. The letter of transmittal shall contain the name of the project, contract number, technical specifications section number, the name of the Contractor, a list of drawings with numbers and titles, and any other pertinent information.

2.Drawings or descriptive data will be stamped "Approved", "Approved Subject to Corrections Marked", or "Examined and Returned for Correction" and one copy with a letter of transmittal will be returned to the Contractor.

3.If a drawing or other data is stamped "Approved", the Contractor shall insert the date of approval on five additional copies of the document and transmit the five copies to the Engineer together with one copy of a letter of transmittal containing substantially the same information as described in Instruction 1. above.

4.If a drawing or other data is stamped "Approved Subject to Corrections Marked", the Contractor shall make the corrections indicated and proceed as in Instruction 3., above.

5.If a drawing or data is stamped "Examined and Returned for Correction", the Contractor shall make the necessary corrections and resubmit the documents as set forth in Instruction 1., above. The letter of transmittal shall indicate that this is a resubmittal.

The Contractor shall revise and resubmit the working drawings as required by the Engineer, until approval thereof is obtained.

SECTION 4
MATERIALS AND EQUIPMENT

G-4.01 GENERAL REQUIREMENTS
All materials, appliances, and types or methods of construction shall be in accordance with the Specifications and shall, in no event, be less than that necessary to conform to the requirements of any applicable laws, ordinances, and codes.

All materials and equipment shall be new, unused, and correctly designed. They shall be of standard first grade quality, produced by expert personnel, and intended for the use for which they are offered. Materials or equipment which, in the opinion of the Engineer, are inferior or of a lower grade than indicated, specified, or required will not be accepted.

The quality of Workmanship and Materials entering into the work under this Contract shall conform to the requirements of the pertinent sections, clauses, paragraphs, and sentences, both directly and indirectly applicable thereto, of that part of the Technical Specifications, whether or not direct reference to such occurs in the Contract Items.

Equipment and appurtenances shall be designed in conformity with ANSI, ASME, IEEE, NEMA and other

generally accepted standards and shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions of operation. All bearings and moving parts shall be adequately protected against wear by bushings or other approved means and shall be fully lubricated by readily accessible devices. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers, and the like, shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be mitered.

Equipment shall be of the approximate dimensions as indicated on the Plans or as specified, shall fit the spaces shown on the Plans with adequate clearances, and shall be capable of being handled through openings provided in the structure for this purpose. The equipment shall be of such design that piping and electrical connections, ductwork, and auxiliary equipment can be assembled and installed without causing major revisions to the location or arrangement of any of the facilities.

Machinery parts shall conform exactly to the dimensions shown on the working drawings. There shall be no more fitting or adjusting in setting up a machine than is necessary in assembling high grade apparatus of standard design. The equivalent parts of identical machines shall be made interchangeable. All grease lubricating fittings on equipment shall be of a uniform type. All machinery and equipment shall be safeguarded in accordance with the safety codes of the ANSI and applicable state and local codes.

G-4.02 MANUFACTURER

The names of proposed manufacturers, suppliers, material, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Engineer for approval, as early as possible, to afford proper investigation and checking. Such approval must be obtained before shop drawings will be checked. No manufacturer will be approved for any materials to be furnished under this Contract unless he shall be of good reputation and have a plant of ample capacity. He shall, upon the request of the Engineer, be required to submit evidence that he has manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the Engineer, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.

Any two or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.

G-4.03 REFERENCE TO STANDARDS

Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the date of advertisement for proposals, even though reference has been made to an earlier standard, and such standards are made a part hereof to the extent which is indicated or intended.

Reference to a technical society, organization or body may be made in the Specifications by abbreviations, in accordance with the following list:

AASHTO for American Association of State Highway and Transportation Officials (formerly AASHO)
ACI for American Concrete Institute
AGMA for American Gear Manufacturer's Association
AFBMA for Anti-Friction Bearing Manufacturer's Association
AISC for American Institute of Steel Construction
AISI for American Iron and Steel Institute
ANSI for American National Standards Institute
ASCE for American Society of Civil Engineers
ASTM for American Society for Testing and Materials
ASME for American Society of Mechanical Engineers
AWS for American Welding Society
AWWA for American Water Works Association
AWPA for American Wood Preservers Association
CEMA for Conveyor Equipment Manufacturers Association
CIPRA for Cast Iron Pipe Research Association
IEEE for Institute of Electrical and Electronic Engineers
IPCEA for Insulated Power Cable Engineers Association
NEC for National Electrical Code
NEMA for National Electrical Manufacturers Association
SAE for Society of Automotive Engineers
SHBI for Steel Heating Boiler Institute
Fed.Spec. for Federal Specifications
Navy Spec. for Navy Department Specifications
U.L.,Inc. for Underwriters' Laboratories, Inc.

When no reference is made to a code, standard or specification, the Standard Specifications of the ANSI, the ASME, the ASTM, the IEEE, or the NEMA shall govern.

G-4.04 SAMPLES

The Contractor shall, when required, submit to the Engineer for approval typical samples of materials and equipment. The samples shall be properly identified by tags and shall be submitted sufficiently in advance of the time when they are to be incorporated into the work, so that rejections thereof will not cause delay. A letter of transmittal, in duplicate, from the Contractor requesting approval must accompany all such samples.

G-4.05 EQUIVALENT QUALITY

Whenever, in the Contract Documents, an article, material, apparatus, equipment, or process is called for by trade name or by the name of a patentee, manufacturer, or dealer or by reference to catalogs of a manufacturer or dealer, it shall be understood as intending to mean and specify the article, material, apparatus, equipment or process designated, or any

equal thereto in quality, finish, design, efficiency, and durability and equally serviceable for the purposes for which it is intended.

Whenever material or equipment is submitted for approval as being equal to that specified, the decision as to whether or not such material or equipment is equal to that specified shall be made by the Engineer.

Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Contract, the Contractor shall immediately proceed to furnish the designated material or equipment.

Neither the approval by the Engineer of alternate material or equipment as being equivalent to that specified nor the furnishing of the material or equipment specified, shall in any way relieve the Contractor of responsibility for failure of the material or equipment, due to faulty design, material, or workmanship, to perform the functions required of them by the Specifications.

G-4.06 DELIVERY
The Contractor shall deliver materials in ample quantities to insure the most speedy and uninterrupted progress of the work so as to complete thw work within the allotted time. The Contractor shall also coordinate deliveries in order to avoid a delay in, or impediment of, the progress of the work of any related Contractor.

G-4.07 CARE AND PROTECTION
The Contractor shall be solely responsible for properly storing and protecting all materials, equipment, and work furnished under the Contract from the time such materials and equipment are delivered at the site of the work until final acceptance thereof. He shall, at all times, take necessary precautions to prevent injury or damage by water, freezing, or by inclemencies of the weather to such materials, equipment and work. All injury or damage to materials, equipment, or work resulting from any cause whatsoever shall be made good by the Contractor.

The Engineer shall, in all cases, determine the portion of the site to be used by the Contractor for storage, plant or for other purposes. If, however, it becomes necessary to remove and restack materials to avoid impeding the progress of any part of the work or interference with the work to be done by any other Contractor, the Contractor shall remove and restack such materials at his own expense.

G-4.08 TOOLS AND ACCESSORIES
The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind or size of equipment, one complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

Spare parts shall be furnished as specified.

Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight and principal rating data.

G-4.09 INSTALLATION OF EQUIPMENT
The Contractor shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character.

Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise by the Engineer during installation. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.

The Contractor shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the Engineer and made of ample size and strength for the purpose intended. Substantial templates and working drawings for installation shall be furnished.

The Contractor shall, at his own expense, furnish all materials and labor for, and shall properly bed in non-shrink grout, each piece of equipment on its supporting base that rests on masonry foundations. Grout shall completely fill the space between the equipment base and the foundation.

G-4.10 OPERATING INSTRUCTIONS
The Contractor, through qualified individuals, shall adequately instruct designated employees of the City in the operation and care of all equipment installed hereunder, except for equipment that may be furnished by the City.

The Contractor shall also furnish and deliver to the Engineer three complete sets for permanent files, identified in accordance with Subsection G-3.01 hereof, of instructions, technical bulletins and any other printed matter, such as diagrams, prints or drawings, containing full information required for the proper operation, maintenance, and repair, of the equipment installed and the ordering of spare parts, except for equipment that may be furnished by the City.

In addition to the above three copies, the Contractor shall furnish any additional copies that may be required for use during construction and start-up operations.

G-4.11 SERVICE OF MANUFACTURER'S ENGINEER
The Contract prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test and place in operation the equipment in conformity with the Contract Documents. After the equipment is placed in

permanent operation by the City, such engineer or superintendent shall make all adjustments and tests required by the Engineer to provide that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the City in the proper operation and maintenance of such equipment.

SECTION 5
INSPECTION AND TESTING

G-5.01 GENERAL
The Contractor's attention is hereby directed to Article 3.03 of the Agreement.

Inspection and testing of materials will be performed by the City unless otherwise specified.

For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Five copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.

If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract, the Contractor will be notified thereof and he will be directed to refrain from delivering said material and equipment, or to remove it promptly from the site or from the work and replace it with acceptable material, without cost to the City.

Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the City formally takes over the operation thereof.

G-5.02 COSTS
All inspection and testing of materials furnished under this Contract will be performed by the City or duly authorized inspection engineers or inspection bureaus without cost to the Contractor, unless otherwise expressly specified.

The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor and such costs shall be deemed to be included in the contract price.

Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the City for compliance. The Contractor shall reimburse the City for the expenditures incurred in making such tests on materials and equipment which are rejected for noncompliance.

G-5.03 INSPECTIONS OF MATERIALS
The Contractor shall give notice, in writing to the Engineer, sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice the Engineer will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials or he will notify the Contractor that inspection will be made at a point other than the point of manufacture, or he will notify the Contractor that inspection will be waived. The Contractor must comply with these provisions before shipping any material. Such inspection shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

G-5.04 CERTIFICATE OF MANUFACTURE
When inspection is waived or when the Engineer so requires, the Contractor shall furnish to him authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

G-5.05 SHOP TESTS OF OPERATING EQUIPMENT
Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No such equipment shall be shipped to the work until the Engineer notifies the Contractor, in writing, that the results of such tests are acceptable.

Five copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company, shall be forwarded to the Engineer for approval.

The cost of the shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

G-5.06 PRELIMINARY FIELD TESTS
As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make preliminary field tests of equipment. If the preliminary field tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the Contractor shall, prior to the acceptance tests, make all changes, adjustments, and replacements required.

G-5.07 FINAL FIELD TESTS
Upon completion of the work and prior to final payment, all equipment and appliances installed under this Contract shall be subjected to acceptance tests as specified or required to prove compliance with the Contract Documents.

The Contractor shall furnish labor, fuel, energy, water and all other materials, equipment, and instruments necessary for all acceptance tests, at no additional cost to the City.

G-5.08 FAILURE OF TESTS
Any defects in the materials and equipment or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to make those corrections or if the improved materials and equipment, when tested, shall again fail to meet the guarantees or specified requirements, the City, notwithstanding its partial payment for work, and materials and equipment, may reject the materials and equipment and may order the Contractor to remove them from the site at his own expense.

In case the City rejects any materials and equipment, then the Contractor shall replace the rejected materials and equipment within a reasonable time. If he fails to do so, the City may, after the expiration of a period of thirty calendar days after giving him notice in writing, proceed to replace such rejected materials and equipment, and the cost thereof shall be deducted from any compensation due or which may become due the Contractor under this Contract.

The City agrees to obtain other equipment within a reasonable time and the Contractor agrees that the City may use the equipment furnished by him without rental or other charges until the new equipment is obtained.

Materials or work in place that fails to pass acceptability tests shall be retested at the direction of the construction engineer all such retests shall be at the Contractor's expense. The rates charged shall be in accordance with the Department of Public Works current annual inspection contract which is available for inspection at the offices of the Department of Public Works.

G-5.09 FINAL INSPECTION
The procedures for final inspection shall be in accordance with the provisions of Article 4.07 of the Agreement. During such final inspections, the work shall be clean and free from water. In no case will the final estimate be prepared until the Contractor has complied with all the requirements set forth and the Engineer has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily cosntructed in accordance with the requirements of the Contract Documents.

SECTION 6

TEMPORARY STRUCTURES

G-6.01 GENERAL
All false work, scaffolding, ladders, hoistways, braces, pumping plants, shields, trestles, roadways, sheeting, centering forms, barricades, drains, flumes, and the like, any of which may be needed in the construction of any part of the work and which are not herein described or specified in detail, must be furnished, maintained and removed by the Contractor, and he shall be responsible for the safety and efficiency of such works and for any damages that may result from their failure or from their improper construction, maintenance, or operation.

G-6.02 PUBLIC ACCESS
At all points in the work where public access to any building, house, place of business, public road, or sidewalk would be obstructed by any action of the Contractor in executing the work required by this Contract, the Contractor shall provide such temporary structure, bridges or roadway as may be necessary to maintain public access at all times. At least one lane for vehicular traffic shall be maintained in streets in which the Contractor is working. Street closure permits are required from the Department of Public Works.

The Contractor shall provide suitable temporary bridges, as directed by the Engineer, at street intersections when necessary for the maintenance of vehicular and pedestrian traffic.

Prior to temporarily cutting of access to driveways and garages, the Contractor shall give twelve (12) hours notice to affected property owners. Interruptions to use of private driveways shall be kept to a minimum.

G-6.03 CONTRACTOR'S FIELD OFFICE
The Contractor shall erect, furnish and maintain a field office with a telephone at the site during the entire period of construction. He or an authorized agent shall be present at this office at all times while his work is in progress. Readily accessible copies of both the Contract Documents and the latest approved working drawings shall be kept at this field office.

G-6.04 TEMPORARY FENCE
If, during the course of the work, it is necessary to remove or disturb any fence or part thereof, the Contractor shall, at his own expense, if so ordered by the Engineer, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced. The Engineer shall be solely responsible for the determination of the necessity for providing a temporary fence and the type of temporary fence to be used.

G-6.05 RESPONSIBILITY FOR TEMPORARY STRUCTURES
In accepting the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance, or operation and will indemnify and save harmless the City from

all claims, suits or actions and damages or costs of every description arising by reason of failure to comply with the above provisions.

SECTION 7
TEMPORARY SERVICES

G-7.01 WATER
The Contractor shall provide the necessary water supply at his own expense. He shall, if necessary, provide and lay necessary waterlines from existing mains to the place of using, shall secure all necessary permits and pay for all taps to water mains or hydrants and for all water used at the established rates.

G-7.02 LIGHT AND POWER
The Contractor shall provide, at his own expense, temporary lighting and power facilities required for the proper prosecution and inspection of the work. If, in the opinion of the Engineer, these facilities are inadequate, the Contractor will not be permitted to proceed with any portion of the work affected thereby.

G-7.03 SANITARY REGULATIONS
The Contractor shall prohibit and prevent the committing of nuisances on the site of the work or on adjoining property and shall discharge any employee who violates this rule.

Ample washrooms and toilet facilities and a drinking water supply shall be furnished and maintained in strict conformity with the law by the Contractor for use by his employees.

G-7.04 ACCIDENT PREVENTION
Precautions shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed. The Contractor shall comply with the U. S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596), and under Section 107 of the Contract Work. Hours and Safety Standards Act (PL 91-54), except where state and local safety standards exceed the federal requirements and except where state safety standards have been approved by the Secretary of Labor in accordance with provisions of the Occupational Safety and Health Act.

G-7.05 FIRST AID
The Contractor shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when men are employed on the work.

G-7.06 HEATING
The Contractor shall provide temporary heat, at his own expense, whenever required on account of work being carried on during cold weather and to prevent freezing of water pipes and other damage to the work.

SECTION 8
LINES AND GRADES

G-8.01 GENERAL
All work done under this Contract shall be constructed in accordance with the lines and grades shown on the Plans, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

The Engineer will establish bench marks and base line controlling points. Reference remarks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the work as possible. The Contractor shall so place excavation and other materials as to cause no inconvenience in the use of the use of the reference marks provided. He shall remove any obstructions placed by him contrary to this provision.

G-8.02 SURVEYS
The Contractor shall furnish and maintain, at his own expense, stakes and other such materials, and give such assistance, including qualified helpers, as may be required by the Engineer for setting reference marks. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Engineer's attention to any inaccuracies. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the reference marks set by the Engineer, and shall be solely responsible for the accuracy thereof. He shall, however, be subject to the check and review of the Engineer.

The Contractor shall keep the Engineer informed a reasonable time in advance as to his need for line and grade reference marks, in order that they may be furnished and all necessary measurements made for record and payment with the minimum of inconvenience to the Engineer or of delay to the Contractor.

It is the intention not to delay the work for the establishment of reference marks but, when necessary, working operations shall be suspended for such reasonable time as the Engineer may require for this purpose.

G-8.03 SAFEGUARDING MARKS
The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes and marks.

The Contractor shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the work and, if required, shall bear the cost of reestablishing them if disturbed or destroyed.

G-8.04 DATUM PLANE
All elevations indicated or specified refer to the Mean Sea Level Datum of the U.S.C. & G.S. (N.O.S.) which is 0.80 feet above the Mean Low Water Datum of the U. S. Army

Corps of Engineers.

SECTION 9
ADJACENT STRUCTURES AND LANDSCAPING

G-9.01 RESPONSIBILITY
The responsibility for removal, replacement, relocation, repair, rebuilding or protection of all public utility installations, including poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes, sewers, traffic control and fire alarm signal circuit installations and other appurtenances and facilities shall be in accordance with G-1.02 and G-1.03.

The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation, and reconstruction of such items called for on the Plans or specified shall be included in the various Contract Items and no separate payment will be made therefor. Where such public and private property, structures of any kind and appurtenances thereto are not shown on the Plans and when, in the opinion of the Engineer, removal or relocation and reconstruction is necessary to avoid interference with the work, payment therefor will be made as provided for extra work in Article 7.02 of the Agreement.

G-9.02 PROTECTION OF TREES
All trees and shrubs shall be adequately protected by the Contractor with boxes or otherwise and, within the City of Tampa, in accordance with ordinances governing the protection of trees. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by him with new stock of similar size and age, at the proper season, and at the sole expense of the Contractor.

Beneath trees or other surface structures, where possible, pipelines may be built in short tunnels, backfilled with excavated materials, except as otherwise specified, or the trees or structures carefully supported and protected from damage.

The City may order the Contractor, for the convenience of the City, to remove trees along the line of trench excavation. If so ordered, the City will obtain any permits required for removal of trees. Such tree removal ordered shall be paid for under the appropriate Contract Items.

G-9.03 LAWN AREAS
Lawn areas shall be left in as good condition as before the starting of the work. Where sod is to be removed, it shall be carefully removed and later replaced, or the area where sod has been removed shall be restored with new sod in the manner described in the Technical Specifications section.

G-9.04 RESTORATION OF FENCES
Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the Contractor and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the approval of the Engineer. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or Items, or if no specific Item is provided therefor, as part of the overhead cost of the work, and no additional payment will be made therefor.

SECTION 10
PROTECTION OF WORK AND PUBLIC

G-10.01 TRAFFIC REGULATIONS
The Contractor shall arrange his work to comply with Article G-6.02. The work shall be done with the least possible inconvenience to the public and to that end the work may be confined by the Engineer to one block at a time.

G-10.02 BARRIERS AND LIGHTS
During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers, and lights, as will effectually prevent accidents. The Contractor shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public. Such barriers and signs shall be constructed to State of Florida Department of Transportation standards and placed as recommended by the Traffic Division of the City's Department of Public Works.

No open fires will be permitted.

G-10.03 SMOKE PREVENTIONS
The Contractor shall use hard coal, coke, oil or gas as fuel for equipment generating steam. A strict compliance with ordinances regulating the production and emission of smoke will be required.

G-10.04 NOISE
The Contractor shall eliminate noise to as great an extent as practicable at all times. Air compressing plants shall be equipped with silencers and the exhaust of all gasoline motors or other power equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The Contractor shall strictly observe all local regulations and ordinances covering noise control.

Except in the event of an emergency, no work shall be done between the hours of 7:00 p.m. and 7:00 a.m., or on Sundays. If the proper and efficient prosecution of the work requires operations during the night, the written permission of the Engineer shall be obtained before starting such items of the work.

G-10.05 ACCESS TO PUBLIC SERVICES
Neither the materials excavated nor the materials or plant used in the construction of the work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.

G-10.06 DUST PREVENTION
The Contractor shall prevent dust nuisance from his operations or from traffic by keeping the streets sprinkled with water at all times.

G-10.07 PRIVATE PROPERTY
The Contractor shall so conduct the work that no equipment, material, or debris will be placed or allowed to fall upon private property in the vicinity of the work unless he shall have obtained the owner's written consent thereto and shall have shown this consent to the Engineer.

SECTION 11
SLEEVES AND INSERTS

G-11.01 COORDINATION
When the Contract requires the placing of conduits, saddles, boxes, cabinets, sleeves, inserts, foundation bolts, anchors, and other like work in floors, roofs, or walls of buildings and structures, they shall be promptly installed in conformity with the construction program. The Contractor who erects the floors, roofs, and walls shall facilitate such work by fully cooperating with the Contractors responsible for installing such appurtenances. The Contractor responsible for installing such appurtenances shall arrange the work in strict conformity with the construction schedule and avoid interference with the work of other contractors.

G-11.02 OPENINGS TO BE PROVIDED
In the event timely delivery of sleeves and other materials cannot be made and to avoid delay, the affected Contractor may arrange to have boxes or other forms set at the locations where the appurtenances are to pass through or into the floors, roofs, walls, or other work. Upon the subsequent installation of these appurtenances, the Contractor erecting the structure shall fill around them with materials as required by the Contract. The necessary expenditures incurred for the boxing out and filling in shall be borne by the Contractor or Contractors required to furnish the sleeves and inserts. Formed openings and later installation of sleeves will not be permitted at locations subject to hydrostatic pressure.

SECTION 12
CUTTING AND PATCHING

G-12.01 GENERAL
The Contractor shall do all cutting, fitting, or patching of his portion of the work that may be required to make the several parts thereof join and coordinate in a manner satisfactory to the Engineer and in accordance with the Plans and Specifications. The work must be done by competent workmen skilled in the trade required by the restoration.

SECTION 13
CLEANING

G-13.01 DURING CONSTRUCTION
During construction of the work, the Contractor shall, at all times, keep the site of the work and adjacent premises as free from material, debris, and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the Engineer, such material, debris, or rubbish constitutes a nuisance or is objectionable.

The Contractor shall remove from the site all of his surplus materials and temporary structures when no further need therefor develops.

G-13.02 FINAL CLEANING
At the conclusion of the work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and he shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.

The Contractor shall thoroughly clean all equipment and materials installed by him and shall deliver such materials and equipment undamaged in a bright, clean, polished, and new appearing condition.

SECTION 14
MISCELLANEOUS

G-14.01 PROTECTION AGAINST SILTATION AND BANK EROSION
The Contractor shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed watercourses and drainage ditches.

G-14.02 EXISTING FACILITIES
The work shall be so conducted to maintain existing facilities in operation insofar as is possible. Work shall be scheduled to minimize bypassing during construction. Requirements and schedules of operations for maintaining existing facilities in service during construction shall be as described in the Special Provisions.

G-14.03 USE OF CHEMICALS
All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.

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SPECIFIC PROVISIONS

SP-1.G Scope

The work included under these Contract Documents is described in the Proposal.

The Contractor shall furnish all labor, materials and equipment for the accomplishment of all work as described in the Specifications, as shown on the Plans and as directed by the Engineer in accordance with the obvious or expressed intent of the Contract.

SP-2.TP Permits

The Contractor shall have in his possession the proper license to perform the work before submittal of his bid and shall obtain any required City/County building permits and shall obtain and pay for all other licenses and authorizations required for the prosecution of the work, including the cost of all work performed in compliance with the terms and conditions of such permits, licenses and authorizations, whether by himself or others.

City permit fees will be paid by the City.

The Contractor shall require all subcontractors to be currently licensed by the City to perform the proposed work in their respective fields and to obtain permits for the execution of said work. All work shall be performed in accordance with the licenses, permits and the requirements of the current Building and Construction Regulations Chapter of the City of Tampa Code.

The Contractor is responsible to schedule and coordinate with the City Inspectional Services Division of the Department of Housing and Development Coordination all required inspections and tests for all phases of work to obtain final approval thereof.

The Contractor is encouraged to contact the City's Permitting Department and Building Inspections Bureau prior to commencement of work to ascertain their respective requirements.

SP-5 Working Drawings

Prior to performing any work requiring working drawings, as specified on the Plans and in the Workmanship and Materials Sections, the Contractor shall submit the working drawings in accordance with the General Provisions section headed "Working Drawings."

SP-6 Environmental Protection

The Contractor will be held liable for the violation of any and all environmental regulations. Violation citations carry civil penalties and in the event of willful violation, criminal penalties. The fact that the permits are issued to the City does not relieve the Contractor in any way of his environmental obligations and responsibilities.

SP-8 Construction Start

Construction will not begin prior to receipt by the City of the required permits. If issuance of the Notice to Proceed is delayed due to permit acquisition, the contract time will be extended to suit, but no extra payment will be made

to the Contractor.

SP-9 Coordination and Cooperation

In performing work under this Contract, the Contractor shall coordinate his work with that of any adjacent contractors for the City, and others, and cooperate with them in every reasonable way, to the end that there shall be the minimum practicable interference with their operations.

SP-12 Releasing Facilities for Use

It is the intent of these Specifications that all newly constructed sewers and appurtenant facilities be placed in service as rapidly as an integrated portion of the facilities can be constructed, inspected and accepted by the Engineer. Acceptance or use by the City of any portion of the facilities prior to final acceptance shall not relieve the Contractor of any responsibilities, regarding such facilities, included in the Contract.

SP-13 Material and Equipment Approval

The Contractor shall not enter into any subcontracts, or place any order, for the furnishing of any material or equipment until he has received the Engineer's written approval of the manufacturers.

SP-14 Contractor Emergency Response Time

The Contractor must be available to service emergency calls seven (7) days a week, twenty-four (24) hours a day. The response time for emergency calls shall be within two (2) hours. A contact person and telephone number shall be provided to the Engineer for such purposes.

SP-15 Contractor's Field Office

Delete Article G-6.03 Contractor's Field Office on Page G-14 from GENERAL PROVISIONS. The Contractor or an authorized agent shall be present at all times while his work is in progress. Readily accessible copies of both the contract documents and the latest approved working drawings shall be kept at the job site.

SP-16 Salvage

All existing pipe and appurtenances removed by the Contractor and which are not designated to be salvaged shall become the property of the Contractor and shall be removed from the site of the work to the Contractor's own place of disposal.

Items which are shown on the Plans or specified to be salvaged shall be removed by the Contractor, delivered, and unloaded at a location within the Department’s service area, as directed by the Engineer. The cost of removing, disposing, delivering, and unloading as salvage items of pipe and appurtenances shall be included in the various classified unit price Contract Items or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

SP-17 Sequence of Operations

The Contractor shall develop with the Engineer a complete schedule of operations which, in the opinion of the Engineer, will permit use of the facilities at the earliest possible date.

Taking over of parts of the work for operation before completion of the entire project shall not relieve the Contractor of any responsibility for proper integrated operations of all parts of the work, nor shall it act to relieve him of any responsibilities under Article A-6.04 of the Agreement, for guaranty of all parts of the work, for one year after the date of acceptance of all the work on the project.

SP-23 Project Cleanup

Cleanup is extremely important and the Contractor will be responsible for keeping the construction site neat and clean with debris to be removed regularly as the work progresses.

SP-26 Surface Restoration

Where construction activities are conducted in existing grassed areas, the grassed areas shall be restored as specified or directed by sodding or grassing. Such restoration of grassed areas shall conform to the requirements of the Workmanship and Materials section headed "Lawn Replacement."

The Contractor shall replace or repair all ground surfaces damaged during construction. Any bushes, flowers, gardens, patios, or other landscaping and irrigation systems disturbed by the construction project shall be repaired or replaced by the Contractor. The cost of such ground surface repair shall be included in the various classified unit price Contract Items, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

Existing corrugated metal and concrete pipe culverts removed during the construction work shall be stored and maintained in sound, useful condition and replaced upon completion of the work. Culverts damaged by the Contractor shall be replaced with new culverts meeting the applicable requirements of the Standard Specifications for Road and Bridge Construction published by the Florida Department of Transportation. No separate payment will be made for replacement of damaged culverts.

SP-36 Fences

Temporary fences, where required, shall be "wood and wire fence" or other suitable fencing as approved by the Engineer.

Permanent fences shall be restored by the Contractor and shall be finished and installed so that the restoration is equal to the original. Only those portions of original fencing, or materials therefrom, that the Engineer approved for reuse shall be used by the Contractor in fence restoration. All other materials, including lumber, paint, creosote, concrete and metal products, shall be furnished by the Contractor.

The cost of temporary fences and permanent fence restoration shall be included under the various classified unit price Contract Items, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

SP-60 Contingency

Contractor shall include a Seventy-five Thousand Dollar ($75,000.00) contingency sum, to be included as part of the total bid amount for this Contract. This contingency is for the purpose of compensating the Contractor for any incidental work that may arise as construction operations proceed and was not addressed as part of the original work portrayed in the Plans and Specifications.

SP-63 Existing Wastewater Flows

The following flow data was obtained for use by the Department of Sanitary Sewers and is believed to be reasonably accurate, but not guaranteed to be absolutely so, and is presented only as an approximation:

Low Flow	-	2.5 MGD (Million Gallons per Day)
Average Flow	-	3.8 MGD
Peak Flow	-	7.5 MGD
Rain Peak	-	15.0 MGD

SP-64 Bypass Pumping

Maintaining sanitary sewer flows during all phases of construction is the responsibility of the Contractor. Any property damage or FDEP fines due to an overflow shall be the contractor's responsibility. The Contractor shall review the plans, phasing, and the construction schedule to determine the need for bypassing to suit the sequence of operations. Bypass pumping shall be continuous during the entire length of time each portion of the work is being accomplished.

The Contractor shall submit a detailed plan for bypass pumping to the Engineer for approval prior to proceeding with the work. All required agency approvals and permits, if required, shall be the responsibility of the Contractor. The hydraulic design of the bypass pumping arrangement shall be the sole responsibility of the Contractor. The plan, at a minimum, shall include the following information:

- Site plan showing location and arrangement of pumps and piping, including pipe sizes, fittings, valves, and connections
- Pump operation strategy and projected flow rates
- Pump curves for each size pump

Bypass pumping system shall be capable of providing a minimum peak flow rate of 22 MGD (15,300 gpm). The discharge for the bypassing system shall be in the Junction Chamber No. 1 Facility, through an access opening in the deck (at approximately Elevation +24.0) over the influent channel, and shall discharge under the water level in the influent channel to reduce turbulence, as shown in the plans.

The bypass pumping system shall, as a minimum, consist of the pumps, the pump drives, suction and discharge piping, level sensing equipment, and pump controls to automatically start, stop and control speed of pumps, as necessary, to bypass at a rate equal to the incoming flow. The pumps shall be designed to handle the flow rates shown in the subsection heading "Existing Wastewater Flows". Each pump shall be equipped with a check valve on the discharge to prevent backflow through the pumps.

The hydraulic design of the bypass system shall be the sole responsibility of the Contractor. Pumping equipment shall be of a type suitable for pumping raw unscreened wastewater over an indefinite period without clogging or requiring shutdown for routine maintenance. Contractor shall design and size the bypass system and shall guarantee that the system meets the minimum peak flow requirements. Prior to performing any work that will prevent the pumping station from being placed back into service, the minimum flow rates of the bypass system must be confirmed and a performance test of the system must be completed to ensure that the system will provide uninterrupted service under all conditions.

The bypass pumping system shall include at least two back-up pumps that are completely installed and are automatically placed into operation in the event one of the primary pumps fail. Each of the back-up pumps shall be no smaller than the largest pump required for the system.

The bypass pumps shall be diesel powered and fuel tanks shall be monitored daily. Bypass pumping system shall have sufficient fuel storage at all times for a minimum of 48-hours of continuous operation at peak flow rate. All pumps shall be properly secured to avoid damage, vandalism, or unauthorized shutdown. Pumps shall be baffled to comply with all noise abatement ordnances and regulations.

Pump suction pipes shall be installed in the second manhole upstream from the Pumping Station wet well, as is indicated in the Plans. A minimum of two separate and independent suction pipes are required for the bypassing system. The bypassing system shall be watertight. The Contractor may need to remove the top section of the bypassing manhole in order to fit the suction pipes in place. Contractor shall be responsible for restoration of the manhole and adjacent areas back to their original condition, or better, after bypassing operations have been completed.

Partial backup of wastewater in the influent sewer pipe is acceptable. The maximum elevation to which the wastewater shall be allowed to rise is Elevation -5.00 ft, which is approximately 15-inches above the crown of the influent 48-inch sewer. Backup of wastewater beyond this elevation can result in upstream overflows. The Contractor shall assume responsibility for fines and cleanup cost of upstream overflows due to insufficient or defective bypass pumping operation.

Bypass system will have a monitoring/alarm system equipped with an auto-dialer that automatically contacts the Contractor and City Personnel if one of the primary pumps fail or high water level occurs.

Bypass pumping system shall be continuously monitored (24-hrs/day) by the bypass contractor/supplier for the first 48 hours of operation. Once the 48 hour performance test is successful and the conditions listed below are met, the system can be placed into unmanned service. During unmanned operation the Contractor shall be available on a 24-hour/7-day/week basis to respond to problems and to make any necessary adjustments and/or repairs needed to maintain continuous operation of the bypass system. The Contractor shall be solely responsible for maintaining the bypass system during the bypass operation.

Continuous monitoring by personnel will not be required after the initial 48 hours provided the following conditions are met:

1. The initial 48 hour operation of the bypass pumping system operated trouble free as determined by City personnel.

2. The high water alarm signal from the Raw Sewage Pumping Station shall be relocated into the upstream manhole so that high water alarms are sent to SCADA.

3. The back-up pumps shall automatically start in the event of high water conditions.

4. The bypass pumping system shall be equipped with an auto-dialer such that key contractor, bypass sub-contractor and City personnel are automatically contacted by phone during a high water condition.

5. The minimum response time during a high water condition shall not exceed 1 hour for the contractor to arrive on site. Responder shall be qualified and capable of performing the necessary work to remedy bypass pumping problems.

6. Bypass pumping sub-contractor shall provide instructions to plant personnel in the basic operation of the bypass pumping system.

The costs of bypass pumping shall be included in the total Lump Sum Price and no separate payment will be made therefor.

SP-65 Pump Characteristics

Each Flygt pumping unit shall be designed for operating under the following conditions:

Rating Data	Pump No.
Number of Units	2
Rate of flow at rating point,	11,827 gpm
Total pumping head at rating point,	32 ft.
Minimum pump efficiency at rated conditions,	74.1 %
Range of flow with satisfactory operation	3,000 gpm @ 60.0 ft.
and corresponding approximate heads	14,000 gpm @ 24.0 ft.
Service and characteristics of electrical power	480/240 Volt
	3 phase
	60 hertz
	4 wire
Motor:	
Horsepower (minimum)	120 HP - 3 phase
Speed, rpm	590 rpm

SP-67 Interruption of Service

Because of the nature of the work, it is imperative that the pumping station not be out of service for very long. The Contractor shall plan all this work, especially the work pertinent to the pumping operation, in detail and ensure that all the required items and equipment are on hand and in good working condition.

Prior to initiating any work pertaining to the operation of the pumping station, the Contractor shall submit to the City a detailed plan for shutdown of the station. No shutdown shall be performed until the plan is approved by the Engineer.

Scheduling of all shutdowns (partial or full) shall be coordinated with Tampa Electric Company (TECO) and the City. The Contractor shall make provisions and pay for temporary power used by him in performing this work.

SP-68 Water, Light and Power

Delete Article G-7.01 Water and G-7.02 Light and Power on Page G-14 from GENERAL CONDITIONS. The City currently provides water and electrical power facilities to the sites. The Contractor may use the electrical and water sources as presently configured. If necessary to modify, extend, or relocate either the electrical or water facilities to

facilitate construction, all costs shall be the responsibility of the Contractor.

SP-71 Electrical Work

Where definite requirements are not set forth in the Specifications, all electrical equipment, materials, and work under this Division shall comply with the requirements of the Occupational Safety and Health Act (OSHA) and shall be in accordance with applicable ANSI, IEEE, IPCEA, and NEMA standards. The work shall be performed in compliance with the latest issue of the NEC, all applicable state and municipal regulations and codes, and the service rules of the Tampa Electric Company, unless otherwise specified or directed. All equipment and materials shall be listed and labeled as complying with the requirements of a Southern Building Code Congress International (SBCCI) recognized testing laboratory for the particular applications wherever available.

SP-72 Operation and Maintenance Manual, Submittals / Request for Information / Shop Drawings, and Asset Tracking Form

Operation and Maintenance Manuals

The Contractor shall prepare and submit to the Engineer four (4) hardcopies and one (1) high resolution color, bookmarked, and unsecured electronic portable document format (PDF) of an Operation and Maintenance Manual for all equipment and associated control systems furnished and installed under this Contract. Black and white copies will not be accepted. When the work reaches 75 to 80 percent completion, the Contractor shall submit to the Engineer for approval one (1) hardcopy and one (1) PDF electronic copy of the manual with all specified material that is available at that time. The submittal shall accompany the Contractor's partial payment request for the specified completion. Within 30 days after approval of the Engineer of the PDF submittal, the Contractor shall furnish to the Engineer four (4) hardcopies of the manual. Appropriate space shall be left in the manual for material not available at the time of submittal. All missing material for the manual shall be submitted prior to the request for final payment.

Also along with the missing material submitted with the request for final payment, one electronic copy (in pdf format) complete with all the missing material to be included in the earlier submitted hard copies shall be submitted.The manual shall be prepared and arranged as follows:

1. Space shall be provided in the manual for a reduced set of record Contract Drawings, size approximately 11 by 17 inches and folded to 8-1/2 by 11 inches. Drawings will be furnished by the Engineer.

2. One copy of all approved shop drawings and diagrams for all equipment furnished. The shop drawings and diagrams shall be reduced to either 8-1/2 by 11 inches or to 11 inches in the vertical dimension and as near as practicable to 17 inches in the horizontal dimension. Such sheets shall be folded to 8-1/2 by 11 inches.

3. One copy of manufacturer's operating, lubrication and maintenance instructions for all equipment and controls furnished. All equipment operating, lubrication and maintenance instruction and procedures shall be furnished on 8-1/2 by 11 inch commercially printed or typed forms. Such forms shall include equipment name, serial number and other identifying references.

4. One copy of manufacturer's spare parts list for all equipment furnished and prepared as specified in No. 3 above.

5. One valve schedule, giving the valve number, location, fluid and fluid destination for each valve installed and

prepared as specified in No. 3 above. All valves in the same piping system shall be grouped together in the schedule. A sample of the valve numbering system to be used will be furnished by the Engineer. Valve numbers may include three or four numerals and a letter.

6. List of electrical relay settings and control and alarm contact settings.

Each copy of the manual shall be assembled in one or more binders, each with title page, typed table of contents, and heavy section dividers with copper reinforced holes and numbered plastic index tabs. Each manual shall be divided into sections headed by the equipment specification section included in "Workmanship and Materials." Binders shall be 3-ring hard-back. All data shall be punched for binding and composition and printing shall be arranged so that punching does not obliterate any data. The cover and binding edge of each manual shall have the project title, Division designation and manual title printed thereon, all as furnished and approved by the Engineer.

Where more than one binder is required, they shall be labeled Vol. 1, Vol. 2, and so on. The table of contents for the entire set, identified by volume number, shall appear in each binder.

The four (4) hardcopies of the manuals and data included therein shall be provided in conformance with the subsection headed "Working Drawings" and, in addition, to the requirements of the General Provisions. The costs of the Operation and Maintenance Manual shall be included in the various Contract Items, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

Submittals / Request for Information / Shop Drawings

Contractor shall prepare and submit a minimum four (4) hardcopies and one (1) bookmarked, unsecured electronic portable document format (PDF) file for all Submittals, RFI, and Shop Drawings. The City will review the submittals and return one (1) hardcopy and PDF file of the marked up submittal to the contractor. The contractor shall have approved hard copies of all submittals at the job site. Each electronic submission must be in a high resolution color format and shall be original electronic documents from the manufacturer. Hardcopies shall be high quality printed in color. Scanned printouts or poor quality resolution PDF files will not be accepted.

Asset Tracking Form

The Asset Tracking Form (ATF) is a general spreadsheet that is intended to begin tracking assets and their respective preventative maintenance at an early stage in the project. An ATF shall be prepared and submitted by Contractor (in electronic format) during two phases of the project. The first phase ATF shall be submitted after procurement of each piece of equipment and will include general information and specifications on the equipment such as, but not limited to, model, voltage, amperage, horsepower, material, and preventative maintenance tasks. The second ATF submission shall accompany the final submission of the Operation and Maintenance Manuals. Information included during this submission will include specific information on the equipment such as, but not limited to, serial numbers, equipment number, location, runtime hours, etc.

The City of Tampa Wastewater personnel will provide a blank electronic copy of the ATF in Microsoft Office 2007. Any submission must be in the same format.

SP-73 Work Directive Change

A Work Directive Change is a written directive to the Contractor, issued on or after the date of the execution of

the Agreement, and signed by the Engineer on behalf of the City, ordering an addition, deletion or revision in the work, or responding to an emergency. A Work Directive Change will not change the contract price or the time for completion, but is evidence that the parties expect that the change directed or documented by an Authorization to Proceed with Extra Work letter will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the contract price or the time for completion.

Without invalidating the Agreement, additions, deletions or revisions in the work may, at any time or from time to time, be authorized by a Change Order or a Work Directive Change. Upon receipt of any such document, the Contractor shall promptly proceed with the work involved.

SP-75 Programmed Controls Equipment

Prior to acceptance of computers and programmable logic controllers, the Contractor shall meet the following requirements:

A full set of the original software media and licenses and documentation for all software items used on the equipment shall be provided to the City. All unique configuration files and databases shall be included in as-built documents and in disk format containing itemized filename lists and ASCII Source listings of each. All unique hardware, wiring schemes and dip switch settings, exact as-built program listings, and digital configurations shall be included in the as-built documents.

No aspect of programmed controls equipment shall have any security or access controls which are not totally in the control of the City. No programmed software self-destructs, of any type, shall be allowed. The software shall allow unlimited restorations and backups from any appropriate storage media, to all appropriate equipment.

No Software Restriction Plug-in Modules or Software Activation Keys shall be allowed in any system, unless spare modules and keys are on hand for immediate disaster recovery.

Any part, whether hardware, software, or logical for which spare parts are not readily available; whose function or programming is not fully explained in documentation; or which in any way is not able to be replaced, restored, reprogrammed, and immediately placed back into service by the City using the as-built data, program listings, software media, and other resources provided shall not be accepted by the City.

All security information and data, including security bypass procedures for all approved security features, shall be fully documented to the City prior to acceptance. All unique patch cords, cables, connectors, tools, and appurtenant programming devices necessary to restore and maintain programming shall be supplied for use by the City and demonstrated in the appropriate training sessions.

The training for all programmed controls equipment shall include instructions on operation and maintenance of hardware and software. The training shall also demonstrate the full backup and restoration of all software after total equipment failure utilizing reinstallation procedures that accommodate unique hardware requirements, unique configuration files and databases, unique dip switch settings, and unique wiring information. The appropriate City personnel shall be trained to bypass all approved security features of all such equipment. The backup and restoration training shall use the actual as-built information and all unique appurtenances and itemize all such documentation and appurtenances to show that these items are complete.

SP-82 Access

GENERAL

Access to the site of the work shall be from Guy Verger Boulevard. The Contractor shall construct, as required for his purposes or as necessary, such temporary access roads between the public roads and the site as may be required for movement of heavy construction equipment and material delivery vehicles at locations approved by the Engineer.

Access facilities shall be adequate for equipment movement and shall provide for surface drainage. Areas used for temporary access, haul roads and access from public or plant roads shall be graded and restored to proposed site grade conditions, all to the satisfaction of the Engineer.

Access to existing plant roads by the Contractor will be restricted to those roads so designated. The Contractor will not be permitted to use any existing plant roads not designated for such use. All existing plant roads which are designated for use by the Contractor shall be maintained in serviceable condition by the Contractor during construction. Any damage to such roads caused by construction operations shall be promptly repaired to keep the road in serviceable condition. Any accumulations of soil, gravel or any other debris deposited on such plant roads as a result of construction operations shall be promptly removed by the Contractor to his own place of disposal.

Additionally, all existing plant roads which are designated for use by the Contractor shall be open at all times for unrestricted use by plant operations, maintenance and inspection service.

In NO case will the Contractor be permitted to use the monitored plant entrances for the passage of heavy construction equipment, concrete trucks or any other large vehicles.

PARKING

All employees of the Contractor shall park personal vehicles within the Contractor's storage and field office site. Contractor employees will not be permitted to drive personal vehicle onto the construction site. The Contractor shall provide transportation for all employees between the Contractor's storage and field office site and the work areas on the construction site.

IDENTIFICATION

The Contractor shall provide a Photo I.D. card for each employee. Each photo I.D. card shall be encapsulated in plastic and be provided with a clip for fastening to each employee's apparel. Each photo I.D. card shall be approximately 2 inches by 3 inches in size and shall include the following:

1. Employee photograph mounted on the left half of the card.

2. Name of employee and name of Contractor located on the right half of the card.

Each employee shall display the photo I.D. card on outer apparel at all times when on the plant site.

Any person found on the site without the required photo I.D. card will be directed to leave the site immediately.

The cost of construction, modification, maintenance, removal and restoration of all access facilities, and existing plant roads including excavation, backfilling, select fill material, paving material, grading, drainage and other such work, and all costs associated with limited access to the site, employee parking and transportation and photo I.D. cards, except as specified otherwise shall be included in the lump sum Contract Item for Structures and Equipment and no separate

payment will be made therefor.

SP-84 Piping and Equipment Identification

All piping and equipment shall be identified as follows:

1. All painted piping and equipment shall be color coded. Such coding on pipelines shall include painted or plastic tape banding at 10-foot intervals. The Engineer will select the colors. Underground pipelines with plastic tape wrapping shall be wrapped with colored tape and include additional colored bands as directed. Polyethylene or hot bituminous wrapped underground pipelines shall have plastic tape bands. Polyethylene wrapping for ductile iron sewage or force main piping shall be green. Tape bands shall be placed at 10-foot intervals and all colors shall be selected by the Engineer.

2. All equipment and slide gates shall have an identification nameplate. The nameplates shall be of Type 304 stainless steel, No. 6 finish, not less than No. 16 gauge with indented stamped lettering. Nameplates shall be attached to equipment bases in accessible locations. Nameplates shall be fastened, in a permanent manner arranged not to damage equipment, with not less than four stainless steel fasteners. All nameplates shall be of the same size (approximately 3- by 8-inch) and shall conform to the following standard sample:

Sewage Pump	(Name of item)
SC-P-1	(General type of designation, final list furnished by Engineer)
	(12 digit number) (Furnished by Engineer)

   Lettering shall be block style in size and spacing to suit the nameplate. A sample nameplate including fastenings shall be submitted to the Engineer for approval prior to manufacture of any of the nameplates. Stainless steel identification nameplates shall not be painted.

3. Piping shall be identified with a designation and directional flow arrow. The designation will be furnished by the Engineer. The designation will comprise a maximum of 20 letters. The designations and flow arrows shall be painted on after completion of color coding using suitable stencils and colors. Designations and flow arrows shall be arranged to be clearly in view from the normal operating or access space all as directed and approved by the Engineer. Designations and flow arrows shall be located along straight runs at intervals of not more than 50 feet, near valves, branches and junction points, and where pipes pass through walls or ceilings. Underground piping wrapped with polyethylene shall be provided with colored material selected by the Engineer.

The cost of piping and equipment identification shall be included in the various Contract Items, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

SP-87.TP Use of Site for Storage and Field Office

Space, on the site, for storage and field office for the Contractor shall be as directed by the Engineer. Any structures or facilities needed for storage or field office shall be constructed by the Contractor at his own expense and no separate payment will be made therefor. All security requirements for such facilities shall be provided and maintained by the Contractor.

Upon completion of the work, and as directed, the Contractor shall clean up the areas, remove any temporary facilities and finish grade as necessary, all as approved.

SP-88 Notice of Construction

The Contractor shall provide a minimum of 72 hours notice to the Engineer prior to performing any work involving wastewater facilities. In the event that the Contractor ceases operations for more than 3 consecutive working days, he shall again provide a minimum of 72 hours notice to the Engineer prior to performing any work involving wastewater facilities.

SP-129.TP As-Built Plans

During manufacture and construction, installation and testing, records shall be kept of any changes or adjustments made in the work. All such changes shall be incorporated in the "As-Built" plans, shown in red.

The Contractor shall provide the City of Tampa with one (1) hardcopy and (1) electronic high resolution color PDF copy of "As-Built" plans. Plan sheets shall have all deviations from original design annotated in red pencil to clearly show as-built conditions. Relocation of existing facilities and utilities must be clearly noted.

All as-built plans shall be submitted within seven (7) calendar days of the final inspection. The final payment will not be issued until the as-built plans have been submitted to, and accepted by the City. Upon request the City will provide AutoCAD drawings.

SP-130 SAFETY:

A. Responsibility:Employees shall immediately report any unsafe work practice or unsafe condition to their supervisor(s). The Contractor is solely responsible for the safety of their workers, and shall comply with all applicable requirements [i.e.: 29 CFR 1910 -Occupational Safety and Health Standards, 29 CFR 1926 - Safety and Health Regulations for Construction, etc] and industry safety standards while at the work site. The fact that City personnel may bring un-safe conditions to the attention of any member of the Contractors work force does not relieve the Contractor of this responsibility.

Suggest, all Contractors employees and sub-contractors be given a copy of SP-130.

The Contractor shall have a designated Safety Officer within his organization. At the Pre-Construction meeting, the Contractor shall provide the name and contact information of the Safety Officer to the Engineer.

At the Pre-Construction meeting, the Contractor will be given pertinent safety related information, necessary forms and instructions (i.e.: AWTP Lockout/Tagout Procedures, AWTP Hot Work Permits, etc) that pertain to any work that might be utilized during the contract. The Contractor shall be responsible to disseminate that information to their employees and sub-contractors. Special care shall be taken by the Contractor to ensure that any new employee or sub-contractor to the work site shall be briefed on these safety instructions.

If warranted by the project and directed by the Engineer, the Contractor shall develop and implement a comprehensive health and safety plan for their employees that will cover all aspects of onsite construction operations and activities associated with the contract. This plan must comply with all applicable health and safety regulations and any project specific requirements that the contract has specified.

B. Incident Reporting: All accidents that result in personal injury, illness or property damage shall be immediately reported and investigated, regardless of the extent of injury, illness or property damage. Employees must report accidents within one hour (or as soon as practical) from the time of occurrence to their immediate

supervisor who in turn will report it to the City's inspector. The City inspector will record the incident in their daily report and report it to the Risk Management Division (274-5708).

C. Air-Borne Debris: All personnel in close proximity to drilling, sawing, sanding, scraping, spraying, power-washing or other work being done, either in enclosed spaces or in the open, that creates dust or air-borne debris shall wear eye protection
[29 CFR 1910.133] and a respirator [29 CFR 1910.134].

D. Hot Work: All welding, soldering, brazing, acetylene cutting or any other work at the AWTP or any pump station; that produces high temperatures shall require a AWTP "Hot Work Permit" and may require one or more fire watches. The number and location of fire watches (if any) shall be a condition of the Hot Work Permit. A current, portable, fully charged fire extinguisher shall be located with each person performing hot work and each fire watch. The Hot Work Permit shall be signed off by the appropriate personnel and maintained in the project file.

E. Confined Spaces: OSHA defines a confined space as having limited or restricted means for entry or exit, and is not designed for continuous employee occupancy. Confined spaces include, but are not limited to: vaults, tanks, manholes,
wet-wells, pipelines, utility tunnels, etc.

The Contractor shall take measures [29 CFR 1910.146 (c)(5)] to ensure that atmospheric conditions in confined spaces are not hazardous to occupants. This can be accomplished by forcing a sufficient amount of clean air through the confined space and testing the atmosphere by using a portable certified, calibrated, atmosphere monitor that meets OSHA requirements [29 CFR 1910.146(c)(5)(ii)(C)]. The atmosphere monitor should record oxygen content, flammable gases and vapors and toxic air contaminants, such as the Industrial Scientific TMX-412.

F. Air-Borne Gases: The AWTP is located in an industrial area and as such there are several different substances, either on or off site, that can escape and become dangerous fumes such as: chlorine, methanol, anhydrous ammonia, etc. The AWTP currently has nine (9) Shelter In Place (SIP) locations that are designated as safe havens in the event of release of hazardous gases. These SIP's are stocked with necessary instructions and supplies to protect City and any Contractor's personnel.

The first day on site, City personnel will show all the Contractor's personnel present where the several closest SIP's are located, explain the alarm signals and provide the current alarm testing schedule. It shall be the Contractor's responsibility to show any future employee and/or sub-contractor that comes on site the location of the SIP's and explain the alarm signals.

In the event of an alarm, the Contractor's personnel shall immediately and hastily proceed to the nearest SIP along with the City personnel and remain there until further notice, taking guidance from and following the instruction of the senior City employee present.

G. Lockout / Tagout Policy: The AWTP Lockout / Tagout program is designed to set standards to help safeguard all employees from hazardous electrical or mechanical energy while they are performing service or maintenance on machines and equipment at the AWTP or any pump station. This program will also identify the practices and procedures to shut down and Lockout or Tagout machines and equipment. The Contractor shall be given a copy of the AWTP "LOCKOUT / TAGOUT POLICY AND PROCEDURES" instruction and shall make all of his employees and sub-contractors aware of this program.

No padlock (lockout) shall be removed except by the individual that installed it or if not available, by a City of Tampa

AWTP team leader.

No tag (tagout) shall be removed except by the individual that installed it or if not available, by a City of Tampa AWTP team leader, except in an Emergency and the tag states "Do Not Use Unless in an Emergency". In that event, the Contractor shall notify the City of Tampa AWTP team leader, who will prepare the necessary follow up report.

H. Trench Safety: Any excavation deeper than four (4) feet shall adhere to the requirements contained in 29 CFR 1926.650 thru 652 and the Florida Trench Safety Act [Florida Statutes, ss 553.60 - 553.64].

I. Open Flames: No fires shall be allowed. No open flames necessary for any construction activity shall ever be left un-attended. A current, portable, fully charged fire extinguisher shall be located with each activity requiring an open flame.

J. Sparks: Any activity lasting more than 10 continuous minutes, that creates sparks, such as grinding or chipping shall have a dedicated fire watch in attendance. A current, portable, fully charged fire extinguisher shall be located with each activity creating sparks, regardless if a fire watch is required or not.

K. First Aid: The Contractor shall furnish appropriate First Aid Kits [29 CFR 1910.151] and shall be responsible to ensure his employees are properly trained to render first aid. If injurious corrosive materials are to be utilized, eye wash and body wash facilities must be provided in the immediate area.

L. Related Costs: All costs associated with these or any safety measures shall be included in the total lump sum contract price or the various contract item unit prices, as applicable, and no separate payment shall be made thereof.

SP-133 Tampa Port Authority Access

The Tampa Port Authority has restricted access in accordance with Florida Statute 311.12. Procedures for Tampa Port Authority access are included in these Specific Provisions. All costs to comply with these procedures shall be included in the total Price for this project, and no separate payment shall be made therefore.

* * *

City of Tampa – DMI Sub-(Contractors/Consultants/Suppliers) Payments

(FORM MBD-30)

[ ] Partial [ ] Final

Contract No.: _____ WO#,(if any):_____ Contract Name:_____

Contractor Name:_____ Address:_____

Federal ID:_____ Phone:_____ Fax:_____ Email:_____

GC Pay Period:_____ Payment Request/Invoice Number:_____ City Department:_____

Total Amount Requested for pay period: $_____ Total Contract Amount(including change orders):$_____

-Type of Ownership - (F=Female M=Male), BF BM = African Am., HF HM = Hispanic Am., AF AM = Asian Am., NF NM = Native Am., CF CM = Caucasian S = SLBE

Type Trade/Work Activity []Sub []Supplier Federal ID	Company Name Address Phone & Fax	Total Sub Contract Or PO Amount	Amount Paid To Date Amount Pending Previously Reported	Amount To Be Paid For This Period Sub Pay Period Ending Date
			$	$
			$	$
			$	$
			$	$
			$	$
			$	$

(Modifying This Form or Failure to Complete and Sign May Result in Non-Compliance)

Certification: I hereby certify that the above information is a true and accurate account of payments to sub – contractors/consultants on this contract.

Signed:_____ Name/Title:_____ Date:_____

Note: Detailed Instructions for completing this form are on the next page

Page 2 of 2 – DMI Payment

Instructions for completing The DMI Sub-(Contractors/Consultants/ Suppliers) Payment Form (Form MBD-30)

This form must be submitted with all invoicing or payment requests where there has been subcontracting rendered for the pay period. If applicable, after payment has been made to the subcontractor, "Waiver and Release of Lien upon Progress Payment", "Affidavit of Contractor in Connection with Final Payment", or an affidavit of payment must be submitted with the amount paid for the pay period. The following will detail what data is required for this form. The instructions that follow correspond to the headings on the form required to be completed. **(Modifying or omitted information from this form my result in non-compliance).**

- **Contract No.** This is the number assigned by the City of Tampa for the bid or proposal.
- **W.O.#** If the report covers a work order number (W.O.#) for the contract, please indicate it in that space.
- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid or proposal.
- **Contractor Name.** The name of your business.
- **Address.** The physical address of your business.
- **Federal ID.** A number assigned to a business for tax reporting purposes.
- **Phone.** Telephone number to contact business.
- **Fax.** Fax number for business.
- **Email.** Provide email address for electronic correspondence.
- **Pay Period.** Provide start and finish dates for pay period. (e.g. 05/01/13 – 05/31/13)
- **Payment Request/Invoice Number.** Provide sequence number for payment requests. (ex. Payment one, write 1 in space, payment three, write 3 in space provided.)
- **City Department**. The City of Tampa department to which the contract pertains.
- **Total Amount Requested for pay period.** Provide all dollars you are expecting to receive for the pay period.
- **Total Contract Amount (including change orders).** Provide expected total contract amount. This includes any change orders that may increase or decrease the original contract amount.
- **Signed/Name/Title/Date**. This is your certification that the information provided on the form is accurate.
- **See attached documents.** Check if you have provided any additional documentation relating to the payment data. Located at the bottom middle of the form.
- **Partial Payment.** Check if the payment period is a partial payment, not a final payment. Located at the top right of the form.
- **Final Payment.** Check of this period is the final payment period. Located at the top right of the form.

The following instructions are for information of any and all subcontractors used for the pay period.

- **(Type) of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business or SLBE.
- **Trade/Work Activity.** Indicate the trade, service, or material provided by the subcontractor.
- **SubContractor/SubConsultant/Supplier.** Please indicate status of firm on this contract.
- **Federal ID.** A number assigned to a business for tax reporting purposes. This information is critical in proper identification of the subcontractor.
- **Company Name, Address, Phone & Fax**. Provide company information for verification of payments.
- **Total Subcontract Amount.** Provide total amount of subcontract for subcontractor including change orders.
- **Amount Paid To Date.** Indicate all dollars paid to date for the subcontractor.
- **Amount Pending, Previously Reported.** Indicate any amount previously reported that payments are pending.
- **Amount To Be Paid for this Period.** Provide dollar amount of dollars requested for the pay period.
- **Sub Pay Period Ending Date.** Provide date for which subcontractor invoiced performed work.

Forms must be signed and dated or will be considered incomplete. The company authorized representative must sign and certify the information is true and accurate. Failure to sign this document or return the document unsigned can be cause for determining a company is in non-compliance of Ordinance 2008-89.

If any additional information is required or you have any questions, you may call the Minority Business Development Office at (813) 274-5522.

SIGN EXAMPLE ONLY GRAPHIC TO BE DEVELOPED BY CONTRACTOR

3"

scale: 3"

Sign Information

Building a Better Tampa

Downtown Riverwalk

Creates a waterfront pedestrian walkway connecting the south edge of the CapTrust building with MacDill Park.

$1.5 Million investment
Scheduled for completion in October 2012

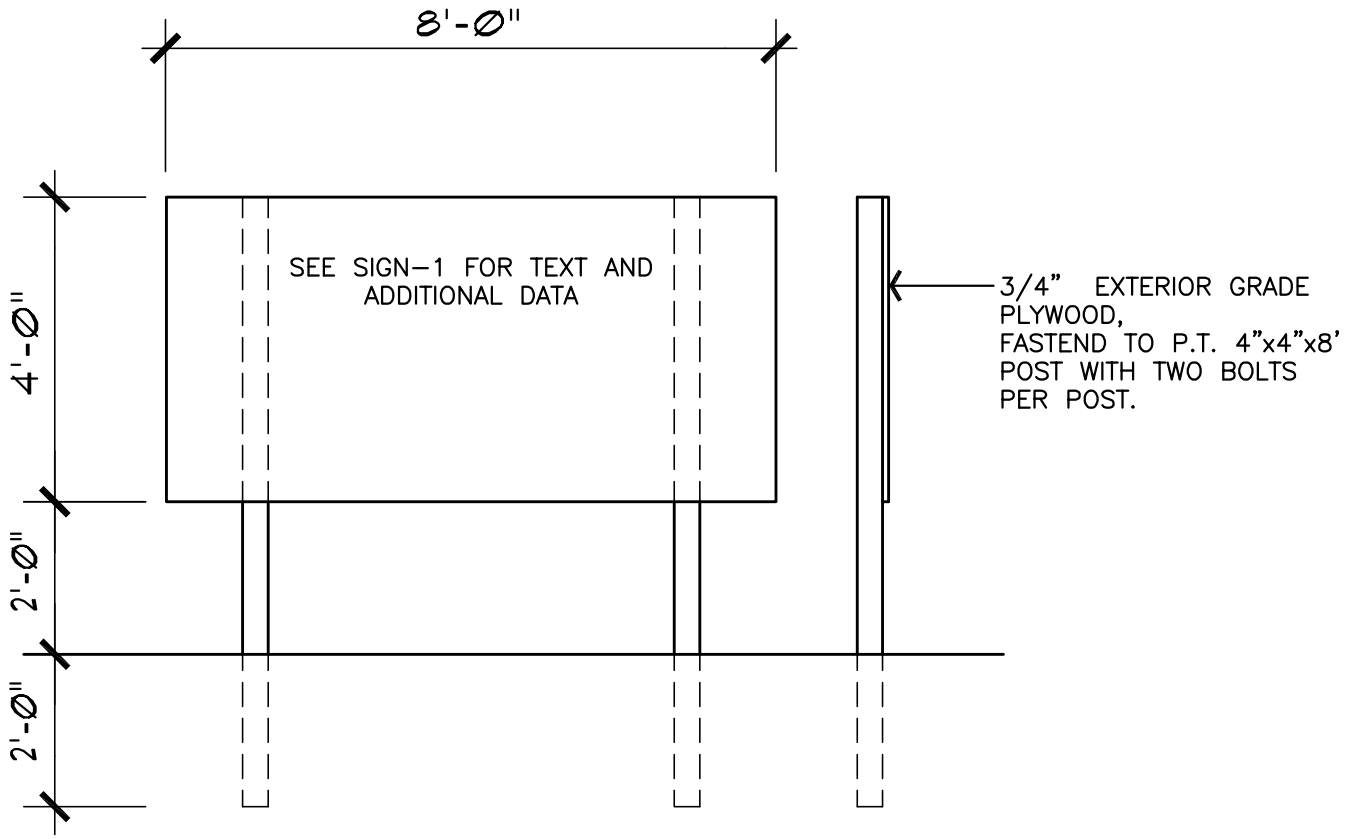
Orion Marine
Construction, Inc.

Colors

Blue: Sherwin Williams Naval SW6244
Green: Sherwin Williams Center Stage SW6920
White: Sherwin Williams Pure White SW7005

Font

Franklin Gothic



SECTION 4 – CONCRETE AND CONCRETE MATERIALS

W-4.01 General

This section covers concrete materials and performance requirements for wastewater structures.

W-4.02 Cement

Cement shall be from a source approved by the Engineer before the cement is ordered. Domestic manufacturers of cement shall furnish to the Engineer notarized Certificates of Manufacture as evidence that the cement conforms to the requirements of the Specifications. These certificates shall include mill test reports on the cement. Suppliers of foreign cements shall furnish to the Engineer test data from a testing laboratory approved by the Engineer to show conformance with all applicable requirements of ASTM Des: C 150. Samples for testing shall be taken in accordance with ASTM Des: C 183. The cost of tests on foreign cement shall be considered as part of the cost of the work and shall be included under the appropriate Contract items. No separate payment for such testing will be made. Cement shall be either air-entraining portland cement or standard portland cement, except as otherwise specified. If standard portland cement is used, an air-entraining agent meeting the requirements of ASTM Des: C 260 shall be added to the concrete at the time of mixing in an amount sufficient to produce from 4 to 6 percent entrained air in the concrete for plastic mixes having a slump of 2 to 4 inches. Standard portland cement shall meet the requirements of ASTM Des: C 150, Type I or Type II, and air-entraining cement shall meet the requirements of ASTM Des: C 150, Type IA or Type IIA.

W-4.03 High-Early Strength Cement

In case high-early strength cement is used in any special part of the work, it shall be true portland cement with no chemicals or other substances added to expedite hardening and shall be of a brand approved by the Engineer. The cement shall meet the requirements of ASTM Des: C 150 Type III or Type IIIa. High-early strength cement shall be used only with the approval of the Engineer.

W-4.04 Fine Aggregate

Fine aggregate shall be natural sand, washed clean, having hard, strong, sharp, durable, uncoated grains; and shall be free from injurious amounts of dust, lumps, soft or flaky particles, mica, shale, alkali, organic matter, loam, or other deleterious substances. Fine aggregate shall conform to the requirements of Section 902 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

W-4.05 Coarse Aggregate

Coarse aggregate shall consist of gravel or broken stone composed of strong, hard, durable, uncoated pebbles or rock fragments, washed clean and free from injurious amounts of shale, coal, clay, lumps, soft fragments, dirt, glass, and organic and other deleterious substances. It shall conform to ASTM Des: C 33. The size shall be No. 57, as specified in Table II of ASTM Des: C 33.

W-4.06 Admixtures

The use of admixtures will be permitted but must be approved by the Engineer. Set retarders shall be Pozzolith 100-XR as manufactured by BASF, Cleveland, Ohio, or Plastiment as made by Sika Chemical Corporation, Lakewood, OH, or equal. Retarding admixtures shall be used in strict accordance with the manufacturer's directions and the manufacturer shall make available, at no cost upon 72 hours notification, the services of a qualified full time field representative to assure proper use of the admixture.

Set retarding admixtures shall be used only with the approval of the Engineer. The amount of set retarder added shall be sufficient to keep the concrete workable during the period of placement and finishing.

W-4.07 Water

Water used in mixing concrete shall be clean and shall not contain deleterious amounts of acids, alkalies, or organic materials. All water shall be furnished from sources approved by the Engineer.

W-4.08 Fly Ash

Fly ash shall be a local product with cementitious properties, conforming to the requirements of ASTM C 618, Class C or F, with the following exceptions:

Loss on ignition	- 5% maximum
Sulfur trioxide	- 4% maximum

Fly ash shall have a uniform light color, and shall be from a source approved by the Engineer.

Fly ash shall be stored at the concrete mixing plant separate from the cement, in accordance with the requirements specified for storage of cement. Cement and fly ash shall not be intermixed prior to being added to the concrete mix.

W-5.01 Concrete Strength Classes

Concrete shall be divided into two grades, classified according to compressive strength, to be used in the respective places shown on the Plans, called for in the Specifications, or ordered by the Engineer. The classes of concrete mixtures are referred to as Class B, and Class D.

Class B concrete is intended principally for reinforced concrete structures, and shall be used for columns, walls, beams, slabs, equipment pads, precast structures and the like.

Class D concrete is intended principally for low strength concrete, plain or reinforced, used for soil stabilization, filling, and other similar purposes. For large volume, boulders or fragments of rock excavated during construction may be embedded in the concrete to provide added bulk. Care shall be taken in placing the boulders or rock fragments, so that there are no voids in the concrete.

W-5.02 Strength and Proportion

Concrete mixes shall be designed and proportioned to provide the following minimum compressive strengths and the proper workability without exceeding the stipulated maximum quantities of mixing water:

Class	Compressive Strength - psi 7-day Test	28-day Test	Maximum Water Gallons Per Sack
B	2,700	4,000	5-1/2
D	1,300	2,000	7-1/4

Concrete, except Class D, shall contain not less than 564 pounds (six standard 94-pound bags) of cement per cubic yard.

W-5.03 Moisture Content of Aggregates

The quantity of free water contained in the aggregate shall be determined from time to time as required by the Engineer, and this quantity shall be deducted from the water added at the mixer, but no change shall be made in the water-cement ratio.

The quantity of water used in each batch shall be the total quantity, including the free moisture contained in the aggregate.

W-5.04 Consistency

Proportions of ingredients shall be varied to secure the desired concrete consistencies when tested in accordance with ASTM Des: C 143, conforming to the following slump requirements:

Concrete Placement	Minimum and Maximum Slump in Inches	
	Class B	Class D
Normal	3 to 4	3 to 5
Pumped	4 to 6	4 to 6

In all cases, the proportions of aggregates for concrete shall be such as to produce mixtures which will work readily into the corners and angles of the forms and around reinforcement, without permitting the segregation of materials or the collection of free water on the surface. The combined aggregates shall be of such composition of sizes that when separated on the No. 4 standard sieve, the weight passing the sieve shall not be less than 30 percent, nor greater than 45 percent of the total, unless otherwise required by the Engineer.

W-5.05 Field Tests

During the progress of the work, a reasonable number of test cylinders shall be made, cured, and stored in accordance with ASTM Des: C 31 and shall be tested in accordance with ASTM Des: C 39. Each test shall consist of three cylinders, one laboratory control cylinder to be tested at 7 days, and one field control cylinder to be tested at 28 days. If the 7-day cylinder is not satisfactory, the third cylinder, a laboratory control cylinder, will be tested at 7 days. Otherwise, the third cylinder will be tested at 28 days.

The Contractor shall furnish all labor, equipment and materials necessary for making concrete test cylinders. Concrete test cylinders must be tested by a materials testing laboratory approved by the Engineer. The Contractor is responsible for all costs associated with testing.

The average strength of all the cylinders shall be equal to or greater than the strengths specified, and at least 90 percent of all the tests shall indicate a strength equal to or greater than the strength specified. In cases where the strength of the test cylinders for any portion of the structure falls below the requirements specified herein, the Engineer may order a change in the mix or water content for the remaining portion of the work, and may require the Contractor to secure test specimens of the hardened concrete represented by these cylinders. The number of test specimens required to be taken shall be the same as the number of test cylinders made for each concrete placement. Specimens shall be secured and tested in accordance with ASTM Des: C 42. If the specimen tests further substantiate that the concrete represented by the cylinders and specimens is below the strength requirements specified herein, the Engineer may order such concrete removed and rebuilt at the expense of the Contractor.

W-5.06 Ready-Mixed Concrete

Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in ASTM Des: C 94, and subject to all provisions herein relative to materials, strength, proportioning, consistency, measurement, and mixing.

The rate of delivery of the mixed concrete shall be such that the interval between placing of successive batches shall not exceed 45 minutes. The elapsed time between the introduction of mixing water to the cement and aggregates and depositing concrete in the work shall not exceed 45 minutes including mixing and agitating time.

W-5.07 Forms - General

Forms shall conform to shape, lines, and dimensions of the member as shown on the Plans. They shall be substantial, properly braced, and tied together so as to maintain position and shape and to resist all pressures to which they may be subjected. Forms shall be sufficiently tight to prevent leakage of mortar. The size and spacing of studs and walers shall be determined by the nature of the work and the height to which concrete is placed. In all cases, walers shall be doubled, and the size of studs and walers used shall not be less than 2 by 6 inches. Joints shall be snug and shall occur at the designated locations only. Horizontal joints shall be level and vertical joints plumb.

The entire inside surfaces of forms shall be oiled with an approved form oil or shall be thoroughly wetted just prior to placing concrete.

The Contractor shall be responsible for the adequacy of all forms and for remedying any defects resulting from their use, notwithstanding inspection and prior approval by the Engineer.

W-5.08 Placing Concrete

Concrete shall be placed only in forms which have been approved by the Engineer and in his presence. Where the procedure is not specifically described herein, the placing of concrete shall be in accordance with the recommendations of ACI Standard 614.

After mixing, concrete shall be transported rapidly to the place of deposit. Concreting operations shall be continuous until the section, panel, or scheduled placement is completed.

Concrete may be conveyed in buckets, buggies, chutes, or other approved means. Apparatus used for conveying concrete shall be flushed thoroughly with water before and after each run. The point of delivery of concrete shall be as close to the work as possible and in no case more than 5 feet from the point of final deposit in the horizontal direction. Rehandling of concrete will not be permitted.

Concrete shall be deposited level in layers not to exceed 18 inches in a manner to prevent segregation of the ingredients.

Wall concrete shall be deposited through heavy duck canvas or galvanized iron chutes equipped with suitable hopper heads. Chutes shall be of variable lengths, so that the free fall of concrete shall not exceed 3 feet.

Freshly laid exposed concrete shall be protected in an approved manner against damage from the elements and unavoidable construction operations.

Special care shall be taken to place the concrete against the forms, particularly in angles and corners, in order to prevent voids, pockets, and rough areas. The concrete shall be rodded and spaded in a manner to work the coarse aggregate away from the forms, whether vibrators are used or not. Every precaution shall be taken to make all concrete masonry solid, compact, watertight, and smooth.

W-5.09 Cold Weather Requirements

When the atmospheric temperature at the work is 40 degrees F or below, or when the U.S. Weather Bureau forecasts such temperatures within 24 hours, the freshly placed concrete shall be protected against freezing.

W-5.10 Hot Weather Requirements

For placement of concrete in hot weather, the recommendations of ACI Standard 305R shall be followed.

W-5.11 Curing

Standard portland cement concrete surfaces normally exposed to the atmosphere shall be protected against excessively rapid drying by curing a minimum period of seven days. When average daily temperatures are above 70 degrees F, similarly exposed high-early strength concrete surfaces shall be cured for a minimum period of three days. When daily average temperatures are below 70 degrees F, the curing period for all concrete shall be extended as directed by the Engineer. The curing period shall commence immediately following the placing of the concrete. Curing shall be accomplished by a method approved by the Engineer. Should there be any delay in the application of the method of curing used, the concrete shall be covered with moistened burlap or kept wet by sprinkling.

W-5.12 Grout and Mortar

Grout for grouting around tunnel linings and for other locations as specified or directed shall be mixed in the proportions of one (1) part portland cement to one (1) part of sand by volume.

Non-shrink grout shall be a pre-blended mixture of a non-shrinking agent and shall be Embeco 636 as manufactured by the Master Builders Company, Cleveland, Ohio, or Propak as manufactured by Protex Industries, Denver, Colorado, or equal.

Lean grout for backfilling the space surrounding the sewer sections in tunnels or other areas as specified or directed shall be mixed in the proportion of one (1) part portland cement to twelve (12) parts of sand, by volume.

Mortar for brick or concrete block masonry shall be composed of one (1) part Type IIA portland cement to one (1) part of sand, by volume. Sufficient water shall be added to give the proper consistency. The mixture shall be thoroughly worked to produce a uniform mortar with all particles of aggregate well coated.

W-5.13 Water Stops

Water stops shall be installed in construction joints as shown on the Plans or specified. Water stops shall be made of extruded polyvinyl chloride. Reclaimed plastic material shall not be used in the manufacture of the water stops.

The water stop shall be 4 inches wide and not less than 1/8 inch thick at the narrowest point and 3/8-inch thick immediately adjacent to the center of the water stop. The water stop shall have longitudinal ribs with a hollow bulb center pleat. Water stops shall have a Shore A durometer hardness between 65 and 75, a finished tensile strength of not less than 2,000 psi, and a specific gravity of not more than 1.38.

In matters not covered herein, plastic water stops shall meet the requirements of the latest specifications of the Society of the Plastics Industry, Inc. for Polyvinyl Chloride Water Stops.

Field splices for water stops shall be made by heat fusion using a field splicing unit. Each water stop type shall have its own splice mold built to the size and shape of the water stop to be spliced. Splicing mold and materials, including splicing cement, solvent, splicing stock, and other items, shall be as furnished by the manufacturer of the water stop. Field splicing shall be performed in strict accordance with the manufacturer's directions and to cause as little damage as possible to the continuity of the ribbed strips, all to the satisfaction of the Engineer.

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SECTION 6 - REINFORCING STEEL

W-6.01 Standards

Reinforcing steel bars for concrete reinforcement shall be deformed bars meeting the requirements of ASTM Des: A 615, Grade 60, unless shown or specified otherwise. They shall be free from defects, kinks, and from bends that cannot be readily and fully straightened in the field. Test certificates of the chemical and physical properties covering each shipment shall be submitted for approval.

Reinforcing mesh shall be of the electrically welded type, with wires arranged in rectangular patterns, of the sizes shown or specified and shall meet the requirements of ASTM Des: A 185.

W-6.02 General

Reinforcing steel bars shall be supplied in lengths which will allow them to be conveniently placed in the work and provide sufficient lap at joints. Dowels of proper lengths, size, and shape shall be provided for tying walls, beams, floors, and the like together when shown, specified, or ordered.

Stirrups and ties shall have a minimum inside radius of bend of 2-1/2 bar diameters. All other bars No. 7 and smaller shall have a minimum inside radius of bend of 3 bar diameters, and No. 8 bars and larger shall have a minimum inside radius of bend of 4 bar diameters.

Splices in all reinforcements shall be lapped as specified hereinafter in "Table 1 - Grade 60 Reinforcing Bar Splice Lapping Lengths" unless shown or specified otherwise. All splices shall be staggered, unless otherwise approved by the Engineer.

TABLE 1 - GRADE 60
REINFORCING BAR SPLICE LAPPING LENGTHS

Bar Size	#3	#4	#5	#6	#7	#8	#9	#10	#11
Top Bars - ACI Class B	13	17	22	28	38	50	64	81	100
Top Bars - ACI Class C	17	23	29	37	50	66	83	106	130
Other Bars - ACI Class B	12	12	16	20	27	36	46	58	71
Other Bars - ACI Class C	12	16	20	26	36	47	60	75	93

Notes:

1. Splice length given in inches.

2. Top bars are all horizontal reinforcement so placed that more than 12 inches of concrete is cast in the member below the bar. This includes horizontal wall reinforcement.

3. Where lapping bars of different sizes, use lap required for larger bar.

4. For all bars spaced closer than 6 inches, increase lap length 25 percent.

5. Unless otherwise specified, the length of lap for splices shall be as shown for ACI Class B where no more than 50 percent of the bars are lap spliced, and as shown for ACI Class C where more than 50 percent of the bars are lap spliced.

W-6.03 Detailing

The Contractor shall submit detailed placing drawings and bar listed to the Engineer for approval in accordance with the requirements for "Working Drawings" of the General Provisions, except as otherwise specified herein.

All provisions of the latest ACI "Manual of Standard Practice for Detailing Reinforced Concrete Structures" shall be followed in the preparation of placing drawings and bar lists.

Wall and slab reinforcing shall not be billed in sections. Complete elevations of all walls and complete plans of all slabs must be shown, except that when more than one wall or slab are identical only one such elevation or plan will be required. These plans or elevations need not be true views of the walls or slabs shown. Every reinforcing bar in a slab or a wall shall be billed on either a plan or an elevation. Where necessary, sections shall be taken to clarify the arrangement of the steel reinforcement. All bars shall be identified on such sections, but in no case shall bars be billed on such sections.

For all reinforcing bars, unless the location of a bar is perfectly obvious, the location of such bar or bars shall be given by a dimension to some structural feature which must be readily distinguishable at the time bars are placed.

The set of placing drawings shall be complete in and by themselves to the extent that the bar setters will have no occasion to refer to the design drawings.

Before submittal to the Engineer, every placing drawing and bar list shall be completely checked including the quantity, size, type, length, bend dimensions, and type of support for all bars or mesh, and all other information on the drawing and list. The checking shall be done by a qualified person and all necessary corrections made.

If after placing drawings and bar lists have been submitted to the Engineer for approval, a partial or spot check by the Engineer reveals that the placing drawings obviously have not been checked by a qualified person, they will be returned to the Contractor for such a check and corrections, after which they shall be resubmitted for approval by the Engineer.

W-6.04 Delivery

Reinforcing steel shall be delivered to the work in bundles strongly tied, and each group of both bent and straight bars shall be identified with a metal tag giving the identifying number corresponding to the shop drawings and bar schedules. All bars shall be properly stored in an orderly manner, at least 12 inches off the ground and kept clean and protected from the weather, as directed by the Engineer, after delivery at the site of the work.

W-6.05 Protection

Reinforcing steel shall be delivered without rust other than that which may have accumulated during transportation to the work. It shall at all times be fully protected from moisture, grease, dirt, mortar, and concrete. Before being placed in position, it shall be thoroughly cleaned of all loose mill scale and rust and of any dirt, coatings, or other material that might reduce the bond. If there is a delay in depositing concrete, the steel shall be inspected and satisfactorily cleaned immediately before the concrete is placed.

W-6.06 Fabrication and Installation - Bars

Bars shall be cut to required length and accurately bent before placing. Bars shall be bent in the shop unless written approval of field bending is obtained from the Engineer. If field bending is permitted, it shall be done only when the air temperature where the bending operation is performed is above 30 degrees F.

The bars shall be placed in the exact positions shown with the required spacing and shall be securely fastened in position at intersections to prevent displacement during the placing of the concrete. The bars shall be fastened with annealed wire of not less than 18 gauge or other approved devices. Spacing chairs of a type approved by the Engineer shall be furnished and properly placed to support and hold reinforcing bars in position in all beams and slabs, including slabs placed directly on the subgrade. Chairs which rest on the forms for slabs, the underside of which will be exposed to view in the finished work, shall have those portions galvanized or plastic coated which come in contact with the forms.

Splices in all reinforcement shall be lapped as specified in "Table 1 - Grade 60 Reinforcing Bar Splice Lapping Lengths" in the subsection headed "General." Splices at points of maximum tensile stress shall be avoided wherever possible. Temperature bars shall have a minimum clear spacing of 2-1/2 diameters. All bar splices shall be staggered where possible.

All welded splices shall be full penetration, butt welds, made by certified welders in accordance with AWS D12.1. Thermite welding or Cadweld type couplers may be used where approved by the Engineer.

On any section of the work where horizontal bars run further than the length of the forms, the form or head against which the work ends shall be perforated at the proper places to allow the bars to project through a distance at least equal to the lap specified. The projecting ends, however, unless otherwise directed by the Engineer, shall be of different lengths so that in no place will laps in adjoining bars in the same place occur opposite each other.

W-6.07 Installation - Mesh

Reinforcing mesh shall be placed in the positions shown, specified, or required to fit the work. Suitable spacing chairs or supports as specified for bars shall be furnished and placed to maintain the mesh in correct location. Where a flat surface of mesh is required, the mesh shall be rolled or otherwise straightened to make a perfectly flat surface before placing. The length of laps not indicated shall be approved by the Engineer.

W-6.08 Concrete Protection for Reinforcing Steel

Reinforcing steel shall be placed and held in position so that the concrete cover, as measured from the surface of the bar to the surface of the concrete, shall be not less than the following, except as otherwise shown, specified, or directed:

1. General

   a. Concrete deposited directly against soil - 3 inches.
   b. Concrete in contact with soil or exposed to weather or sewage:
      (1) #6 bars or larger - 2 inches
      (2) #5 bars or smaller - 1-1/2 inches

2. Slabs (See Item 6)

   a. Troweled surfaces - 1-1/2 inches
   b. Elsewhere - 1 inch

3. Beams - Girders - Columns (See Item 6)

   a. To main reinforcement - 2 inches
   b. To ties - 1-1/2 inches

4. Walls (See Item 6)

   a. 12 inches or more thick - 2 inches
   b. Less than 12 inches thick:
      (1) #6 bars or larger - 2 inches
      (2) #5 bars or smaller - 1-1/2 inches

5. Footings and Base Slabs

   a. Top face - 2-1/2 inches
   b. Sides and ends - 3 inches
   c. Bottom, Concrete deposited directly against ground - 3 inches

      Concrete deposited directly against lean concrete work mat - 2 inches

6. Add 1/2 inch for surfaces contacting or exposed to water or sewage.

7. Laps - as specified in "Table 1 - Grade 60 Reinforcing Bar Splice Lapping Lengths" in the subsection headed "General."

8. Spacing - clear distance between parallel bars - 2 inches minimum.

* * *

SECTION 9 - STRUCTURAL AND MISCELLANEOUS STEEL

W-9.01 General

Structural and miscellaneous steel shall include all ferrous metals, whether wrought, rolled, fabricated, or assembled, except castings, pipelines, and ornamental iron.

Columns, girders, beams, lintels, trolley beams, frames for openings and removable slabs, ladders, baffle supports, weirs and weir angles, nuts and washers, sheet piling, and similar work are included in this classification.

W-9.02 Materials

Structural and miscellaneous steel shall meet the requirements of the following standards, except as otherwise shown or specified.

Structural Steel Shapes Plates and Grating	ASTM A 36
Stainless Steel Plates	ASTM A 167 Type 304, No. 1 Finish
Stainless Steel Angles, bolting materials and other shapes	ASTM A 276 Type 304, No. 1 Finish
Rivet Steel	ASTM A 502
High Strength Bolts	ASTM A 325
Steel Sheet Piling	ASTM A 328
Silicon Bronze Bolting Materials	ASTM B 98, Alby A

W-9.03 Workmanship

The design, workmanship, and erection shall conform to the requirements of the latest AISC Specifications for Design, Fabrication and Erection of Structural Steel for Buildings unless otherwise shown, specified, or required. The Contractor shall be solely responsible for the correctness of all shop and field fabrication and fit. Members shall be straight, shall fit closely together, and finished work shall be free from burrs, twists, bends, and open joints. Holes, connecting angles, supports and braces for stair stringers, equipment, apparatus, and similar work shall be provided where required. Structural plates and members for equipment, piping, and similar supports shall be 1/4-inch minimum thickness, unless shown or specified otherwise.

Where shop assembly of field connections is shown, specified, or required, unmatched holes shall be reamed and the pieces matchmarked before disassembly. No drifting will be allowed. In case the eccentricity is too great for good work or the strength of the joint is liable to be weakened by reaming, the piece shall be rejected and a new and satisfactory one shall be provided by the Contractor at his own expense.

W-9.04 Connections in Field

Connections made in the field shall be welded or bolted as hereinafter specified unless riveted connections are approved by the Engineer.

W-9.05 Detailing

Completely detailed shop and erection drawings shall be submitted by the Contractor for approval. Working drawings will be approved for strength only. The numbering of columns, beams, and the like, as shown on detail and erection drawings, shall conform to the numbering shown on the Plans.

W-9.06 Welding

Welding shall be performed by certified welders holding current certificates in accordance with the requirements of the AISC, AWS, and ANSI standards. In assembling and during welding, the component parts of built-up members shall be supported and held by sufficient clamps and other adequate means to hold the parts in proper relation for welding. Welding at joints on weir plate appurtenances shall be watertight. Field welding on weir plates and appurtenances shall require prior written approval of the Engineer.

W-9.07 Bolted Connections

Bolted connections for structural framing shall be made with high strength bolts meeting the requirements of ASTM A 325.

All bolts shall be tightened by means of a torque wrench to the bolt tension recommended in Subsection 1.23.5 of the AISC Specifications.

W-9.08 Riveting

Rivets shall be driven by skilled workmen only and with pneumatic hammers. Rivet heads shall be full, tight, and concentric with the shank. No caulking or recupping will be permitted. Loose, burned, or defective rivets shall be cut out and replaced in a manner which will not injure the surrounding metal. Punching shall be done accurately, but small inaccuracies may be corrected by reaming. Riveted members shall be well pinned and firmly drawn together before riveting. Rivets shall be thoroughly and uniformly heated to not less than a bright red before driving. In removing loose, burned, or otherwise defective rivets, the oxyacetylene torch shall not be used.

W-9.09 Bolts and Nuts

Bolts and nuts other than those specified above for structural framing connections shall be of the best quality mild steel, except where bronze, aluminum, stainless steel, or other materials are shown or required. Bolts shall have hexagonal nuts. Threads shall be clean cut of the American Standard size. Anchor bolts shall be accurately set, and if placed after concrete is poured, all necessary drilling and grouting shall be at the expense of the Contractor. Bolt anchors, unless shown or specified otherwise, shall be of the sizes indicated or approved and shall be Nations Lead Company "Cinch Anchor," Phillips "Stainless Steel Wedge Anchor," or equal.

All anchor bolts and nuts for equipment and items submerged or subject to periodic wetting shall be of stainless steel, unless other shown or specified.

W-9.10 Stud Anchors

Welded headed studs and stud anchors shall be provided in locations and of sizes and shapes shown as manufactured by Nelson Stud Welding or equal.

W-9.11 Sliding Plates

Sliding plates shall conform to ASTM B 147 (8B) and shall be "Lubrite Plates," manganese bronze No. 423, as manufactured by Merriman, Inc., or equal.

W-9.12 Steel Sheet Piling

Steel sheet piling shall have a minimum thickness of 3/8 inch in web and flange.

W-9.13 Painting

Structural steel shall be painted in accordance with the requirements of the Workmanship and Materials section headed "Painting." Stainless steel parts shall not be painted, but shall be wiped and rubbed clean of all foreign matter and left in a condition satisfactory to the Engineer.

* * *

SECTION 10 - DUCTILE IRON PIPE AND FITTINGS

W-10.01 General

All ductile iron pipe shall meet the requirements of AWWA C151. The type and configuration of pipe bedding for buried pipe shall be as shown on the Plans. Coatings and linings for ductile iron pipe and fittings shall conform to the subsection headed "Coatings and Linings," contained herein. Pipe joints shall be bell and spigot, flanged, or mechanical joint as shown on the Plans.

Ductile iron pipe and ductile iron fittings buried in the ground for force mains or installed in pumping stations shall have a minimum thickness of Class 52 unless specified otherwise as shown on the Plans. Ductile push-on iron pipe and fittings for gravity systems, including house laterals, shall be Class 54 and shall have an interior lining as specified in the subsection "Lining for Ductile Iron Gravity Pipe."

W-10.02 Flanged Pipe

Flanged pipe shall conform to the requirements of AWWA C115. Flanges shall be ductile iron and shall have long hubs. There shall be no leakage through the pipe threads, and the flanges shall be designed to prevent corrosion of the threads from outside.

W-10.03 Fittings

All ductile iron fittings shall meet the requirements of AWWA C110, and have a pressure rating of 250 psi, or as specified, whichever is larger.

W-10.04 Flanged Joints

Flanged joints shall meet the requirements of ANSI Specification B16.1. Flanges, flange facing drilling, and protecting shall be as specified for flanged pipe. Bolts and nuts for flanged joints shall be Type 316 stainless steel unless otherwise stated on the Plans or directed by the Engineer.

Except where otherwise directed by the Engineer, gaskets for flanged joints shall be of the full-face type, meeting the requirements of ANSI B16.21. Gaskets shall be rubber with cloth insertion, as made by the Crane Company, Garlock Packing Company, U.S. Rubber Company, or equal.

W-10.05 Mechanical Joints

Mechanical joints shall meet the applicable requirements of AWWA C111.

W-10.06 Push-on Joints

Push-on joints shall be of the bell and spigot type which employs a single, elongated grooved gasket to effect the joint seal. Push-on joints shall meet the applicable requirements of AWWA C111.

W-10.07 Wall Castings, Connecting Pieces, and Special Fittings

Wall castings and connecting pieces, such as bell and bell, bell and spigot, bell and flange, flange and flange, flange and spigot, and flange and flare, shall meet the requirements of ANSI Specification A21.10. Unless otherwise

shown or specified, fittings 14 inches and larger shall have a pressure rating of 250 psi.

Where special fittings are required, they shall be of an approved design and shall have the same diameters and thicknesses as standard fittings, unless otherwise required, but their laying lengths and other functional dimensions shall be determined by their positions in the pipelines and by the particular piping materials to which they connect.

Where watertightness is essential and at other locations where indicated, wall castings shall be provided with an integrally cast intermediate collar located at the center of the wall.

W-10.08 Sleeve-Type Couplings

Except where standard solid sleeves or split sleeves are shown or specified, sleeve-type couplings for ductile iron pipe shall be Style 38 couplings as made by Dresser Industries, Inc., or Type 411 as made by Smith-Blair, or equal. Gaskets shall be of molded rubber, Dresser Plain Grade 27, Smith-Blair 003, or equal. Middle rings shall be without a pipe stop and shall be at least 1/4 inch thick and 5 inches wide for 8-inch and smaller pipe, 3/8 inch thick and 7 inches wide for 10-inch through 30-inch pipe, and 1/2 inch thick and 10 inches wide for 36-inch and larger pipe with follower rings of appropriate thickness, unless otherwise shown or specified.

Sleeve-type couplings shall be shop coated with Dresser Red "D" Shop-Coat, Smith-Blair Standard Blue Shop Coat, or equal nontoxic material compatible with the finished coatings specified.

W-10.09 Coatings and Linings

Pipe which is to be buried shall have the standard outside coating specified in AWWA C151-8.1.

Unless otherwise shown on the Plans or specified, all ductile iron pipe and fittings shall have a cement-mortar lining meeting the requirements of AWWA C151-8.2.

The weight and class designation shall be painted conspicuously in white on the outside of each pipe, fitting, and special casting after the shop coat has hardened.

W-10.10 Harnessing

Ductile iron pipe and fittings with mechanical joints that require harnessing shall be provided with ductile iron retainer glands, Megalug, as manufactured by EBAA Iron, or equal. The glands shall be installed in accordance with the manufacturer's recommendations. Set screws shall be tightened to 75 foot-pounds torque. Where the glands are to be buried or not exposed to view, the assembly shall be given 2 heavy coats of asphalt varnish after installation. Ductile iron pipe and fittings with push-on joints that require harnessing shall be Clow F-128 "Super Lock Joint," American Cast Iron Pipe "Lok-Fast Joint," U.S. Pipe and Foundry Company "TR Flex," or equal.

W-10.11 Lining for Ductile Iron Gravity Pipe

All ductile iron pipe and fittings, unless otherwise shown or specified, shall be provided with a special interior lining. For sizes 8 inches in diameter and above, the lining material shall be virgin polyethylene complying with ASTM D 1248 (40 mils thick) heat bonded to the interior of the pipe for all pipe sizes. For 6-inch diameter, the lining material shall either be the aforementioned polyethylene system or a 40 mil thick coal tar epoxy system. All pipe joint bells shall be coated on the inside with the same lining material as used in the pipe barrel. All field cuts shall be field coated with 40 mils of high build epoxy compatible with the lining.

W-10.12 Polyethylene Encasement

Polyethylene encasement shall be installed on all ductile iron pipe and fittings within the sections indicated on the Plans or as directed by the Engineer and in accordance with ANSI/AWWA C105/A21.5.

Although not intended to be a completely air-and-water-tight enclosure, the polyethylene shall prevent contact between the pipe and the surrounding backfill.

Polyethylene encasement shall be installed in accordance with the pipe manufacturer's instructions, or in a manner acceptable to the Engineer. Polyethylene encasement shall extend 1 foot beyond the joint in both directions (a total of 2-foot overlap) and shall be adhered to said joint with 2-inch wide green marking tape. The slack width shall be taken up at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points. Upon installation of the encasement, any cuts or damaged portions of the polyethylene encasement shall be securely mended with tape or with a short length of polyethylene sheet, or a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

Backfill material shall be the same as specified for pipe without polyethylene wrapping; however, extra care should be taken that the backfill be free from cinders, refuse, boulders, rocks, stones, or other materials that could damage the encasement. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill.

Because prolonged exposure to sunlight will deteriorate polyethylene film, such exposure prior to backfilling the wrapped pipe shall be kept to a minimum.

W-10.13 Ductile Iron Pipe Exterior Coating

All pipe and fittings shall have an exterior asphaltic coating conforming to the following requirements:

Viscosity, KU at 25 degrees C	56-60
Flashpoint, degrees F (TCC)	40 degrees F Min
Dry set to touch, minutes	6
Dry hard, minutes	22

W-10.14 Force Main Identification

Ductile iron pipe sanitary force main shall be continuously spiral wrapped with 2-inch wide green stick-on vinyl tape prior to installation for permanent identification purposes. The tape shall have a minimum thickness of 6 mils with a minimum tensile strength of 22 pounds per inch and a minimum adhesive factor of 40 ounces per inch. The pipe shall be clean and dry when wrapped.

* * *

SECTION 17 - LAWN REPLACEMENT AND SODDING

W-17.01 General

The Contractor shall replace all lawn areas which have been removed or damaged due to construction. Lawn replacement includes fine grading the areas to be restored and furnishing and placing topsoil, fertilizer, sod, sprigs, seeding, and maintaining all areas. Grassing and mulching or sodding lawn areas will be required as directed. Grassing shall be accomplished by seeding.

Sod shall be Argentine Bahia, St. Augustine, or other approved native grass sod, and shall be well matted with grass roots. It shall be sufficiently thick to secure a dense stand of live grass, with a minimum thickness of 2 inches. The sod shall be live, fresh and uninjured, and shall contain sufficient moisture at the time of planting to induce growth. The type and quality of sod shall be approved by the Engineer before placing.

Grass seed shall be Argentine Bahia, 60 #/acre from March 1 to November 1; 50 #/acre with 20 #/acre of rye grass seed from November 1 to March 1. Argentine Bahia seed shall be a scarified seed having a minimum active germination of 40% and total of 85%.

Mulch material shall be free of weeds and shall be oat straw or rye, Pangola, peanut, Coastal Bermuda or Bahia grass hay.

W-17.02 Topsoil

Where areas are to be restored by sodding, topsoil shall be placed to a minimum compacted depth of 2 inches over the subgrade. Where areas are to be restored by grassing, topsoil shall be placed to a minimum compacted depth of 4 inches over the subgrade. All topsoil shall be suitable excavated topsoil which has been segregated or other topsoil material approved by the Engineer. Topsoil shall be free from stones, roots, sticks, or other foreign substances.

W-17.03 Water

The Contractor shall furnish at his own expense all water required for lawn replacement and maintenance of the work until final acceptance.

W-17.04 Construction Methods

Prior to sodding or grassing, the Contractor shall fine grade the subgrade to 4 inches below finished grade. Topsoil shall be spread over the subgrade to a uniform depth and density. Topsoil shall be uniformly compacted by a light hand roller weighing between 250 and 750 pounds to the specified depths for sodding or grassing.

Immediately before sodding, 14-4-14 or 15-0-15 fertilizer shall be applied at the rate of approximately 600 pounds per acre, either in the furrows or by broadcasting and raking, into the planting area. After the surface has been properly prepared, the sod shall be placed and firmly embedded by light tamping. Additionally, dolomite (lime) shall be applied at a rate of 2 tons per acre.

Immediately after the sod has been planted, if the soil does not contain sufficient moisture to ensure growth, water shall be applied twice daily for the first week, once in the morning or late evening and once at approximately 2:00 P.M. Water shall then be applied once a day over the next 2 weeks and alternating days for an additional 2 weeks. If rooting has not taken place by the end of the third week, 1 daily watering shall continue until sod is firmly rooted.

One week after the sod has been planted, a complete fertilizer with minor elements shall be applied weekly at the rate of 1# nitrogen per 1,000 square foot in a 2-1-2 or 4-1-2 formula for a period of 4 weeks, and thereafter every 2 weeks for an additional 30 days. The ground shall not be wet when the fertilizer is applied but will be immediately watered after application of the fertilizer to remove it from the leaf area.

Prior to grassing, 14-4-14 or 15-0-15 fertilizer shall be applied to the soil at the rate of approximately 300 pounds per acre. Grass seed at the specified rate per acre shall then be raked into the soil and covered with mulching material. The area shall then be thoroughly rolled with approved equipment.

After the grass has been planted, if the soil does not contain sufficient moisture to ensure growth, water shall be applied as directed by the Engineer. After the grass has started growing, fertilizer shall be applied uniformly over the area weekly, at a rate of 0.5# nitrogen and potash per 1,000 square feet, until turf cover the area. The fertilizer shall not be applied unless the surface of the ground or sod is sufficiently moist to quickly dissolve the fertilizer.

W-17.05 Caretaking

The Contractor shall keep all replaced lawn areas in good, healthy, insect free, moist condition by watering, replanting or resodding, weeding, fertilizing, and cutting as specified, and directed by the Engineer.

* * *

SECTION 27 - DEMOLITION

W-27.01 General

Demolition includes all work necessary for the removal and disposal of masonry, steel, reinforced concrete, plain concrete, wastewater equipment, piping, electrical facilities, and any other material or equipment shown or specified to be removed. Dust control shall be provided and provision made for safety.

Demolition shall be carried out in such a manner that adjacent structures, which are to remain, shall not be endangered. The work shall be scheduled so as not to interfere with the day to day operation of the existing facilities, all in accordance with the Sequence of Operations specified in the Specific Provisions. Doorways or passageways in existing facilities shall not be blocked.

Care shall be taken to assure that concrete shall be broken and removed in reasonably small masses. Where only parts of a structure are to be removed, the concrete shall be cut along limiting lines with a specially designed saw so that damage to the remaining structure is held to a minimum.

W-27.02 Requirements Prior to Demolition

The Contractor shall visit the site and inspect all existing structures. Special care shall be taken to observe and record any defects, which may exist in buildings or structures adjacent to but not directly affected by the demolition work. Prior to commencing the demolition, the Contractor shall provide the Engineer with a copy of this inspection.

Drawings of existing structures and equipment will be available for inspection by the Contractor at the office of the Engineer and Owner.

Warning signs, protection barriers and red warning lights shall be provided as necessary adjacent to the work as approved by the Engineer and shall be maintained during the demolition period.

Demolition work shall not be undertaken until all mechanical and electrical services affected by the work have been properly disconnected. Interconnecting piping or electrical services that are to remain in service either permanently or temporarily shall be capped, rerouted or reconnected in a manner that will not interfere with the operation of the remaining facilities.

Where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

W-27.03 Requirements During Demolition

The use of explosives will not be permitted.

All mechanical and electrical equipment shall be carefully protected against dust and debris.

All debris shall be removed from the structures during demolition and not allowed to accumulate in piles.

Safe access to and egress from all working areas shall be provided at all times with adequate protection from falling material.

Adequate scaffolding, shoring, bracing and protective covering shall be provided during demolition to protect personnel and equipment against injury or damage. Floor openings not used for material drops shall be covered with material substantial enough to support any loads placed on it. The covers shall be properly secured to prevent accidental movement.

Adequate lighting shall be provided at all times during demolition.

Areas below demolition work shall be closed to workmen while removal is in progress.

No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effectively protected.

No workmen shall stand on any wall to remove material except when adequate staging or scaffold protection is provided at a distance not exceeding 12 feet below the top of such walls and other reasonable precautions are taken. Whenever a workman is required to work at a height of more than 12 feet above a floor, platform, scaffold or the ground, he shall be equipped with a safety belt with a life line attached.

W-27.04 Disposal of Materials

All debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition shall become the property of the Contractor and shall be removed from the site, except for the items designated by the Engineer to be salvaged.

* * *

SECTION 30 - MISCELLANEOUS PIPE AND FITTINGS

W-30.01 General

Miscellaneous pipe and fittings include polyvinyl chloride (PVC) pipe, copper pipe, steel pipe, and plastic tubing.

W-30.02 Polyvinyl Chloride Pipe

Polyvinyl chloride (PVC) pipe shall be Schedule 80 minimum meeting the requirements of ASTM Des: D 1785, 1254B. All joints and fittings shall be threaded except where flanged joints are shown or required for connection to other piping. Threaded PVC fittings shall be socket welding type, 150-pound class, conforming to ASTM Des: D 2467 and D 2657.

W-30.03 Copper Pipe

Copper pipe shall be Type K or L hard-drawn copper tubing and shall meet the requirements of ASTM Des: B 88.

Fittings shall be of the streamlined, solder joint type, and shall meet the requirements of ANSI Specifications B16.22.

W-30.04 Steel Pipe

Steel pipe shall be galvanized, meet the requirements of ASTM Des: A 53 and shall not be less than Schedule 40. Dimensions of steel pipe shall conform to ANSI B36.10.

Fittings for steel pipe shall be galvanized and shall be made to standard dimensions or as shown. Fittings used in pipelines 2 ☐ inches in diam the requirements of ASTM Des: A 197. The fittings shall conform to ANSI B 16.3. Where galvanized fittings are shown or specified, galvanizing shall meet the requirements of ASTM Des: A 120. Steel flange fittings shall meet the requirements of ANSI B 16.5 for 150-pound standard, except that the flanges shall be plain faced.

All flanges for steel pipe, except blind flanges, shall be of the slip-on welding type with hubs meeting the requirements of AWWA C207 Class B, D, or E suitable for the size of pipe and test pressures specified, and conforming to the requirements of ASTM Des: A 181, Class 1. The flanges shall be attached to the barrel of the pipe with two continuous fillet welds. The flanges shall be attached to the barrel of the pipe with two continuous fillet welds. Blind flanges shall be plain faced and shall conform to ANSI B 16.5, Class 150. All flanges shall be covered and protected during delivery and storage.

Flanged joints shall be made with bolts or bolt studs with a nut on each end. Bolts, stud bolts, and nuts shall meet the requirements of ASTM Des: A 307, Grade B and ANSI B 16.1 unless noted otherwise on the Plans.

Gaskets for flanged joints shall be of rubber with cloth insertion of the full face type meeting the requirements of ANSI B 16.21 and shall be those made by the Garlock Packing Company, Crane Company, U.S. Rubber Company, or equal. Gaskets shall be 1/16 inch thick.

Zinc for galvanizing, zinc coating, and plating shall meet the requirements of ASTM Des: B 6 and shall be at least equal to the grade designated as "Prime Western."

Wrought metals and castings shall be sandblasted or ground smooth. When a smooth coat is required, castings shall be tumbled and all high spots ground flush. Castings shall be normalized to prevent cracking.

Base metal shall be thoroughly cleaned, using only approved solvents and wire brushes, after which it shall be pickled.

Products to be galvanized shall be safeguarded against embrittlement in accordance with ASTM Des: A 143 and against warpage and distortion in accordance with ASTM Des: A 384.

Galvanizing shall be done by the hot-dip process after fabrication, unless otherwise specified in conformance with the appropriate ASTM and American Hot Dip Galvanizers Association, Inc. specifications. The dipping shall not come in contact with or rest upon the dross during the operation.

Galvanizing and coating shall be done in a plant having sufficient facilities to produce the quality of coatings herein specified and ample capacity for the volume of work required. Galvanized material shall be shipped and handled in a manner which will avoid damage to the zinc coating.

Galvanizing shall meet the requirements of ASTM Des: A 120.

W-30.05 Plastic Tubing

Plastic tubing for the air supply line shall be clear vinyl instrument grade tubing with an inside diameter of 3/8 inch and a minimum wall thickness of 0.062 inch. The tubing shall be FAST & TIGHT, Formula PV-2 as manufactured by Parker Hannifin, Kent, Ohio, or equal.

W-30.06 Workmanship

Working drawings, delivery, erection, testing, insulation, and disinfection of miscellaneous pipe and fittings shall meet the applicable portions of similar requirements for ductile iron pipe specified under the respective sections of Workmanship and Materials.

* * *

SECTION 31 - HANGERS AND SUPPORTS

W-31.01 General

Hangers and supports shall include all hanging and supporting devices of metallic construction shown, specified, or required for pipelines, apparatus, and equipment other than electrical equipment. The Contractor's working drawings, as required by the General Provisions hereof, shall show the quantity, type, design, and location of all hangers and supports required.

W-31.02 Materials

Structural and miscellaneous steel, iron castings, cast-iron pipe, and steel pipe used for hangers and supports shall meet the requirements of the applicable Workmanship and Materials sections.

W-31.03 Design

Hangers and supports not detailed on the Drawings shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions with due allowance for expansion and contraction, and shall have springs where necessary. Hangers and supports shall be of standard design where possible, and be best suited for the service required, as approved by the Engineer. Where required, they shall be screw adjustable after installation.

Supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. Sufficient hangers and supports shall be installed to provide a working safety factor of not less than five for each hanger.

All supporting devices shall be designed as to minimize interference with access and movement. The injury hazard shall be considered and minimized in all protruding supporting devices.

On pipes which are covered with heating insulation, hangers and supports shall include proper pipe protection saddles.

Overhead hangers shall be supported by threaded rods properly fastened in place by suitable screws, clamps, inserts, or bolts, or by welding.

Brackets for the support of piping from walls and columns shall be made of welded steel and shall be designed for three maximum loads classified as follows:

Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

When medium or heavy brackets are bolted to walls, backplates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. When the use of backplates is not practicable, the brackets shall be fastened to the wall in such a manner that the safe bearing strength of the wall will not be exceeded.

Pipe rolls or chairs shall be of the cast-iron type. Pipe rolls shall be provided with threaded nuts or with sockets to take threaded rods.

Saddle stands shall be of the adjustable type. Each stand shall consist of a length of steel pipe fitted at the base with a standard threaded cast-iron flange and at the top with an adjustable saddle or roll. The base flanges shall be bolted to the floor foundation or concrete base.

Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with cast-iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.

Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller may be supported on cast-iron, malleable iron, or steel hook, hook plates, rings, or ring plates.

W-31.04 Anchors

Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval by the Engineer.

Anchors for piping shall be of the cast-iron chair type with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

W-31.05 Inserts

Inserts for concrete shall be galvanized and shall be installed in the concrete structures where required for fastening supporting devices. They shall be designed to permit the rods to be adjusted horizontally in one place and to lock the rod nut or head automatically. Inserts shall be recessed near the upper flange to receive reinforcing rods. Inserts shall be so designed that they may be held in position during concrete placing operations. Inserts shall be designed by the rod which they engage.

W-31.06 Painting

Hangers, supports, anchors, and similar devices shall be painted in accordance with the Workmanship and Materials section headed "Painting."

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SECTION 32 - VALVES

W-32.01 General

This section includes all valves to be used on City maintained force mains, City owned pump stations and the Howard F. Curren Advanced Wastewater Treatment Plant. Requirements of this section apply to all valves unless exceptions are shown or stated on the plans or specific provisions.

Plug valves for buried applications shall be provided with mechanical joints. Plug valves for above-ground applications shall be provided with flanged connections.

All force main valves shall be plug valves meeting the requirements of the sub-section “Eccentric Plug Valves.”

Valves 2 inches in diameter and smaller shall be all brass or bronze, except the handwheel, and shall have screwed ends. Valves 2-1/2 inches in diameter and larger shall be iron body, bronze mounted with flanged ends, except that in the smaller sizes, valves may be all bronze at the Contractor's option.

All gate, globe, and angle valves shall have rising stems, unless otherwise specified, and shall open when the nut or handwheel is turned counterclockwise. Each handwheel shall be marked with an arrow and the word "Open.” Each nut shall be marked with an arrow and shall not be greater than 24 inches in depth below finished grade.

All references to “stainless steel” or “SS” shall mean 316 stainless steel.

All valves of the same type shall be from a single manufacturer. Parts of valves of the same type and size shall be interchangeable.

All valves shall be carefully erected in their respective positions, free from all distortion and strain, and shall be packed and left in satisfactory operating condition.

W-32.02 Submittals

The Contractor shall prepare and submit for approval a complete detail drawing of all valves in accordance with the requirements of the General Provisions. At minimum the submittal shall show all proposed material types to be used as well as proposed interior and exterior coating manufacturer, coating type and proposed minimum dry film thickness.

W-32.03 Flanges

Flanges shall be cast solid and faced accurately at right angles to the axis of the casting. Flanges shall be faced and drilled and shop coated with a rust preventive compound before shipment.

Dimensions and drillings of flanges shall meet the requirements of ANSI B16.1 for working pressures of 125 pounds per square inch. Special drillings shall be provided where required.

W-32.04 Gate Valves

Except as otherwise specified, gate valves shall meet the requirements of Fed. Spec. WW-V-54, Class A, 125 pounds.

Gate valves shall have standard stuffing box seals. Bonnet bolts, studs, and nuts shall be cadmium plated. Wedging devices shall be bronze to iron or bronze to bronze as specified. Glands shall be bronze bushed; gland bolts and nuts shall be bronze.

Gate valves 2-1/2-inch diameter and larger shall be of the double disc type. Gate valves 2-inch diameter and smaller may be of the double disc or solid wedge type.

Valves with operating nuts or wheels 7 feet or more above the floor shall be provided with chains and chain wheels.

W-32.05 Globe and Angle Valves

Except as otherwise specified herein, globe and angle valves shall meet the requirements of Fed. Spec. WW-V-51, Class A, 125 pounds.

W-32.06 Hose Valves

Hose valves shall be globe or angle valves with rising stems, and rubber composition discs for cold water pressures up to 200 psi, nonshock.

Hose valves shall be all bronze or brass, except the handwheel which shall be of malleable iron. Hose threads shall conform to ANSI B2.4.

W-32.07 Check Valves

Check valves, unless otherwise specified, shall be APCO Series 6000B Oil Controlled/Bottom Buffer Check Valves as manufactured by APCO, a subsidiary of DeZurik. A Letter of Standardization has been executed for this valve. The letter states that no other valve shall be considered an "or equal" in accordance with the City's standardization program. The "or equal" clause applies to all other equipment, unless specifically excluded by a Single Source Certificate or Letter of Standardization.

Check valves shall have body and body cover of heavily constructed cast iron meeting requirements of AWWA, C508. Check valve body shall have integrally cast-on end flanges. Check valves shall be provided with complete oil cushioning assemblies.

Check valves shall be manufactured so as to have the lever arm and oil cushioning assembly located on the specific side as indicated on the plans. Each check valve shall be equipped with a limit switch (See Electrical Plans & Specifications). Limit switches shall be mounted on the side of the valves as is indicated in the Plans.

The exterior of the check valve shall be factory coated with an approved interior and exterior corrosion resistance coating. The exterior of the check valve shall receive a field coat as indicated for "Steel Pipe and Fittings" in the Workmanship & Materials Section titled "Painting".

W-32.08 Pump-Check Eccentric Plug Valve

Pump-check valves, unless otherwise specified, shall meet the requirements of the sub-section for "Eccentric Plug Valves".

The valve shall be equipped with a G-Series rotary cylinder pneumatic actuator that is properly sized for the existing compressed air system within the pump station.

Plug valves shall be Dezurik PEF (100% Port) eccentric plug valve or approved equal.

W-32.09 Eccentric Plug Valves

Plug valves shall be of the eccentric valve design and shall meet or exceed the requirements of AWWA C517 and shall be designed for 175 PSI 3'-12" and 150 PSI 14"-36". Manufacturer's Name shall be cast in body and Valve shall be serialized for future parts identification. Port area shall be 100% of standard pipe area. The Plug shall be Rectangular with associated Rectangular Port and shall provide dead tight shutoff when seated in the closed position. Body material shall be Cast Iron ASTM A126 Class B, Seats shall be 1/8" thick 95% Nickel and 1/2" wide for proper plug seating. Plug shall be Ductile Iron ASTM A536 and Chloroprene Faced. Bearings shall be sintered, oil impregnated permanently lubricated type 316 stainless steel, include upper and lower grit excluders to prevent grit and foreign solids from entering the bearings. Shaft seals shall be multiple V-ring type and shall be externally adjustable via an air gap and re-packable under pressure without removing the actuator or bonnet from the valve. Valves shall have interior and exterior epoxy.

Plug valves shall be nut operated (1/4 turn) 4" to 8" and gear operated 10" and larger. Both nut and gear operated valves shall have a 2-inch square nut for operation. On pump stations where the valve is 7 feet or more above the floor level, a chain and wheel shall be provided for operation.

Plug valves shall be Dezurik PEF (100% Port) eccentric plug valve or approved equal.

W-32.10 Knife Gate Valves

Valves shall be bonnetless wafer knife gate type with cast single-piece body construction. Lugged ends shall have threaded holes in accordance with ANSI B16.1 125/150 pound standards. Working pressure rating shall be 150 psi in sizes 2"-24". Valve body and gate shall be stainless steel type 316 or as specified. Stem shall be type 304 stainless steel. Valve shall have a round port equal to 100% of the connecting pipe. Valves shall be chloroprene resilient seated or as specified.

The body design shall have no pockets or grooves in the flow port where media can settle and adversely affect closure. The gate shall be polished to provide low thrust requirements and long packing life. The leading edge of the gate shall be beveled to assist in closure. The stem shall be outside of the body and will not contact the flowing media. Valves shall have multi-layer square packing with adjustable packing gland bolting.

All valve bodies shall be tested with water at 150% of rated pressure with no visible leakage. Assembled valves shall be tested for seat leakage with water at 40 psi applied to the back of the gate (pressure in the normal flow direction) and allowable leakage shall be as per MSS SP-81 specifications.

Valves shall be provided with a manually operated direct-mounted handwheel as specified or shown on the construction drawings. Floor stands and extensions shall be provided if specified. Valve superstructures shall be designed to allow easy field interchangeability between manual and pneumatic actuators. New superstructures shall not be required for conversion between manual and pneumatic operators.

Metal surfaces other than stainless steel shall receive a field coat as indicated for "Steel Pipe and Fittings" in the Workmanship & Materials Section titled "Painting".

Valves shall be model GKU by DeZURIK, Inc, or approved equal.

W-32.11 Multiport Valves

Three-way and four-way valves, unless otherwise specified, shall meet the requirements of the sub-section for eccentric plug valves.

W-32.12 Solenoid Valves

Solenoid valves, unless otherwise shown or specified, shall be normally closed packless type with full area ports. The body and bonnet shall be forged brass and the solenoid core shall be stainless steel. The diaphragm shall be of synthetic rubber assuring long service life. The coils shall be designed for 115-volt, 60-hertz operation and shall be embedded in molded plastic in NEMA Type I general purpose enclosure.

W-32.13 Ball Valves

All ball valves shall be Apollo Valves, Model 87A-200 Series, Stainless Steel ANSI 150 Flanged Full Port Ball Valves or shall meet Apollo Valves' published specifications for this unit. Ball valves shall be equipped with Apollo Valves' Standard Features.

W-32.14 Testing

All valves shall be given hydrostatic shop pressure tests at twice the working pressure specified. The valves shall be tested, first by applying the hydrostatic pressure with the valve open and then with the valve closed. The valves shall be tight and secure under the test pressure.

Valves shall be tested in place by the Contractor, as far as practicable, and any defects in valves or connections shall be corrected to the satisfaction of the Engineer.

W-32.15 Painting and Coating

Plug valves shall receive a factory interior and exterior coating of Tnemec Series 141 (4 mils thick).

All other valves shall receive a factory interior and exterior coating of an approved system.

Metal surfaces other than stainless steel shall receive a field coat as indicated for "Machinery and Equipment" in the Workmanship & Materials Section titled "Painting".

Chain wheels shall be coated by galvanizing or electroplating with zinc or cadmium. The chain shall be coated by electroplating with zinc or cadmium. Zinc electroplating shall meet the requirements of Fed. Spec. QQ-Z-325, Type II, Class 2; and cadmium electroplating shall meet the requirements of Fed. Spec. QQ-P-416, Type II, Class 2.

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SECTION 36 - PAINTING

W-36.01 General

Painting includes furnishing all labor, materials, and services to paint all structures and equipment specified and required to complete the work, including, but not limited to, the following: preparation of surfaces; field painting of existing and proposed structures, piping, conduit, ductwork and equipment as specified, and the marking of existing piping and electrical conduit. The work shall include furnishing samples of paints and color charts.

Paint and other materials shall be of the type and quality of the manufacturer on which the coating schedule is based. All coats of paint for any particular surface and thinners used shall be from the same manufacturer. The treatment of the surface to be painted and the application of paint shall be in accordance with the instructions of the manufacturer and as approved by the Engineer. The colors of paints shall be as approved by the Engineer. Specimens, approximately 8 by 10 inches in size, shall be prepared and submitted to the Engineer. The minimum number of specimen custom mixed colors submitted shall be 6 not including color coding colors. Only paint of approved manufacturers shall be delivered and stored at the site.

All painting shall be in accordance with the schedules included in this specification. A supplementary schedule of paint products shall be submitted, with mil thickness, to cover all paint applied. The schedule shall be in accordance with the recommendations of the manufacturer of the paint. The total mil thickness of all coatings shall be not less than the schedule included in this section.

W-36.02 Delivery and Storage

Paints, stains, varnish, or ingredients of paints to be mixed on the job shall be prepared, packed and labeled, and guaranteed by an approved manufacturer. All material shall be delivered to the site in original, unbroken containers.

The manner of and place for storing the painting materials at the site shall be as approved by the Engineer. The storage space shall be kept clean at all times. Every precaution shall be taken to eliminate fire hazards.

W-36.03 Surface Preparation

Prior to painting, all surfaces shall be prepared and cleaned in strict accordance with the paint manufacturer's recommendations and as directed by the Engineer. Surfaces shall be dry before any paint is applied. Special surface preparation work shall be as directed by the manufacturer of the paint specified to be applied to the surface.

Metal Surfaces:

This includes all exterior and interior steel surfaces and all nonferrous metals. This applies to structural and miscellaneous steel, motors, designated housings and protective guards, piping, valves, stairs, and in general, all surfaces to be painted as designated in these specifications.

All surfaces shall be cleaned in accordance with Steel Structures Painting Council standards SSPC - SP1 Solvent Cleaning for removal of grease and oil. This standard allows for pressure washing, detergent cleaning, etc. Additional rust, loose paint, loose mill scale, etc., shall be removed in accordance with SSPC - SP2 Hand Tool Cleaning or SSPC - SP3 Power Tool Cleaning. All welds, beads, blisters or protuberances, other than identification markings shall be ground smooth. Pits and dents shall be filled with a suitable product as approved by the Engineer, and other imperfections shall be removed. Painted edges shall be sanded smooth with adjacent bare metal surfaces.

Where aluminum surfaces come in contact with incompatible metals, lime, mortar, concrete or other masonry materials, these areas shall be given two coats of asphalt varnish conforming to Fed. Spec. TT-V-51F.

Concrete and Wood Surfaces:

Surface preparation of all exterior concrete and wood surfaces shall be pressure washed to remove cobwebs, dirt, dust, and other surface contaminations. Mildew shall be treated with a 22% chlorine solution or otherwise by mixing equal parts solution bleach and water to the affected area. Loose paint and other defects shall be removed by hand; brushing, sanding, chipping or other hand tools or by power; brushes, impact tools, grinders, sanders or other power tools or by any combination thereof. Painted edges shall be sanded smooth to match adjacent bare surfaces.

All interior concrete and wood surfaces including ceilings, walls, and floors shall be cleaned similar to SSPC - SP1 Solvent Cleaning standards. Loose paint and other defects shall be removed by hand; brushing, sanding, scraping, chipping or other hand tools or by power; brushes, impact tools, grinders, sanders or other power tools or by any combination thereof. Painted edges shall be sanded smooth to match adjacent bare surfaces.

Priming shall be performed with Porter Acri-Pro 100, 100% Acrylic, or equal. First and second coats shall be performed with Porter Acri-Shield, 100% Acrylic, or equal. Concrete, concrete masonry, and wood shall be thoroughly dry prior to painting.

W-36.04 Coatings

All paints and similar materials shall be mixed in galvanized iron pans or pails or other approved containers of adequate capacity. All paint shall be stirred thoroughly before being taken from the containers, shall be kept stirred while using, and all ready-mixed paint shall be applied exactly as received from the manufacturer without addition of any kind of drier or thinner, except as specified or as permitted or directed by the Engineer. Successive coats of paint shall be tinted to make various coats easily distinguishable. Undercoats of paint shall be tinted to the approximate shade of the final coat of paint. The paint shall be a minimum temperature of 60 degrees F before application.

Only skilled painters shall be used on the work, and specialists shall be employed where required. Paint shall be applied by brush, roller, or sprayer in accordance with the manufacturer's recommendation. Finished surfaces shall not show brush marks or other irregularities. Top and bottom edges of doors shall be painted. Undercoats on hollow metal work shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal abrasive to remove all surface defects and provide a smooth, even surface.

Painting shall be a continuous and orderly operation to facilitate adequate inspection. All paint application methods shall be in accordance with the instructions of the paint manufacturer and as approved by the Engineer. Access panels, pipes, pipe covering, ducts, and other building appurtenances built into or adjoining walls to be painted shall be painted the same color as adjacent walls, unless otherwise directed by the Engineer. Hardware and accessories, fixtures, and similar items placed prior to painting shall be removed or protected during painting and replaced on completion of painting. All wall surfaces to be concealed by equipment shall be painted before installation of the equipment.

Areas under and adjacent to painted work shall be fully protected at all times and dripped or splattered paint shall be promptly removed. Painting shall not be done when the temperature is below 60 degrees F, or in dust-laden air, or until moisture on the surface has completely disappeared. If necessary, sufficient heating and ventilation shall be provided to keep the atmosphere and all surfaces to be painted dry and warm until each coat of paint has hardened. Any painting found defective shall be removed and repainted or touched up as directed by the Engineer.

Coatings must be allowed to cure before being recoated or placed into service. Drying time requirements recommended by the manufacturer should be followed exactly.

The final colors shall be as selected by the Engineer from the manufacturer's color charts.

Coverage shall be complete. When color on undercoats shows through the final coat of paint, the work shall be covered by additional coats until the paint is of uniform color and appearance and coverage is complete, at no additional cost.

Rooms or areas being painted shall be supplied with sufficient temporary ventilation during painting operations to keep the atmosphere safe from harmful or dangerous fumes and harmful dust levels for personnel.

All application tools and equipment shall be in good working order and suitable for proper applications. It shall be the Contractor's responsibility to ensure that no paint mist or spatter falls or blows to other objects, vehicles, equipment, buildings, etc.

Coating Schedule:

All painting shall be in accordance with the following schedule, unless otherwise directed by the Engineer. The number of coats shall not be less than the number shown on the schedule.

COATING SCHEDULE					
			Coats		
Class of Work - Metal Surfaces	**Pretreatment**	**Primer**	**1ST**	**2ND**	**3RD**
Copper Piping		C	K	K	
Electrical Conduit	N/A	N/A	N/A		
Steel/Iron Pipe, Valves, and Fittings		C	K	K	
Ductile Iron Pipe, and Fittings (In Pumping Station Wet Well)		E	G	G	
Miscellaneous Steel and Ironwork		C	K	K	
Machinery, Interior, and Nonsubmerged		C	K	K	

The designations in the following list are given solely for the purpose of indicating the type and quality of materials desired. Approved equivalent material of other manufacturers may be substituted. All coats of paint for any particular surface shall be from the same manufacturer.

ALPHABETICAL DESIGNATIONS OF PRODUCTS		
Symbol	**Product Name and Number**	**Minimum Dry Film Thickness Mils per Coat**
A	Porter International Alumiprep 33	N/A
C	Tnemec Series 1 Omnithane	3.0
E	Tnemec N140 Pota-Pox Plus	6.0
F	Not Applicable	N/A
G	Tnemec Series 46H-413 Hi-Build Teneme-Tar Epoxy - Coal Tar	9.0
H	Porter International Acrylic Exterior Paint 520	2.0
I	Porter International I.A-24 Gloss Finish 241D	1.5
K	Tnemec Series 446 Perma-shield	8.0
N	ZRC Cold Galvanizing Compound	1.5

This paint schedule may vary to suit the current product recommendations of the manufacturer's technical representative. All products shall be suitable for industrial application at an urban stormwater pumping facility.

W-36.05 Safety

The Contractor shall be responsible for exercising all necessary precautions to ensure that no accidents or damage to personnel, equipment, or buildings shall occur. The Contractor shall further determine any special operations which could influence the safe workmanship of his personnel with respect to electrical, mechanical, or chemical fumes or fire hazard situations.

When painting in confined areas or otherwise in areas where explosive fumes or gases need to be ventilated, the Contractor shall use suction type fans designated specifically for the safe removal of explosive fumes or gases, and all equipment involved shall meet all OSHA (Occupational Safety Hazard Act) requirements and MSHA (Mine Safety and Health Administration) approved. The Contractor shall be responsible in all respects for the safe conduct of his personnel when using any of the rigging or equipment involved in the accomplishment of the work specified herein.

W-36.06 Cleaning

The Contractor shall touch up and restore any damaged finish. Paint or other finishes spilled, splashed, or splattered shall be removed from all surfaces. Care shall be taken not to mar any surface finish or item being cleaned.

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SECTION 38 - SEWAGE PUMPING EQUIPMENT

W-38.01 General

Sewage pumping equipment shall include the installing of totally submersible, electrically operated sewage pumps complete with all accessories and appurtenances necessary for a complete installation in the pumping station.

Each pump shall be a Xylem Flygt Pump, and shall comply with the drawings and specifications for this project. A single source certificate of conditions and circumstances was executed for this pump. The certificate states that no other pump shall be considered an "or equal" for this project in accordance with the City's standardization program. The "or equal" clause applies to all other equipment in this project, unless specifically excluded by a single source certificate or letter of standardization.

Each pump shall have a substantial guide bracket to permit vertical sliding along not less than two unthreaded stainless steel guide rails from an automatic pump discharge connection at the bottom of the wet pit to the wet pit access cover for inspection, maintenance, and removal of the pump without requiring personnel to enter the wet pit. The pump shall be easily removable from the guide rails and shall require no bolts, nuts, or other fasteners to be disconnected. The guide brackets shall be of stainless steel and shall be an integral part of the pumps. The guide rails shall be Type 304, Schedule 40 stainless steel pipe and shall be connected to the automatic pump discharge connection at the bottom and supported at the top by substantial stainless steel brackets bolted to the concrete sides of the wet pit access opening. The automatic pump discharge connection shall be cast-iron, flanged by plain-end, 90 degree vertical bend with an integral cast-iron support. The support shall be bolted to the floor with not less than four, 3/4-inch diameter stainless steel anchor bolts cast into the concrete. The pump volute discharge shall have a machined flange, which when the pump is lowered into pumping position will automatically and firmly mate with the plain-end of the discharge connection without the need of adjustment, fasteners, clamps, or similar devices. No motion other than vertical shall be required to seat the mating flange of the pump volute to the discharge connection. Sealing of the discharge interface shall be accomplished by only metal contact and the use of a diaphragm, O-ring, or other device will not be permitted. The pump, with its appurtenances, shall be capable of continuous submergence under water without loss of watertight integrity to a depth of 65 feet. No portion of the pump shall bear directly on the floor of the wet pit. Each pump shall fitted with a tall stainless steel lifting handle and a stainless steel welded link chain of adequate length to permit the raising and lowering of the pump for inspection and removal.

W-38.02 Pump Characteristics

SEE SPECIFIC PROVISIONS

W-38.03 Construction

The stator casing, oil casing, sliding bracket, volute, and impeller of each pump shall be of hard, close grained gray cast iron. All surfaces coming into contact with sewage shall be protected by a coat of Nylon-II, heat fused to the metal. All external bolts and nuts shall be of stainless steel.

The impeller of each pump shall be of non-clog design capable of passing a 3-inch spherical solid, fibrous material, and heavy sludge and shall be constructed with long throughlet without acute turns. The impeller shall be statically and dynamically balanced. Static and dynamic balancing operations shall not deform or weaken the impeller. The impeller shall be firmly secured to the shaft by a stainless steel key and lock nut in such a way that it cannot unscrew or become loosened due to torque resulting from rotation in either direction.

A renewable Buna-N rubber wearing ring shall be installed at the inlet of each pump to provide protection against wear to the impeller.

Each pump shaft shall be of stainless steel conforming to ASTM Des: A 582, Type 416. The shaft shall be accurately machined and polished and of sufficient diameter to carry the maximum load imposed, to assure rigid support of the impeller and to prevent excessive vibration at all operating speeds. The shaft shall be provided with two guide bearings of the ball type of ample size to carry the loads imposed under continuous service without overheating.

Each pump shall be provided with a tandem double mechanical seal running in an oil reservoir having separate, constantly hydro-dynamically lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper seal unit between the oil sump and motor housing shall contain one stationary tungsten-carbide ring and one positively driven rotating carbon ring. Each interface shall be held in contact by its own spring system supplemented by external liquid pressures. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. Shaft seals without positively driven rotating members or conventional double mechanical seals with a common single or double spring acting between the upper and lower units, requiring a pressure differential to offset external pressure and effect sealing shall not be considered acceptable nor equal to the dual independent seal system specified. The shaft sealing system shall be capable of operating submerged to depths of or pressures equivalent to 65 feet. No seal damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

The pump motors shall be housed in an air-filled watertight casing and shall have Class F moisture resistant insulation. The temperature at any point in the windings shall not exceed 155 degrees C at any load which could be imposed by the pump at any point on its curve. The motors shall be 460-volt, 3-phase, 60-hertz, squirrel-cage induction motors. Each motor shall have a minimum full load efficiency of 85 percent and a minimum full load power factor of 80 percent. Each motor shall be U.L., Inc. or Factory Mutual Engineering Corporation listed for installation and operation in a Class I, Division 2, Group C and D hazardous locations. Each motor shall have a facility for winding high temperature alarm. Each motor shall be provided with a leakage sensor to provide an alarm indication prior to liquid reaching the stator coils. The pumps shall not load the motor beyond its nominal (nameplate) rating at any point on the pump curve. Each pump motor shall be furnished with a minimum service factor of 1.15 or the horsepower rating of the motor shall be a minimum of 15 percent greater than the maximum BHP required over the full range of the pump curve. Electrically and mechanically each pumping unit (pump and motor) shall be capable of a minimum of ten (10) starts per hour.

The motor cable entry water seal shall be such that precludes specific target requirements to ensure watertight and submersible seal. Epoxies, silicones, or other secondary sealing systems shall not be required or used. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board which shall isolate the motor interior from foreign materials gaining access through the pump top. The pump motor cable shall be suitable for submersible pump applications, and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be adequate size to allow motor voltage conversion without replacing the cable.

All mating surfaces of major parts shall be machined and fitted with nitrile O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression in two planes and O-ring contact made on four surfaces, without the requirement of specific torque limits to affect this. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered adequate or equal. Tolerances of all parts shall be such that allows replacement of any part without additional machining required to ensure sealing as described above. No secondary sealing compounds, greases, or other devices shall be used.

Each unit shall be provided with an adequately designed cooling system. Thermal radiators integral to the stator housing, cast in one unit, are acceptable. Where water jackets alone or in conjunction with radiators are used, separate circulation shall be provided. Cooling media channels and ports shall be non-clogging by virtue of their

dimensions.

W-38.04 Field Tests

After installation of the pumping units, control equipment, and all appurtenances, each pumping unit will be subjected to a field running test of not less than 24 hours duration under actual operating conditions. The field test shall be made by the Contractor in the presence of and as directed by the Engineer. The field test shall demonstrate that under all conditions of operation, each unit:

1. Had not been damaged by transportation or installation.
2. Has been properly installed.
3. Has no mechanical defects.
4. Is in proper alignment.
5. Has been properly connected.
6. Is free of overheating of any parts.
7. Is free of all objectionable vibration.
8. Is free of overloading of any parts.

The tests shall also demonstrate that the control systems perform as specified and meet all operating criteria.

Any defects in the equipment or operating controls or failure to meet the requirements of the Specifications shall be promptly corrected by the Contractor.

W-38.05 Service

Authorized service facilities must be available in Florida. The pump supplier will stock at the facility one set of recommended spare parts as described below for the pumps specified in this Contract.

Inspection Plug Washers
Impeller Bolt
Impeller Key
Upper Bearing
Lower Bearing
Upper Mechanical Seal
Lower Mechanical Seal
Wear Rings
Motor Cable
Cable Entry Washer/Grommet
Complete Set of O-rings

W-38.06 Spare Parts

One complete set of mechanical seals shall be furnished for each different model of pump furnished in this Contract (unless otherwise specified on the Plans).

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SECTION 45 - ELECTRICAL

W-45.01 Scope of Electrical Work

The work consists of furnishing all labor, materials, equipment, transportation, and performing all operations required to support the installation and commissioning of the electrical portion of the HFC AWTP RAW SEWAGE PUMPING STATION IMPROVEMENTS. The work includes, but is not limited to, the following:

1. Submit working drawings, parts schedules and cut-sheets to the Engineer.

2. Furnish and install all equipment, controls and instrumentation as shown on the Plans and described in the Specifications.

   Specifically:

   A. DEMOLITION

      1) Prior to demolition, the proposed Switchgear, Motor Control Centers, AFDs, and associated equipment shall be on site and ready for installation. Three (3) 60kW portable diesel Engine Generators (E/G) shall be provided and installed to provide temporary power to the facilities described in the Contract Documents. The Contractor may rent the E/G or use equipment from his inventory. The Contractor shall also supply and install any and all circuit breaker panelboards, combination starters, cabling, etc. that may be required to facilitate the temporary load connections. The Contractor shall submit shop drawings and cut sheets detailing his temporary power system proposal for Engineer's approval. The Contractor shall be fully responsible for maintaining power at all times to the said facilities and performing all associated maintenance functions.

         If during his preconstruction investigation, the Contractor uncovers an alternate method for supplying temporary power to all, or part of, the required loads; he will notify the Engineer, in writing, through the RFI process. After Engineer's preliminary approval, the Contractor shall submit shop drawings and cut sheets for the proposed temporary power system as well as the amount of credit offered to the City for final approval.

      2) Verify existing Power / Instrumentation / Control connections in the field prior to commencing demolition work. The Contractor shall reroute or make other accommodations for any unforeseen wiring passing through conduits or enclosures, scheduled for demolition, that must remain in service for proper operation of other systems. Coordinate Instrumentation / Control connections with City Personnel.

3) In the Raw Sewage Pumping Station Control Room: Label all main and feeder conductors attached to the existing Switchgear 60A (SG-60A) that are to be reconnected to the new Switchgear. Remove existing SG-60A and prepare existing concrete pad as required to install the new switchgear.

4) In the Raw Sewage Pumping Station Control Room: Label all feeder conductors attached to the existing Motor Control Centers MCC-65A and MCC-65B that are to be reconnected to the new MCC. The main conductors from SG-60A shall be replaced. Remove existing MCC-65A and MCC-65B and prepare existing concrete pad as required to install the new MCC.

5) In the Raw Sewage Pumping Station Control Room: Label the motor conductors attached to the existing Adjustable Frequency Drives (AFDs) that are to be reconnected to the new AFDs. Remove existing Wet Well Level Controls, and Programmable Controller (PLC) cabinets. Prepare existing concrete pad as required to install the new MCC-64.

6) In the Raw Sewage Pumping Station Control Room: Carefully remove existing Automatic Transfer Switch (ATS) and turn over to City for maintenance inventory.

7) In the Raw Sewage Pumping Station Control Room: Carefully remove existing Wastewater Flow Meter Transmitter (FIT) from current location. Transmitter shall be relocated to new PLC cabinet.

8) In the Raw Sewage Pumping Station Wet Well Area: Carefully remove the existing Exhaust Fan Disconnect Switch from its current location. Disconnect Switch shall be relocated as shown.

B. INSTALLATION

1) In the Raw Sewage Pumping Station Control Room: After modifying and preparing the concrete housekeeping pad to suit the proposed Switchgear 60A (SG-60A), install Switchgear and make cable connections as shown.

2) In the Raw Sewage Pumping Station Control Room: After modifying and preparing the concrete housekeeping pad to suit the proposed MCC-65A & MCC-65B, install MCCs and make cable connections as shown.

3) In the Raw Sewage Pumping Station Control Room: After modifying and preparing the concrete housekeeping pad to suit the proposed MCC-64, install MCC and make cable connections as shown.

4) In the Raw Sewage Pumping Station Control Room: Provide and install the following equipment on the west wall: Sewage Screen SS1

control enclosure, SS1 Automatic Transfer Switch (power seeking ATS), Screen Spray Water Flow Transmitter (FIT-1), and all necessary conduits, conductors, & grounding as shown, specified, and required. This area in not classified– uncoated rigid aluminum conduit may be used.

5) In the Raw Sewage Pumping Station Control Room: Relocate existing Wastewater Flow Meter Transmitter (FIT) to new PLC cabinet.

6) Provide and install conduit and conductors extending from the newly installed equipment to the existing SCADA RTU as shown, specified, and required. City of Tampa Instrumentation Personnel will make any required modifications to the RTU, and make the final RTU connections.

7) In the Raw Sewage Pumping Station Wet Well Area: Sewage pumps P1 & P4 shall remain, with modifications, under this Contract. See Contract Drawings for details.

8) In the Raw Sewage Pumping Station Wet Well Area: Sewage pumps P2 & P3 shall be replaced under this Contract. See Contract Drawings for details.

9) In the Raw Sewage Pumping Station Wet Well Area: Make proposed modifications to existing sewage pump Disconnects and Terminal Boxes as shown on the Contract Drawings.

10) In the Raw Sewage Pumping Station Wet Well Area: Relocate and reconnect the existing wet well Exhaust Blower Disconnect as shown on the Contract Drawings.

11) In the Raw Sewage Pumping Station Wet Well Area: Provide and install the following equipment related to Wastewater Screening: Automatic Bar Screen, Screen Motor Disconnect, Washer / Compactor, Compactor Motor Disconnect, Local Control Station, Sluice Water Level Detector, Alarm Float Switch, Screen Spray Water Flow Meter (FE-1), Motorized Operators for Screen Water Valve, Compactor Water Valve & Sluice Water Valve and all necessary conduits, conductors, & grounding as shown, specified, and required. All proposed conduits, boxes, and fittings installed near the wet well area shall be PVC coated rigid aluminum.

C. All removed equipment shall remain the property of the City and shall be removed from the premises and disposed of properly as directed by the City.

D. Perform a Short Circuit and Coordination Study as detailed in Section 16085 of the Specifications. The study shall be used to determine the proper settings for the Switchgear 60A circuit breaker, etc.

E. Provide and install stainless steel channel erector systems to mount and support enclosures, boxes, conduits and other equipment.

F. All electrical work shall be performed in accordance with the 2011 National Electrical Code (NEC) and Chapter 5 of the City of Tampa Code.

W-45.02 General Requirements

1. Codes: Any conflicts between the Specifications and Drawings or with the regulations of local codes, public utility company, or the National Electrical Code or the National Electrical Safety Code shall be promptly brought to the attention of the Engineer for clarification. All materials and work shall be in accordance with said standards.

2. Contract Documents: The drawings are generally diagrammatic not necessarily showing in detail all of the minor items and it shall not be interpreted to mean that any minor item required may be omitted. The Contractor shall make use of all the data in all of the Contract Documents and shall verify all information at the site which may influence his proposal. The Contractor shall obtain all necessary shop drawings and shall consult manufacturer's representatives during installation startup as needed.

3. Tests: The Contractor shall provide all necessary instruments and special apparatus to conduct any test that may be required to ensure that the system is free of all improper grounds and short circuits. These tests shall be conducted in the presence of the Engineer prior to final acceptance.

4. Guarantee: The Contractor shall submit a written guarantee to the City that all electrical work and material provided under this Contract is free from defects for a period of two (2) years after final acceptance of the job. There will be no additional charge to the City to repair or replace any such work which is found to be defective within the guarantee period.

5. Materials and Equipment: All materials and equipment shall be new and shall bear the manufacturer's name, date of manufacture, trade name, and the UL label. Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection.

6. Operation and Maintenance Manuals: Supply nine sets of operational and maintenance manuals and one complete set of blue line Contract Drawings marked in red reflecting all as-built information.

7. Test Documentation: Test all equipment and document tests.

W-45.03 Execution of Work

All work shall be executed in a neat and workmanlike manner by experienced and capable electricians so as to present a neat installation upon completion.

The execution of work on one drive system shall not interfere with the normal operation of the remaining pumps and drives.

Electrical work shall be coordinated so as not to interfere with or delay other construction operations.

The ends of all conduits shall be carefully reamed free from burrs after threading and before installation. All cuts shall be made square. All joints shall be made up tight. Care shall be taken to see that all control and power conduits are grounded as required by the NEC and Chapter 5 of the City of Tampa Code, Building and Construction Regulations.

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SECTION 46 – SCREENING EQIUIPMENT CONTROLS

W-46.01 General

Control components shall comply with the latest ANSI, IEEE, and NEMA standards where applicable.

Maximum control voltage shall be 120 VAC, 60 Hertz.

Control devices shall be of industrial grade, heavy-duty design, utilizing modular construction to increase flexibility.

W-46.02 Sewage Screen Variable Frequency Drives (VFD)

Provide all labor, materials, equipment and incidentals required; and install, place in operation and field-test the Variable Frequency Drive equipment.

1) **Acceptable Manufacturers:** The Variable Frequency Drive shall be Yaskawa Electric America model CIMR-VU4A0004BAA. The Wastewater Department has officially standardized on this name brand and no alternates will be considered. The Standardization Certificate of Conditions and Circumstances is included hereinafter.
2) **Ratings:** Heavy Duty; 480 Volt 3-phase input, 3.4 Amp. output
3) **Performance Features:**
   a) Overload Capacity: 150% for 60 sec. (Heavy Duty)
   b) Control Methods: V/f Control, Open Loop Current Vector Control, PM Open Loop Current Vector Control Simple closed loop speed control
   c) DC Injection Braking, ramp to stop
   d) Electronic Reversing
   e) Adjustable Accel/Decel: 0.01 to 6000 seconds
   f) Controlled speed range: 40:1 (V/f mode); 100:1 (open-loop vector mode)
   g) Speed Regulation: ± 0.5 to 1% with slip compensation (V/f mode); ± 0.2% (open-loop vector mode)
   h) Displacement Power Factor: 0.98
   i) Output Frequency: 0 to 400 Hz
   j) Frequency Resolution: 0.01 Hz with digital reference; 0.06 / 60 Hz with analog reference
   k) Frequency Accuracy: 0.01% with digital command; 0.5% with analog command
   l) Volts / Hertz Ratio: infinitely adjustable pattern
   m) DC Injection Braking: adjustable amplitude, duration, current limited
   n) Torque Boost: full range, auto
   o) Power Loss Ride-Thru: 0.5 sec.

p) Speed search
q) Auto restart
r) 3 Critical frequency rejection settings
s) Slip Compensation
t) Energy Savings Function
u) Enhanced PID with loss of feedback function

4) **Protective Features:**

a) Current Limit, Stall Prevention During Accel, Decel, And Run
b) Motor And Drive Overload
c) Over Voltage Prevention Function
d) Instantaneous Over Current
e) Short Circuit
f) Under Voltage
g) Heatsink Overheat
h) Ground Fault Protection
i) Over/Under Torque
j) Short Circuit Current Rating: 30kA RMS Sym.

5) **Design Features:**

a) Dual microprocessor logic
b) Digital keypad operator, 5 digits
c) LED status display
d) Remote Mount Keypad Capability
e) RJ-45 Style Digital Operator Connector
f) 7 multifunction digital inputs
g) 3 multifunction digital outputs
h) Hardwire Baseblock (EN954-1 Cat. 3)
i) Programmable form C output contact for customer use: 1A at 250 VAC or 30 VDC
j) 24 VDC control logic compatible with sourcing or sinking outputs (PNP or NPN)
k) Carrier frequency: 15 kHz max; swing PWM
l) 16 multi-speed settings plus jog speed
m) 2 Remote Speed References: 0-10 VDC (20 kOhms) or isolated 4-20 mA (250 Ohms)
n) Signal Follower: bias and gain
o) 2 programmable open collector outputs
p) Analog Monitor Output: 0-10 VDC proportional to output frequency or output current
q) Approx. 400 parameters & monitors
r) Digital pulse train input (33 kHz max.)
s) Cooling fan controlled by drive run/stop

t) RS-422/485 MODBUS 115 kbps
u) UL recognized electronic overload
v) MTBF 28 years
w) Built-in Dynamic Braking Transistor
x) NEMA 1 Enclosure
y) Side-by-Side mounting
z) Application Presets
aa) Maintenance monitors

6) **Service Conditions:**

a) Ambient Service Temperature: -10° to 40°C (14° to 105°F) NEMA 1; -10° to 50°C (14° to 122°F) Open Chassis
b) Ambient storage temperature: -20° to 60°C (-4° to 140°F)
c) Humidity: to 95% non-condensing
d) Altitude: to 3300 ft; higher by derating
e) Service factor: 1.0
f) Input voltage: -15% to +10%; 380 to 480 VAC
g) Input frequency: +/-5%; 50/60 Hz
h) Input Phase sequence insensitive

W-46.03 Dual Analog Input Process Meter / Controller

The Dual Analog Input Process Meter / Controller shall be used for providing indication of the upstream, downstream, and differential wet well levels, and providing output signals used by the Wastewater Screen Controller. The basis of design: Precision Digital Corporation ProVu Series model PD6060-6R7.

1) **Physical:**

a) Main Display: 0.60" (15 mm) red LED, 6 digits (-99999 to 999999), with leading zero blanking.
b) Second Display: 0.46" (12 mm) red LED, 6 digits (-99999 to 999999), with leading zero blanking.
c) Display Intensity**:** Eight user selectable levels
d) Front Panel: NEMA 4X, IP65; with panel gasket
e) Enclosure: 1/8 DIN, high impact plastic
f) Operating Temperature: -40 to 65°C

2) **Performance Features:**

a) Display Update Rate: 5/second (200 ms)
b) Overrange: Display flashes 999999
c) Underrange Display flashes -99999

d)	Display Assignment:	The main (Big) and second (Little) displays may be assigned to process values for Channels A (Ch-A), B (Ch-B), or C (Ch-C), toggle between (Ch-A & Ch-B, Ch-A & Ch-C, Ch-B & Ch-C, and Ch-A, Ch-B, & Ch-C), toggle between Channel & units, show channel gross value (no tare) or toggle net (tare) and gross values, show relay set points, max & min values, or Modbus input. The second display may also be set to show engineering units or be off, with no display.
e)	Calibration:	All ranges shall be calibrated at the factory.
f)	Max/Min Display:	Max/min readings reached by the process are stored until reset by the user or until power to the meter is turned off.
g)	Password:	Three programmable passwords restrict modification of programmed settings. Pass 1: Allows use of function keys and digital inputs, Pass 2: Allows use of function keys, digital inputs and editing set/reset points, Pass 3: Restricts all programming, function keys, and digital inputs.
h)	Non-Volatile Memory:	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
i)	Process Inputs:	Two inputs, each separately field selectable: 0-20, 4-20 mA, ±10 V (0-5, 1-5, 0-10 V), Modbus PV (Slave)
j)	Channels:	Channel A, Channel B, Channel C (Math channel)
k)	Connections:	Removable screw terminal blocks accept 12 to 22 AWG wire, RJ45 for external relays, digital I/O, and serial communication adapters.
l)	Accuracy	±0.03% of calibrated span ±1 count, square root & programmable exponent accuracy range: 10-100% of calibrated span
m)	Temperature Drift:	0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient.
n)	Signal Input Conditioning:	Linear, square root, programmable exponent, or round horizontal tank volume calculation.
o)	Decimal Point:	Up to five decimal places or none: d.ddddd, d.dddd, d.ddd, d.dd, d.d, or dddddd
p)	Calibration Range:	Input 1 & Input 2: 4-20 mA, 0.15 mA minimum span; ±10 V, 0.10 V minimum span. An Error message will appear if the input 1 and input 2 signals are too close together.
q)	Input Impedance:	Voltage ranges: greater than 500 kΩ Current ranges: 50 - 100 Ω (depending on resettable fuse impedance)
r)	Input Overload:	Current input protected by resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.

s) Relay Output: 4 SPST (Form C) rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads. Deadband is 0-100% of span, user programmable. User may program any alarm for high or low trip point. Unused alarm LEDs and relays may be disabled (turn off).

Relay Operation: Automatic (non-latching); Latching (requires manual acknowledge); Sampling (based on time); Pump alternation control (2 to 8 relays); Off (disable unused relays and enable Interlock feature); Manual on/off control mode.

Relay Reset: User selectable via front panel buttons or digital inputs. 1.) Automatic reset only (non-latching), when the input passes the reset point. 2.) Automatic + manual reset at any time (non-latching) 3.) Manual reset only, at any time (latching) 4.) Manual reset only after alarm condition has cleared (L). Note: Front panel button or digital input may be assigned to acknowledge relays programmed for manual reset.

Time Delay: 0 to 999.9 seconds, on & off relay time delays Programmable and independent for each relay

Fail-Safe Operation: Programmable and independent for each relay. Note: Relay coil shall be energized in non-alarm condition. In case of power failure, relay will go to alarm state.

Auto Initialization: When power is applied to the meter, relays will reflect the state of the input to the meter.

t) Analog Output: Isolated 4-20mA, Output Source: Process channel A, B, or C, max or min for channel A, B, or highest or lowest max or min of A and B, set points 1-8, Modbus input, or manual control mode

Accuracy: ± 0.1% of span, ± 0.004 mA

Temperature Drift: 0.4 µA/°C max from 0 to 65°C ambient, 0.8 µA/°C max from -40 to 0°C ambient.

3) **Programming:**

a) Programming Methods: Four front panel buttons, digital inputs, PC and MeterView Pro software, Modbus registers, or cloning using Copy function.

b) Programmable Constants: Constant P (Adder): -99999 to 999999, default: 0.000; Constant F (Factor): 0.00001 to 999999, default: 1.000

c) Math Functions: Addition, Difference, Absolute diff., Average, Multiplication, Divide, Max of A or B, Min of A or B, Draw, Weighted avg., Ratio, Concentration.

d) Sequence of Operations for Input Programming:
1.) Select Input for A and B; 2.) Set up the engineering units for A, B, and C; 3.) Set up decimal point for A, B, and C 4.) Scale A & B; 5.) Set up the displays for A, B, or C; 6.) Select the transfer function for A & B (e.g. Linear); 7.) Select Math function for Channel C; 8.)

Program constants for Factor (F) and Adder (P). 9.) Program cutoff values for A and B.

4) **Power Supply:**

a) 85-265 Vac, 50/60 Hz; 20 W max .

W-46.04 Digital Universal Input Meter / Relay

The Digital Universal Input Meter / Relay used for monitoring Washer/Compactor Motor current shall be provided with two relay outputs, a 24Vdc transmitter supply, and be suitable for panel mounting. Basis of design: Precision Digital Corporation Trident model PD765-6R2-10.

1) **Physical:**

a) Display: 0.56" (14.2 mm) red LED, 4 digits (-1999 to 9999)
b) Display Intensity**:** Eight user selectable levels
c) Front Panel: NEMA 4X, IP65; with panel gasket
d) Enclosure: 1/8 DIN, high impact plastic
e) Operating Temperature: 0 to 65°C

2) **Performance Features:**

a) Display Update Rate: 3.7-5/sec
b) Noise Filter: Programmable 2 to 199 (0 will disable filter)
c) Overrange: Display flashes 9999
d) Underrange: Display flashes -1999
e) Calibration: All inputs are calibrated at the factory
f) Max/Min Display: Stored until reset by user or meter is turned off.
g) Password: Restricts modification of programmed settings.
h) Non-Volatile Memory: Settings stored for a minimum of 10 years.
i) Process Inputs: 0-20 mA, 4-20 mA, 1-5 V, ±10 V
j) Accuracy: ±0.05% FS ±1 count
k) Calibration Range: User programmable over entire range of meter
l) Input Overload: Protected by automatically resettable fuse
m) Sensor Break: All relays and alarm status LEDs go to alarm state.
n) Isolated 4-20 mA Transmitter Output
o) Output Relays: 2 Form C (SPDT); rated 3 A @ 30 VDC or 3 A @ 250 VAC resistive load; 1/14 HP(≈ 50 watts) @ 125/250 VAC for inductive loads such as contactors, solenoids, etc.

3) **Programming:**

a) Four front panel buttons, cloning with Copy feature, PC with MeterView or LabVIEW software, and Modbus registers.
b) Deadband: 0-100% FS, user selectable

c) High or Low Alarm: User may program any alarm for high or low.

d) Relay Operation: 1). Automatic (non-latching) 2). Latching 3).Pump alternation control

e) Relay Reset: User selectable via front panel buttons or PC 1). Automatic reset only (non-latching) 2). Automatic plus manual reset at any time (non-latching) 3). Manual reset only, at any time (latching) 4). Manual reset only after alarm condition has cleared (latching)

f) Time Delay: 0 to 199 seconds, on and off delays; programmable

g) Fail-Safe Operation: Programmable, independent for each relay. Relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state.

h) Auto Initialization: When power is applied to the meter, relays will reflect the state of the input to the meter.

4) **Power Supply:**

a) 85-265 Vac, 50/60 Hz; 20 W max .

W-46.05 Switches and Push Buttons

Switches and push buttons shall be heavy-duty, oil-tight, watertight, NEMA Type 4X, corrosion resistant units intended for industrial applications. The operator shall mount in a 1.20-inch diameter opening and be provided with the proper legend plate.

Switches and push buttons shall be as manufactured by Square D, General Electric, Allen-Bradley, or equal.

W-46.06 Pilot Lights

Pilot lights shall be heavy-duty, oil-tight, NEMA Type 4X, corrosion resistant, push to test, 120 VAC light emitting diode (LED) type, and intended for industrial applications. The operator shall mount in a 1.20-inch diameter opening and be provided with the proper legend plate and lens color.

Pilot lights shall be as manufactured by Square D, General Electric, Allen-Bradley, or equal.

W-46.07 Circuit Breakers

Circuit breakers shall be of the molded case, air-break type designed for 600 volt, 60 Hertz service or as shown on the Drawings. They shall have both thermal and magnetic elements on all three poles. These elements will actuate a common tripping bar to open all poles when an overload or short circuit occurs.

The circuit breakers shall have an AIC rating greater than the available fault current at the panel.

The equipment shall be as manufactured by Square D, General Electric, Cutler-Hammer or equal.

W-46.08 Control Enclosure and Panel

The control enclosure shall be rated NEMA 12 and be constructed of minimum 14 gauge, steel. The door shall have a handle with padlock provisions and three point latch mechanism. The door shall be provided with a positive stop mechanism to prevent it from closing while controls are being serviced. Stiffeners shall be provided on the enclosure and door as necessary to provide rigidity. The closing surfaces shall have rolled lips. The outside of enclosure shall be painted gray. All hardware shall be heavy-duty, stainless steel. A print pocket shall be provided on the inside of the door. The enclosure dimensions are custom, and shall be as shown or required.

The panel shall be 12 gauge steel and sized to be accommodated by the enclosure. The periphery of the panel shall be formed to provide a 0.75 inch stiffener frame. The panel shall be primed, painted with white enamel and baked, after forming.

The enclosure and panel shall be as manufactured by Quality Metals, Hoffman Engineering, or equal.

W-47.09 Miniature Industrial Control Relay

Miniature Industrial Control Relays shall have the following features:

1. Conform to IEC/EN 61810-1 (ISS. 2), UL 508, and CSA C22-2 No. 14 standards
2. 120 VAC, 60 Hertz, 1.2 VA avg. consumption, coil.
3. Three-pole— three (3) N.O. and three (3) N.C. silver/nickel alloy contacts rated 10A at 250VAC
4. Spring return test button for testing contacts
5. LED indication of relay status
6. Mechanical indication of relay status
7. Plug-in protection module to protect against electrical spikes
8. Surface or DIN rail mounting
9. Mechanical life of 10 million operations

The industrial control relay shall be Telemecanique, model RXM3AB2F7 with sockets and hold-down springs, or equal.

W-46.10 General Purpose Control Relays

Relays for general control switching applications shall have the following features:

10. 120 VAC, 60 Hertz, 2 VA nominal, coil.
11. Two (2) Form C (2PDT), 10 ampere, silver-cadmium oxide contacts.
12. Eight pin octal-type plug (provide matching screw terminal sockets).
13. Clear, high-impact polycarbonate dust cover.

The control relay shall be Potter & Brumfield KRPA-11AG-120 with 27E122 socket, or equal.

W-46.11 Instrumentation Signal Multicontact Relays

Relays for switching instrumentation level signals shall have the following features: 120VAC coil; 4PDT gold-flashed silver, gold-silver nickel, or gold bifurcated crossbar contacts; socket mount; sealed plastic cover; and hold-down spring.

The contact ratings shall exceed the requirements for the application, and shall be no less than 1 Amp at 120VAC. The expected life shall be a minimum of 100,000 operations at rated load.

The socket shall be of the surface or rail-mount design with screw terminals to facilitate circuit connections.

The relay and socket shall be Omron model MYQ4, or equal.

W-47.12 Time Delay Relays

Time delay relays shall have the following features:

1. Digital Integrated Circuitry
2. Switch selectable ranges from .1s to 1000 m in 6 ranges
3. 4 position DIP switch selects x0.1, x1, x10, and s or m
4. LED indication of input voltage applied and output relay status
5. Repeat accuracy of +/- 0.1% or +/- 20 ms
6. Mechanical life of 10 million operations
7. 11 pin DPDT magnal socket
8. Socket shall be surface or rail mount design with screw terminals

The relay and socket shall be ABB/SSAC model TRU Series and socket, or equal.

W-46.13 Elapsed Time Meters

Elapsed time meters shall be furnished and installed where shown. Time meters shall register up to 9999.9 hours, be non-resetable, have square cases suitable for panel mounting, and have coils for 120 volt, 60 Hertz operation. The units shall be as manufactured by Eagle Signal, Crammer, or equal.

W-46.14 Transient Voltage Surge Suppressor (TVSS)

The TVSS shall be able to suppress lightning induced voltage surges three times greater than the industry standards. The rated line voltage for TVSS shall be 277/480 VAC, 3-phase 4-wire wye. The maximum single impulse current shall be 80kA per phase.

1. The TVSS shall have line to neutral protection on all phases, and also neutral to ground protection.

2. The TVSS shall have a 5 year warranty. Under that warranty, the TVSS shall be replaced if it is destroyed by lightning or other impulses.

3. The TVSS shall have an LED failure indicator on all three phases.

4. The clamp voltages for the TVSS shall be the following:

    Line to neutral - 700 volts
    Line to ground - 700 volts
    Neutral to ground - 700 volts
    Line to line - 1200 volts

The Transient Surge Suppressor shall be Advanced Protection Technologies model TE/4XF, or equal.

W-46.15 Panel Mount Terminal Blocks

Control terminal blocks shall be single-pole units constructed of a polyamide plastic base with wire clamp terminals attached. The terminals shall be rated for 30 amperes, 600 volts. The terminals shall accommodate #30 to #10 AWG conductors. The block shall mount on an aluminum DIN rail.

The terminal blocks shall be style UK5N, as manufactured by Phoenix Contact, or equal.

W-46.16 Control Transformers

The control transformer shall be a single output type for primary and secondary voltages as shown. Primary and secondary protection fuse blocks shall be prewired and mounted on top of the transformer. The secondary side neutral leg shall be grounded. The control transformer shall have sufficient capacity to provide the energy demands for all connected control components. They shall be designed with low impedance windings for excellent voltage regulation, and shall accommodate the high inrush current associated with contactors, starters, solenoids, relays and other connected devices. The control transformers shall be designed for a 55°C temperature rise at full load.

The electrical performance shall exceed the requirements of ANSI/NEMA ST-1 (Specialty Transformers). The transformers shall be as manufactured by Square D, General Electric, Cutler-Hammer, or equal.

W-46.17 AC Current Sensor

The AC Current Sensor shall be a split core transducer used to convert a monitored AC current to a proportional 4-20mA output. The sensor shall comprise a current transformer, power circuit, precision rectifier, high-gain servo amplifier, and span and zero adjustments in one UL listed package. The sensor shall have three user selectable ranges. The two-wire loop powered 4-20mA output shall be available on two 6-32 screw terminals. The sensor shall meet the following performance parameters:

1. operating temperature— -55 to +65ºC.
2. accuracy— +/- 0.5% of full scale
3. repeatability— +/- 0.1% of full scale
4. frequency— flat from 20-100 Hz
5. response time— 100 msec (10 to 90%)
6. ripple— less than 10 millivolts
7. voltage supply— 21 to 40VDC

The AC Current Sensor shall be model SC200-1 as manufactured by Enercorp Instrument Ltd, or equal.

W-46.18 Multi-Range Twin Timer

The Multi-Range Twin-Timer shall be of solid-state CMOS circuitry with eight (8) operation modes and shall meet the following performance parameters:

1. Operational Modes: Sequential Start, Coarse/Fine Adjustment, Instantaneous Cycle, Cycle, Cycle Inversion, Interval On, Interval ON Delay, Sequential Interval.
2. T1 time range: .1 sec. to 6 hours
3. T2 time range: .1 sec. to 6 hours
4. Operating Temperature: -10 to +50ºC.
5. Power Consumption: 2.3VA
6. Repeat Error: +/-0.2%, +/-10ms
7. Setting Error: +/-10% maximum
8. Contact Rating: 5A @ 120VAC
9. Voltage Supply— 100 to 240VAC

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SECTION 47 - ELECTRIC MOTORS

W-47.01 General:

Electric motors shall be of the high energy efficient and high power factor type mounted on the equipment being driven. Motor characteristics shall be as specified under the Workmanship and Materials sections for equipment.

W-47.02 Design:

Motors shall conform to the latest ANSI Standards for rotating electrical machinery and in matters not covered therein, the latest NEMA Standards for motors and generators shall apply.

W-47.03 Ratings:

Motors shall have suitable output torque and speed characteristics to operate the driven equipment under design load conditions without exceeding their nameplate ratings. They shall have a 1.15 service factor. Definite purpose motors shall be used on specialized equipment requiring them.

Motors supplied for use with adjustable frequency drives (AFD) and solid-state soft starters shall be rated for inverter duty.

Ratings shall be based on NEMA Class B, 80 degrees C, temperature rise at rated conditions above an ambient of 40°C and shall have Class F moisture resistant insulation. This temperature rise shall be for continuous operation unless otherwise specified or approved.

W-47.04 Operating Types:

Motors of 1/2 HP or larger shall be of the squirrel-cage induction type, designed for 3-phase, 60-Hertz, 460-volt operation, unless shown or specified otherwise. Smaller motors shall be of the capacitor induction type designed for single-phase, 115-volt, 60-Hertz operation unless otherwise noted or approved.

All motors, except where the driven equipment presents unusual requirements, shall have torque and locked rotor characteristics as outlined in the NEMA Standards for Design B.

All gear motors and speed reducers shall be designed for correct mounting position and rated in accordance with the application practice outlined in the Standards of the American Gear Manufacturers Association, for Class II service.

W-47.05 Bearings:

All motor bearings shall be of the antifriction type except where otherwise shown or specified. All antifriction bearings shall have a minimum rating life of 100,000 hours, based on a reliability of 90 percent in accordance with ANSI B3.15. All motor bearings shall be oil or grease lubricated with convenient provisions for inspecting and servicing.

W-47.06 Mechanical Protection:

Motors shall be of the totally enclosed, corrosion resistant (mill and chemical duty) type, unless a higher classification is required by the intended service. Vertical motors shall have solid shafts with high ring bases having ample space for coupling adjustments.

All motors shall be fan cooled except for smaller sizes (approximately 2 HP and less). All totally enclosed motors shall be tapped at a low point and fitted with an Appleton ECD 1/4-inch drain fitting.

Motors in Class I, Division 1, Group D areas shall be explosion proof.

W-47.07 Installation:

Motors shall be of the right or left hand assembly, as required, so that the conduit box and nameplate will be readily accessible.

W-47.08 Performance Data:

Motor make, type and rating, speed-torque curves, along with the outline dimensions and the guaranteed full load and locked rotor amperes at full voltage, shall be presented with the equipment details for review and approval.

Motors shall have the following minimum full load efficiency and uncorrected power factor ratings (efficiencies and power factor of motors at other speeds shall be as specified with driver equipment):

Motor Efficiency and Power Factor - Minimum Percent

	At 1800 RPM		At 1200 RPM	
Horsepower	Efficiency	Power Factor	Efficiency	Power Factor
1	81.5	74.3	78.5	69.7
1-1/2	82.5	76.5	84.0	62.0
2	82.5	70.3	85.5	70.1
3	86.5	79.9	86.5	73.7
5	87.0	83.8	86.5	75.8
7-1/2	88.5	82.4	88.5	78.2
10	88.5	85.0	88.5	76.4

15	90.2	85.0	89.5	81.1
20	90.2	84.6	89.5	81.9
25	91.7	84.5	91.0	82.0
30	91.7	84.2	91.0	82.5
40	92.4	84.2	92.4	83.3
50	92.4	85.0	92.4	84.9
60	93.0	86.8	93.0	85.7
75	93.6	86.6	93.0	86.0
100	94.1	88.3	93.6	86.4
125	94.1	89.3	93.6	85.8
150	94.5	88.5	94.5	87.5

The machine noise of the motors shall not exceed the following sound power levels when measured in accordance with IEEE Standard 85:

	Overall Sound Power Level, Decibels, A-Weighted	
Horsepower	At 1800 RPM	At 1200 RPM
1 - 2	70	67
3 - 5	74	71
7-1/2 - 10	77	74
15 - 20	81	78
25 - 30	85	80
40 - 50	89	84
60 - 75	90	88
100 - 150	90	93

W-47.09 Test Reports:

Unless the equipment specifications stipulate shop tests reports on the actual motors used the test data shall be on a representative motor of the same horsepower and speed. They shall show the motor full load and locked rotor amperes and full load efficiency and power factor rating, and be recorded on standard test forms as outlined in the NEMA Standards.

W-47.10 Painting:

Painting shall meet the requirements of the Workmanship and Materials section headed "Painting." All steel parts shall be chemically treated to insure clean surfaces, then given a rust-resistant undercoat. Screws, nuts, bolts and similar items shall be of nonferrous metal or have an approved rust-resistant finish.

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SECTION 52 - CONCRETE COATINGS & REHABILITATION

W-52.01 General

It is the intent of this specification to provide rehabilitation of the existing deteriorated concrete surfaces in the screen room of San Carlos pumping station. The deteriorated concrete sections exist predominantly in the ceiling of the screen room. The rehabilitation shall consist of concrete rehabilitation material followed by a spray applied coating system as specified herein. All aspects of the rehabilitation shall be done in strict accordance to the manufacturer's instructions. It is the Contractor's responsibility to comply with OSHA standards.

W-52.02 Submittals

Prior to the commencement of any rehabilitation work, the Contractor shall submit the following to the Engineer for approval:

1) A rehabilitation plan detailing the methods, materials and procedures proposed for the rehabilitation of the structures.

2) Detailed method of preventing debris from entering live wet well.

3) Description of all the equipment to be used for the rehabilitation.

4) Safety plan describing all safety and ventilation equipment to be utilized in compliance with OSHA standards pertaining to work in confined space entry.

W-52.03 Surface Preparation

The Contractor shall remove all corroded materials from the concrete as shown and specified. All corroded materials shall be disposed of at an off-site location in accordance with all Federal, State, and local regulations.

The designated surfaces to be restored shall be prepared to a condition suitable for the installation of the proposed concrete repair and coating material in strict accordance with the manufacturer's instructions. Surface preparation shall include, but not be limited to, providing the proper surface profile for the proposed repair material and coating system. Removal of corroded materials shall be accomplished by sand blasting, mechanical removal methods (chipping, brushing, etc.), or other methods as approved by the Engineer. All sand blasting shall be followed by water blasting in order to remove sand and dust from the concrete substrate. The use of acid for cleaning purposes will not be allowed.

W-52.04 Concrete Repair Materials

The following products manufactured by the Sika Corporation have been determined to be suitable for the necessary repairs. Products of other manufacturers may be acceptable, providing they meet or exceed the mechanical properties, service records and warranties of the following products:

1. SikaTop 123 Plus –a two-component, polymer-modified, non-sag cementitious mortar intended for vertical and overhead surfaces. This product also contains FerroGard 901 penetrating corrosion inhibitor.

2. Sika Armatec 110 EpoCem - a three component, solvent-free, moisture tolerant, epoxy-modified, cementitious product specifically formulated as a bonding agent and an anti-corrosion coating. This product shall be applied on existing steel reinforcement.

All surface preparation, storage and application of these products shall strictly conform to the manufacturer's instructions and recommendations. These products shall be manufactured to ISO 9001 and 9002 standards.

The structural concrete work including surface preparation and application of the specified concrete repair materials will be paid for under separate pay item per square foot by depth of repair.

Provide rheoplastic, pourable, chloride- and sulfate-resistant repair concrete which when cured produces the following properties:

1) Compressive Strength (ASTM C 109): Minimum;1 -day 2500 psi (17.2 MPa); 7-day 6000 psi (41.4 MPa); 28-day 8000 psi (55.2 MPa).

2) Flexural Strength (ASTM C 348): 28-day 770 psi (5.3 MPa).

3) Split Tensile Strength (ASTM C 496): Minimum, 1-day 300 psi (2.1 MPa);7-day 550 psi (3.8 MPa); 28-day 700 psi (4.8 MPa).

4) Slant Shear Bond Strength (ASTM C 882-modified): Minimum, 7-day 2150 psi (14.8 Mpa); 28-day 3300 psi (22.8 M Pa).

5) Permeability (ASTM C 1202): Maximum 650 Coulombs.

6) Modulus of Elasticity (ASTM C 469-87): Maximum 5900 ksi (40.7 MPa).

7) Drying shrinkage (ASTM C 157-modified): Maximum 0.06 % at 28 days.

8) Freeze Thaw Resistance (ASTM C 666 300 cycles): Minimum RDM 97%.

Weather Conditions: Apply repair concrete and grout only when ambient and surface temperatures are 50o F (10o C) and rising. Do not make the repair if the ambient temperature is expected to fall below 50o F (10o C) within 24 hours after placement. Do not apply repair concrete and grout when ambient and surface temperatures are 90o F (32o C) and above.

Follow manufacturer's recommendations regarding additional installation information (hot weather-drying conditions, or cold weather installation.)

Rheoplastic, Pourable, Chloride- and Sulfate-Resistant Repair Concrete: "EMACO® S66 CI" by BASF, Sikatop 123 Plus, or approved equal, a blend of rheoplastic cement-based silica-fume-modified flowable repair concrete.

Where reinforcing steel with active corrosion is encountered, comply with the following:

1) Abrasive blast reinforcing steel to remove rust and contaminants.

2) When one-half of the diameter of the reinforcing steel is exposed, splice new reinforcing steel to existing steel where corrosion has depleted the cross-section area by 25%, as directed by the Engineer.

Mechanically abrade the concrete surface to remove all bond-inhibiting materials and to provide additional mechanical bond. Do not use a method of surface preparation that will fracture the concrete.

Coat exposed reinforcing steel with EMACO® P22, Sika Armatec 110 Epochem, or approved equal, rebar protection coating prior to patching. Unless a bonding agent will be used, presoak the prepared concrete surface to a saturated surface-dry condition. Comply with concrete manufacturer's recommendations for water quantity and mixing procedures. Immediately before placement, drain presoaking water from the form, leaving a saturated substrate with no excess water. Apply the repair material with sufficient pressure to ensure intimate contact with the substrate. Remove forms when sufficient strength has developed.

Protect fresh concrete from premature evaporation. Cure finished repair concrete applying curing compound complying with the moisture-retention requirements of ASTM C309 or ASTM C1315 or moist cure for a minimum of 7 days.

W-52.05 Polyurethane Resin System

The sprayed applied polyurethane resin system shall be Elasto-Shield Series 406 as manufactured by Tnemec Corporation of Kansas City, MO. or approved equal. The finished polyurethane shall be resistant to hydrogen sulfide gas and sulfuric acid attack associated with domestic sewage. The polyurethane shall be manually sprayed onto the structure to provide a uniform smooth surface and shall be installed in accordance to manufacturer's recommendations. The coating system shall be capable of being applied over wet surfaces without degrading the final product. The same manufacturer shall supply all coating system materials. Coating thickness shall be as stated in the plans and shall be applied as recommended by manufacturer.

W-52.06 Urethane Resin System

The sprayed applied urethane resin system shall be SprayWall as manufactured by Sprayroq, Inc, Birmingham, Alabama or equal. The finished urethane shall be resistant to sulfuric acid attack associated with domestic sewage. The urethane shall be manually sprayed onto the structures or manholes to provide a uniform smooth surface. The minimum finished thickness shall be as specified on the plans. The coating system shall be capable of being applied over wet surfaces without degrading the final product.

The existing manhole and junction chambers shall be prepared for the application of the urethane system by cleaning and stoppage of infiltration as specified above. Prior to applying the urethane liner, the entire manhole surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the liner will adhere.

The cured urethane system shall conform to the minimum physical standards, as listed below:

CURED URETHANE	STANDARD	LONG-TERM DATA
TENSILE STRENGTH	ASTM D-638	5,000 psi
FLEXURAL STRESS	ASTM D-790	10,000 psi
FLEXURAL MODULUS	ASTM D-790	550,000 psi

The Contractor shall provide certified independent, third party test results verifying the minimum physical properties listed above. The tests shall be in conformance with the ASTM specifications listed.

The finished liner shall be cured in strict accordance with the manufacturer's instructions.

Epoxy coating systems will be considered equal to the specified Urethane Resin System provided that the material is a solvent-free, 100% solids epoxy and meets or exceeds the minimum physical properties listed above. Composite systems containing layers of different materials or cured-in-place resin systems that are inflated in the manholes will not be considered as equal.

W- 52.07 Polymorphic Resin Systems

The sprayed applied Polymorphic Resin system shall be as manufactured by Integrated Environmental Technologies, Santa Barbara, California or equal. The Polymorphic Resin shall be a 100% solids, two component, highly modified isothalic polyester resin material. The finished resin shall be resistant to sulfuric acid attack associated with domestic sewage. The minimum finished thickness shall be as specified on the plans.

The existing manhole and junction chambers shall be prepared for the application of the polymorphic resin system by cleaning and stoppage of infiltration as specified above. Prior to applying the resin liner, the entire manhole surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the liner will adhere.

The cured resin system shall conform to the minimum physical standards, as listed below:

CURED RESIN	STANDARD	LONG-TERM DATA
TENSILE STRENGTH	ASTM D-638	5,000 psi
FLEXURAL STRESS	ASTM D-790	8,630 psi
FLEXURAL MODULUS	ASTM D-790	15,120 psi

The Contractor shall provide certified independent, third party test results verifying the minimum physical properties listed above. The tests shall be in conformance with the ASTM specifications listed.

The finished liner shall be cured in strict accordance with the manufacturer's instructions

W-52.08 Contractor Qualifications

The installer of the rehabilitation system shall be specialized in the installation of the rehabilitation system for at least 5 years and a minimum application of 50,000 square feet with the proposed coating system and a minimum 10 years application experience in the coating industry.

W-52.09 Thickness Verification and Inspection

The Contractor shall provide a method of verifying the actual coating thickness installed to ensure it meets or exceeds the minimum values specified. The proposed liner thickness verification method shall be submitted to the Engineer for approval.

Contractor may utilize a wet film thickness gage meeting ASTM D4414 to ensure monolithic coating and uniform thickness during application. A minimum of three readings per 200 square foot area

shall be recorded. Documentation on thickness readings shall be conveyed to the Inspector on a daily basis when the coating aplication occurs.

All phases of the structure rehabilitation such as surface preparation, coating application, curing, testing, etc., will be inspected by the Department's Field Engineering personnel for conformance to the specifications, construction drawings, and manufacturer's instructions. The Contractor shall coordinate all rehabilitation work with the field office, and with due regard for site and weather conditions prevailing at the time.

W-52.10 Spark Testing

The coating system shall be spark tested prior to acceptance. After the coating has set hard to touch, it shall be inspected with high-voltage holiday detection equipment. Testing equipment shall be in good working condition and evidence of certified calibration within the last year shall be provided before the detection test equipment shall be used. An induced holiday shall be made onto the coated concrete surface and will serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of minimum specified (not average) film thickness applied but may be increased if it is insufficient to detect the induced holiday. All detected holidays shall be marked and repaired per the manufacturer's recommendations. All costs associated with the testing shall be born by the Contractor.

W-52.11 Warranty

The Contractor shall furnish the City of Tampa with an unconditional 5-year warranty for materials and workmanship. This warranty shall be a guarantee against failure for the warranty period. Failure shall be defined to occur if the rehabilitation system fails to:

1. Prevent the internal damage or corrosion of the structure.
2. Adhere to existing structure wall.

If any failures occur within the specified warranty period after final acceptance, the Contractor shall repair or restore the structure to its previously accepted state including all materials, labor, and at no additional cost to the City. Repair shall be completed within 30 days of written notification of the failure.

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SECTION 62 - CONTROL AND WIRING FOR PACKAGED UNITS

W-62.01 General

The electrical requirements for packaged equipment shall be supplied as complete factory assembled units that require only external connections for installation. They shall include all electrical features necessary for the proper functioning of the units.

W-62.02 Standards

All control components shall comply with the latest ANSI, IEEE, and NEMA standards wherever applicable. The assemblies shall be listed as complying with the requirements of U.L., Inc., or other recognized testing organizations, for the particular service to be encountered, where possible.

The conduit and wiring on each unit shall be in accordance with the Workmanship and Materials section headed "Conduit, Wire and Grounding," unless otherwise shown or directed.

The Contractor shall be responsible for providing conduits and wires for field wiring of all the control devices to the packaged units whether such control devices are specifically shown or not. The Contractor shall include in his bid cost for installation and connections of all electrical equipment like control panels, switches, auxiliary control devices, conduit and wires, and all other appurtenances as required.

W-62.03 Electrical Characteristics

Controls for each unit having motors of 1/2 horsepower or larger, except as noted, shall consist of combination circuit breaker and magnetic starter, along with all required control transformers, relays, timers, heaters, and other necessary incidentals to provide a complete functioning unit. Motors shall be designed for 480-volt, 3-phase, 60-Hertz operation with all controls at 115 volts or less.

Controls for each unit having motors of less than 1/2 horsepower shall be provided with 120-volt, single phase, toggle type thermal manual motor starter with neon pilot light.

All controls and equipment shall meet the requirements of the appropriate Workmanship and Materials sections contained herein.

W-62.04 Enclosures

Principal control components shall be installed in NEMA rated enclosures as follows:

AREA	ENCLOSURE
All areas listed Class I, Group C, D	NEMA 7 - Explosion-proof
Outdoor and below grade elevation indoor	NEMA 4X - Watertight
Above grade indoor	NEMA 12 – Industrial

W-62.05 Auxiliary Control Devices

Float switches, pressure switches, limit switches, thermo-stats, and other auxiliary control devices shall be of the heavy-duty type and rugged enough to satisfy the intended service. All contacts shall be rated at 10 amperes, 120 volts, 60 Hertz a-c, unless otherwise specified. Where adjustable, the devices shall be conveniently set and the setting secured firmly. Limit switches shall function in accordance with contact development charts.

W-62.06 Painting

Enclosures for electrical controls and connecting conduit shall be finished in accordance with Workmanship and Materials section headed "Painting."

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SECTION 65 - MOTOR CONTROL CENTERS AND MISCELLANEOUS CONTROL EQUIPMENT

W-65.01 General:

The work shall include furnishing, installing, wiring, testing and placing in satisfactory operating condition all power and motor control centers, main breakers, disconnect circuit breakers/switches, thermal relays, metering devices, control stations, control devices, indicating lights and enclosures as listed herein or shown.

The following working drawings shall be furnished in accordance with the General Provisions:

1. Bill of materials.

2. Outline drawings showing arrangement, identification of components and nameplate schedule for all units.

3. Interconnecting wiring diagrams, where required.

4. Individual schematic and wiring diagrams for each compartment.

5. Catalog data for all components.

6. Required test reports.

The Contractor shall obtain the full performance details on all motors and other equipment being served, and enter such details on the above drawings to permit checking of component ratings and similar requirements.

W-65.02 Design:

The motor control centers and all other equipment specified herein and shown shall be constructed in accordance with the American Standards for Industrial Control Apparatus, IEEE Publication No. 15, and NEMA Standards for Industrial Control, Publication ICS. Motor control centers shall be U.L., Inc. listed.

The motor control centers shall be NEMA Class II, Type B, except as specified herein, and shall be assembled by the manufacturer, including internal interlock and interwiring between controller units and devices. The motor control center shall be designed to form complete control systems with terminals for external device connections as shown.

The manufacturer of this equipment shall be experienced in the design, construction, and operation of this class of equipment. Evidence of such successful operation shall be submitted to the Engineer upon request.

Motor control centers shall be Square D Model 6, Siemens, Cutler-Hammer or equal.

W-65.03 Service Voltage and Insulation Class:

Service to the motor control centers will be 3-phase, 480-volt, 4-wire, wye, 60-Hertz. An isolated neutral lug and neutral distribution unit shall be supplied.

All control devices in the center shall be selected for operation at 120 volts, 60-Hertz, unless specifically noted otherwise.

All control equipment and devices shall conform to the 600-volt insulation class.

W-65-04 Equipment Arrangement:

Motor control centers shall consist of the indicated number of 20-inch deep sections with front mounted component equipment arranged as shown. Motor control centers shall not exceed the dimensions shown.

W-65.05 Motor Control Center Construction:

Motor control centers shall be totally enclosed, dead front, rigid, NEMA 12, self-supporting and freestanding structures consisting of a number of panel sections as shown. The various sections shall be constructed from specially smooth steel sheets not less than 3/32-inch thick, formed into proper shape, suitably reinforced and welded. All internal welds shall be ground smooth and all corners rounded to give a neat and pleasing appearance.

Each motor control center shall have a 3-phase bus compartment at the top and a conduit and cable compartment at the top and bottom. These compartments shall extend the full length of the center. Access to these compartments shall be by means of removable steel plates. Each structure shall have a vertical wiring space between starter cells and side sheet for unit wiring. The vertical wiring space shall be equipped with cable supports to hold cables and wiring in place.

A main horizontal bus shall be provided across each structure. Main buses shall be tin plated copper bars rated as shown and shall be sized in accordance with NEMA temperature rise standards for this class of equipment based on a 40°C ambient temperature. Bus bars shall be supported in each structure by means of bus supports fabricated from an approved insulating material. Distribution to units in each structure shall be by means of a vertical 3-phase copper bus, tin plated, and of sufficient size to carry loads served based on NEMA temperature rise standards for this class of equipment on a 40°C ambient temperature. All bus bars shall be insulated over the entire length of the units. Insulated covers shall be provided over bolted bus bar connections. Bus bar compartments shall be separated from breaker and controller cubicles by insulated barriers or steel plates.

An uninsulated tin-plated copper ground bus shall be provided that runs the entire length of the MCC. The ground bus shall be 0.25 in x 1.0 in. and be rated for 300 amperes. Compression-type lugs shall be provided in the MCC for terminating on the ground bus the grounding conductors designated on the drawings. The ground bus shall be provided with (6) 0.38 in holes for each vertical section to accept customer-supplied ground lugs for any loads requiring a ground conductor. Each vertical section shall have a copper vertical ground bus that is connected to the horizontal

ground bus. This vertical ground bus shall be installed so that the plug-in units engage the ground bus prior to engagement of the power stabs and shall disengage only after the power stabs are disconnected upon removal of the plug-in unit.

All bus work shall be suitably braced to withstand a minimum of 65,000 RMS amperes symmetrical short circuit current. Construction shall be substantiated by a certified laboratory test covering units of similar construction.

Motor control or circuit breaker units shall be built in combinations of not less than 12-inch modular heights. Units shall be of the plug-in or nonremovable type in accordance with the manufacturer's standard for type and size of controller. Plug-in units shall have tin-plated, pressure-type line disconnecting stabs of high strength copper alloy. Each plug-in unit shall be held in place and arranged so that units can be removed or remounted readily without access to the rear of the structure. Each unit shall be totally enclosed and effectively baffled to isolate any ionized gases which may occur within the unit starter. In addition, each unit shall be ventilated so that it can be located anywhere within the structure using the same overload heaters for the same load. All doors shall have hinges and shall be held closed by means of screw fasteners. Each door shall be part of the structure and not part of the starter.

Doors shall be designed and constructed to insure being dripproof and dust-tight.

Doors for motor control compartments shall be equipped with a circuit breaker operating mechanism, thermal overload relay reset mechanism button or buttons, control station where indicated, indicating lights where indicated and other required devices as shown. Doors for branch feeder equipment shall be equipped with a circuit breaker operating mechanism, or the circuit breaker handle extended through them.

Each circuit breaker shall be of the dead front type arranged for operation external to the compartment. Mechanical interlocks between the compartment door and breaker operating mechanism shall prevent opening the door unless the breaker is in the OFF position, and shall prevent closing the breaker unless the door is fully closed. An arrangement shall be provided whereby the circuit breaker operating mechanism or handle may be padlocked in the OFF position with a minimum of three padlocks.

Spaces for future equipment in unit structures shall be furnished with blank hinged doors and removable metal barriers for isolation of vertical buses.

All control and switching units shall be front connected only suitable for mounting without provision for rear access.

The rear of each structure shall be covered with an easily removable steel panel for access to vertical buses. Both ends of a completely assembled center shall be designed so that extensions can be added easily in the future.

Control centers shall be freestanding as shown.

Hinges, screws, bolts, circuit breaker operating mechanisms, nameplate mounting screws and other metallic appurtenances shall be provided with a corrosion-resistant metal finish.

Internal wiring runs for interconnecting units shall be made with stranded switchboard wire having thermoplastic insulation, flame-resistant. No. 14 AWG wire shall be used for control interconnections. Power connections shall be as required for the service.

Where wiring connections are to be made to equipment mounted on hinged doors, connections shall be made with extra flexible wires which shall be suitably cabled together and cleated. All feeder and control connections shall be wired to individual terminal boards at each motor starter. Terminal boards shall be located for front access.

Interlocking wiring between units of a control center or between units of grouped centers shall be installed as internal wiring with terminals provided for external connections.

Indication lights, control relays, timers, and accessories shall be provided as units as specified herein and as shown.

Each magnetic motor starter shall have three thermal block type overload relays of the adjustable type. Where shown a single pole double throw switch providing a normally open and normally closed contacts with common shall be provided.

Control circuits for each unit shall be of the individual transformer type for 120 volts, grounded and fuse protected. The control transformers shall have sufficient capacity to provide the energy demands for all related control components. This shall include relays, solenoids and other indicated items.

The control center starters shall be equipped with all required auxiliary contacts.

Trip elements of motor branch circuit protectors shall be in accordance with the motor and wire sizes shown.

The Contractor shall furnish and install additional switches, relays, and other electrical accessories to control and safeguard the operation of process equipment as shown.

Indicating lights shall be of the LED type suitable for operation on 120 volts, 60-Hertz a-c control circuit voltage. The indicating lights shall be rated NEMA 4X and be at least one inch (30mm) in diameter.

In general, indicating lights shall be color coded as follows:

Red	-	Motor running or valve open
Green	-	Motor off or valve closed
Amber	-	Ready (capable of operation from this point)
Blue	-	Tripped (alarm or trouble condition)
White	-	Power ON

Control stations shall be heavy duty, oiltight, combination push button or selector switch stations arranged for flush panel mounting. Indicating lights may be combined with control stations.

All equipment located within centers shall be arranged for convenient and ready accessibility from the front for inspection and maintenance of equipment, terminals and wiring. A laminated plastic nameplate shall be installed on the door of each control and switching unit for circuit designation in 1/2-inch high letters. Each center shall be provided with a laminated plastic nameplate giving center designation in one-inch high letters. Relays, timers and other elements of control equipment within compartments shall be identified by nameplates.

A schematic wiring diagram of each unit shall be affixed to the inside of the door of that unit.

W-65.06 Combination Motor Circuit Protector Magnetic Starters:

Combination motor circuit protector magnetic starters shall be 480-volt, 3-phase, 60-Hertz across-the-line units. The starters shall be for full voltage nonreversing operation (FVNR), as shown.

Motor circuit protectors for combination starters shall be of the molded case, air-break type designed for 600-volt, 60-Hertz service and provide 65,000 ampere interrupting rating. They shall be 3-pole units with magnetic adjustable trip units actuating a common tripping bar to open all poles when an overload or short circuit occurs. They shall not have thermal elements. The magnetic trip units shall be capable of being set from 700% to 1300% of motor full load amperes. Equipment shall be Square D Type Mag-gard, General Electric, or equal.

Starter units shall be magnetic contactors with thermal overload elements and all required accessories as shown. Size 5 and larger starters shall have current transformer operated overload relays. Contacts shall be of the replaceable spring-loaded wedge type with silver-cadmium oxide plated contact surfaces. Coils shall be of the epoxy sealed replaceable type. Overload relays shall be of the ambient compensated, bimetallic type with adjustment knobs which will allow plus or minus 15% adjustment of the nominal heater rating. All component parts of the starters shall be field replaceable by means of simple methods. Overload relays shall be supplied and adjusted to match the associated motor nameplate running current rating.

W-65.07 Feeder Circuit Breakers:

All feeder circuit breakers installed in the motor control center shall be 2-pole or 3-pole as shown and shall have a minimum voltage rating of 600 volts a-c.

Rated interrupting capacities at 480 volts ac shall be 65,000 Amps, or as explicitly shown on the Drawings.

Interrupting ratings shall be based on the IEEE and NEMA Standard duty cycle for this class of equipment. The continuous current ratings of the circuit breakers shall be as shown.

Circuit breakers in frame sizes 600 amperes and larger shall be of the 2-pole or 3-pole, molded case type with solid state trip units. All other circuit breakers shall be of the 2-pole or 3-pole, molded case type units with individual thermal-magnetic trip units. The trip units shall actuate a common tripping bar to open all poles when an overload or short circuit occurs on any

one. Trip elements shall provide inverse time tripping and instantaneous tripping at about ten times the normal trip device rating. Units shall have trip-free handles.

W-65.08 Instrument Transformers:

All current transformers to be supplied with each motor control center shall be of the dry, wound type with fully coordinated insulation for 600-volt insulation class.

All potential transformers shall be rated 480 to 120 volts.

Transformers shall be in an accuracy class to meet the requirements for metering service as established by the latest ANSI Standards, and for the secondary burdens connected to the transformers.

W-65.09 Relay Panels:

Relay panels shall comprise formed steel enclosures, subpanels, control relays, timers and other control devices, terminal blocks, wiring and all necessary appurtenances as specified, shown and required.

Relay panels shall be the product of the manufacturer of the motor control center or qualified subcontractor and shall conform to the applicable NEMA Standards. All wiring shall be installed in accordance with the NEC and local electrical codes.

The enclosure shall be of NEMA 12 construction suitable for freestanding floor mounting. The enclosure shall be made from No. 10 gauge formed steel panels with all seams continuously welded. Steel stiffeners shall be arc-welded to the tops, back and doors of the panels to maintain flatness and rigidity.

The panels shall have one or more doors as shown, and required. Doors shall have concealed hinges and multipoint vault-type hardware.

Subpanels shall be of No. 10 gauge steel mounted on collar studs and removable through door openings. There shall be no mounting holes through the enclosure. Equipment shall be mounted so that any component can be replaced without removing the panel. No components shall be mounted behind any door mullions.

All relays and timers shall be as specified in the subsections headed “Control and Latching Relays”, and “Timing Relays, Reset and Repeat Cycle Timers”, respectively. They shall have the number of contacts shown and required. Trough covers shall be provided between each row of relays to cover all wire bundles. All wiring shall be brought to terminal blocks. Terminal blocks shall be located so that wiring does not cross over terminals. Raised staggered terminal blocks shall be provided where necessary.

All relays, timers, and control devices shall be permanently identified as shown and specified. All terminals and wiring shall be identified to conform to the wiring diagrams to facilitate external wiring to motor control centers and other control points.

All internal wiring shall have a minimum rating of 600 volts, with 90°C moisture-resistant insulation. Conductors shall be of copper, stranded No. 14 AWG.

W-65.10 Panel Equipment and Accessories:

Fuse blocks and fuses, indicating lamps, control and indicating switches and all other devices for mounting on the motor control center panels shall conform to NEMA-4X Heavy Duty Oil Tight Standards for installation in or upon motor control centers. All control operators shall be of the 30mm dimension class.

W-65.11 Elapsed Time Meters:

Elapsed time meters shall be furnished and installed where shown. Time meters shall register up to 9999.9 hours, shall have square cases suitable for panel mounting and shall have coils for 120-volt, 60-Hertz operation. The units shall be Eagle Signal Cat. No. HK510A6, Agastat or equal.

W-65.12 Control and Latching Relays:

Control and latching relays shall be 600-volt class machine tool quality devices. Contacts shall be easily converted from normally open to normally closed and vise-versa. They shall be Siemens, Cutler-Hammer, Square D, General Electric, or equal.

W-65.13 Timing Relays, Reset and Repeat Cycle Timers:

Timing relays shall be Agastat 7000 Series, Eagle Signal Co., or equal. Timing relays shall be double-pole, double-throw, with timing ranges and ON-DELAY or OFF-DELAY operation as shown and required.

Reset and repeat cycle timers shall be Eagle Signal HP5 Series, Zenith, Automatic Timing and Controls Co., or equal.

W-65.14 Feeder Cable Terminals:

Closed-end, compression-type solderless connectors and terminals, suitable for copper conductors, shall be provided and mounted for terminating cables. Connectors and terminations shall meet the requirements of similar equipment specified in the Workmanship and Materials section headed “Conduit, Wires and Grounding”.

W-65.15 Remote Control Devices:

Remote control station indicating lights and push buttons shall be of the heavy-duty, NEMA-4X, oiltight type with LED lamps and double break silver contacts installed in NEMA rated enclosures as follows:

AREA	ENCLOSURE
Outdoor and below grade elevation indoor	NEMA 4X – Watertight, corrosion-resistant
Above grade indoor	NEMA 12 - Industrial

Remote control stations, indicating lights and push buttons shall be mounted 4 feet 6 inches above finished floor to centerline, unless otherwise shown.

On-Off lockout selector switches shall consist of a two-position selector switch (push-pull) with a pad-lockable attachment (lock in off position). Key operated switches will not be accepted.

Pushbutton Stations in Class I, Division 1, Group D areas shall have a NEMA 7 rating.

W-65.16 Manual Motor Starters:

Manual motor starters shall be provided for all 120-volt, single-phase motors rated 1/3 HP or less. Starters shall be toggle type thermal switches with neon pilot lights, General Electric Co. CR101 series or equal. Starters shall be provided complete with HAND-OFF-AUTO selector switches, where required. Starters shall be mounted 4 feet 6 inches above finished floor to center line, unless otherwise shown. The enclosures shall be as specified hereinbefore under the subsection headed “Remote Control Devices”.

W-65.17 Disconnect Circuit Breakers:

Disconnect circuit breakers shall be molded-case switches, with high magnetic trips (instantaneous trips without overloads) with the number of poles, voltage and current ratings as required.

Disconnect circuit breakers shall have adequate fault current withstand capability to safely interrupt the circuit in which the unit is installed based on U.L. listed series application. Disconnect circuit breakers shall be provided as follows:

1. 15 through 100 amperes, Square D Type FA
2. 125 through 250 amperes, Square D Type KA

Provisions shall be made for padlocking the operating handle in the OFF position. The circuit breakers shall be housed in NEMA rated enclosures as specified hereinbefore under the subsection headed “Remote Control Devices”. Disconnect circuit breakers shall be as manufactured by Cutler-Hammer, Siemens, Square D or equal.

W-65.18 Spare Parts:

The Contractor shall furnish the following spare parts for equipment under this section:

1. One set of contact tips, control power transformers and operating coils for each six or less of each size of motor starters.

2. One auxiliary contact unit or one set of auxiliary contact tips for each six or less motor control units.
3. Ten percent, but not less than two complete control, latching, and timing relays of each type used in motor control centers.
4. One complete reset and repeat cycle timer of each type and rating used in motor control centers.
5. Two sets of arc chutes for each type and rating of magnetic contactor.
6. Two complete replacements of overload heater units for each catalog number installed in motor control centers and motor starters.
7. Two complete replacements of all indicating lamps and fuses used in the installation.
8. One complete magnetic starter with motor circuit protector for each size required.
9. One complete set of replacement indicating light lenses consisting of 6 lenses of each color required.
10. One selector switch of each type required.
11. One of each type and kind of manual starter.

W-65.19 Factory Tests:

After the equipment has been completely assembled, it shall be given shop tests to determine general operating condition and circuit continuity, high potential tests and other standard tests for that particular class of equipment.

W-65.20 Field Tests and Adjustment:

An experienced, competent and authorized representative of the manufacturer of this equipment shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation. The representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the Engineer.

The representative shall furnish to the Engineer a written report certifying that the equipment (1) has been properly installed and lubricated, (2) is in accurate alignment, (3) is free from any undue stress imposed by connecting piping or anchor bolts, and (4) has been operated under full load conditions and that it operated satisfactorily.

W-65.21 Instructions and Parts Lists:

Seven copies of a manual containing specifications, drawings and description of equipment, installation instructions, operating and maintenance instructions, parts lists, and where applicable, test data and curves shall be provided for the equipment.

These manuals shall be in addition to any instructions packed with the equipment and shall be submitted to the Engineer not later than the date of shipment of the equipment. Each manual shall be bound in a heavy fiberboard or hardback cover having indicated thereon the type of equipment, manufacturer's name, and year of purchase.

W-65.22 Nameplates:

Nameplates made of laminated plastic with white printed characters engraved through a black top layer, and fastened with corrosion-resistant screws, shall be provided as required. Mounting cement is not acceptable.

Nameplates with 1-inch high lettering shall be provided for motor control centers, control panels, relay panels and similarly grouped equipment.

Nameplates with 1/2-inch high lettering shall be provided for individual components of a group, such as main breakers, motor control units, and similar devices.

Nameplates with 1/4-inch high lettering shall be provided for all remote motor controllers, control stations, relays and similar equipment.

Where the amount of lettering causes excessively large nameplates, smaller lettering may be used to provide a neat, legible nameplate.

W-65.24 Painting and Shipment:

Motor control centers shall be finished in accordance with the best industry practice. All steel parts shall be chemically treated to insure clean surfaces, then given a rust-resisting undercoat. The inside and outside shall be finished with paint meeting the requirements of ANSI Z55.1. Screws, nuts, bolts and similar items shall be of nonferrous metal or shall have an approved rust-resisting finish.

Three 12-ounce spray cans of the final finish shall be furnished to touch up any scratches or other blemishes.

All structures and equipment shall be suitably packed, rigidly braced, and protected against weather, damage, and undue strain during shipment.

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SECTION 76 - CONDUIT, WIRE, AND GROUNDING

W-76.01 General

Conduit, wire, and grounding includes furnishing and installing all conduits, underground ducts, bus ducts, wires, cables, and grounding systems as shown, specified, and required for a complete installation. The work includes the furnishing and installation of wires and cables in flexible and rigid conduits, underground ducts, all as required, shown, and specified.

Descriptive literature and technical information relative to conduits, wires, and grounding shall be submitted by the Contractor in conformance with the requirements of the General Provisions.

The Contractor shall, with reference to approved drawings of equipment being installed, prepare detailed plans showing the layout and size of all conduits, ducts, bus ducts, cables and wires, connections between the point of service connection and all utilizing equipment. These plans shall be in sufficient detail to serve as working drawings for the installing electricians. The drawings shall be to scale not less than the Plans and be prepared as the work develops with approval by the Engineer before major steps of work are undertaken.

During construction, careful notes shall be kept of all deviations or changes in the layout or connection diagrams. Upon completion of the work, all working drawings shall be corrected and then marked “Record Drawings”. Four sets of final prints, along with an equal number of bound instruction manuals and parts lists shall be given to the Engineer at the end of the job.

Excavation, backfill, form work, concrete, and reinforcing shall be in accordance with the applicable Workmanship and Materials sections.

W-76.02 Underground Ducts

In general, underground ducts for feeders and control wiring shall be plastic conduit. The plastic conduit shall be PVC, Schedule 80, and U.L. Inc. listed for direct burial, as manufactured by Carlon, Triangle, Allied Tube, or equal. The conduit shall be buried a minimum of 18 inches below grade. Manufactured fitted plastic duct spacers shall be used for installation spacing.

Ducts installed under streets, roads, alleys, driveways, and parking lots shall be rigid aluminum conduit covered with no less than 40 mils of PVC, as manufactured by Robroy, Ocal or equal. The PVC material shall conform to the applicable ASTM standards. The conduit shall be buried a minimum of 24 inches below grade.

Each duct shall be carefully cleaned before and after installation. All inside surfaces shall be free from imperfections likely to injure the cable. After installation of complete duct runs in sizes 2 inches and larger, ducts shall be snaked with an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the duct. Ducts through which the mandrel will not pass shall not be incorporated in the work. After snaking,

the ends of dead-ended ducts shall be protected with standard conduit caps to prevent the entrance of water or other foreign matter.

Where ducts enter buildings or at stub-ups to equipment, transitions to aluminum conduits shall be made as noted and detailed. Where it is not otherwise shown, all ducts entering buildings and structures shall have transitions to aluminum conduit at least 5 feet from the outermost edge of the pile cap or footing supporting the outermost vertical wall of the building or structure.

Transitions from above-grade rigid aluminum conduit to nonmetallic conduit shall be accomplished with a threaded adapter. Rigid aluminum conduit installed above grade and extending below grade shall include the first 90° elbow. All rigid aluminum conduits extending below grade shall be coated with two coats of an asphaltum-type paint along its entire length below grade and extending 6" above grade or above the top of the finished slab. The asphaltum-type paint shall conform to Fed. Spec. TT-V-51 and equivalent to Koppers Bitumastic Super Service Black.

W-76.03 Liquidtight Flexible Nonmetallic Conduit (Size 2 Inch or Less)

All flexible conduits size 2 inch or less in non-classified areas shall be nonmetallic, liquidtight, and have a circular cross section. The conduit shall be resistant to oil, water, heat, sunlight, corrosion, most acids, ozone, alkali, strains, abrasions, and crushing. The conduit shall be rated for continuous use at 140°F and be U.L. Inc. listed. Compatible liquidtight nonmetallic fittings shall be used for conduit installation. The flexible conduit and fittings shall be as manufactured by Carlon, Kellems, K-Flex, or equal.

W-76.03(a) Liquidtight Flexible Metallic Conduit (Greater Than 2 Inch)

All flexible conduits greater than 2 inch in non-classified areas shall be metallic, liquidtight, and have a circular cross section. The conduit shall be of a light-weight aluminum core, coupled with a PVC jacket. The conduit shall be resistant to sunlight, acid, and oil. The conduit shall be rated for a working temperature between -20°C to 80°C and U.L. Inc. listed. Compatible liquidtight metallic fittings shall be used for conduit installation. The flexible conduit and fittings shall be as manufactured by Thomas & Betts or equal.

W-76.04 Metallic Conduit and Boxes

All conduit shall comply with the requirements of the U.L. Inc. Standards. Conduit shall be delivered to the job site in standard bundles having each length suitably marked with the manufacturer's name or trademark and bearing the label of the U.L. Inc. inspection service. The minimum size conduit service shall be 3/4 inch.

All exposed conduit within buildings and exposed on outdoor structures shall be rigid heavy wall, 6063 alloy, T-1 temper, aluminum conduit. Aluminum conduit shall conform to Fed. Spec. WW-C-540 and ANSI C80.5.

All conduit encased in building structures, exposed in the screen room/wet well area, or otherwise noted, shall be rigid aluminum covered with not less than 40 mils of PVC outside, and 2

mils of urethane inside, as manufactured by Robroy, Ocal, or equal. The physical properties of the PVC and urethane materials shall conform to the applicable ASTM standards.

Cast aluminum shall be used for outlet boxes and fittings in aluminum conduit systems. Outlet and junction boxes shall be of proper dimensions for each application. Cast metal boxes shall have watertight gaskets and covers secured with nonferrous screws.

PVC coated boxes and fittings shall be used in PVC coated conduit systems.

Conduit fittings, such as elbows, tees, couplings, caps, bushings, nipples, and locknuts shall be threaded to provide watertight connections.

Where it is necessary to use electrical unions, Universal, Erikson, or equal conduit couplings shall be used.

W-76.05 Conduit Installation

All conduits shall be installed as required. The conduit system shall be installed complete with all accessories, fittings, and boxes, in an approved and workmanlike manner to provide proper raceways for electrical conductors.

The Contractor shall note that conduit runs shown are for the purpose of outlining the general method of routing the conduits to avoid interferences.

All other conduit shall be run exposed, except where shown otherwise.

Sizes not shown shall be one size larger than indicated in Tables 1 or 4, Chapter 9, of the NEC. Exposed conduit shall be run parallel to or at right angles from walls or beams and plumb on columns and on walls. Conduit shall not be run through beams except where approved by the Engineer or specifically detailed. Where possible, conduit shall be pitched slightly to drain to the outlet boxes or otherwise installed to avoid trapping of condensate. Where necessary to ensure drainage, Appleton Type ECD, Crouse-Hinds, or equal, 1/4-inch drain fitting shall be installed in the trapped conduit at low points.

Factory made bends or elbows shall be used wherever possible. Field bends shall be carefully made to prevent conduit damage or reduction in the internal area. The bending radius shall be not less than six times the nominal diameters of the conduit with carefully matched bends on parallel runs to present a neat appearance. The number of crossovers shall be kept to a minimum.

All conduit shall be reamed to remove burrs before installation. Aluminum conduit shall be cut with a saw to prevent reduction in internal area. All threads in steel conduit shall be given a coat of zinc dust in oil or other approved corrosion-preventive compound before making connections. Threads on aluminum conduit shall be given a coat of graphite or other approved compound. All connections and joints in all conduit runs shall be watertight and ensure a low resistance ground path in the conduit system. All conduit runs shall be swabbed to remove foreign matter before wires are pulled in. Conduit terminations in boxes, panels, switchboards, motor control centers, and other sheet metal enclosures shall be bonded together for grounding and be fitted with insulating

bushings, O.Z./Gedney Type A, Thomas and Betts, or equal. Where grounding bushings are required by code or shown, O.Z./Gedney Type SBLG, Thomas and Betts, or equal shall be furnished.

Conduit shall be neatly grouped where several lines follow a parallel course, and shall be well supported, using galvanized clips or hangers of the ring or trapeze type. Clips, hangers, and support rods shall be held by self-drilling anchors, power-driven fasteners, or steel channel insets in the concrete ceilings or walls. Perforated strap hangers will not be accepted.

Conduit runs that enter the building from outdoors, or that pass through refrigerated or air conditioned areas, are subject to moisture accumulation due to condensation. A pull box shall be provided in the conduit run near the point of temperature change to prevent trapping of moisture within the conduit system. A 1/4-inch weep hole shall be drilled in the bottom of the pull box. After the wires and cables are installed, the end of the conduit continuing into the warmer area shall be packed with a nonsetting sealing compound.

W-76.06 Conduit Connections to Equipment

The conduit system shall terminate at the terminal box or at the conduit connection point of electric motors, devices, and equipment. Terminations of conduits at such locations shall permit direct wire connections to the motors, devices, or equipment.

Conduit connections shall be made with rigid conduit if the equipment is fixed and not subject to adjustment, mechanical movement, or vibration. Myers water-tight /dust-tight hubs shall be used for outdoor, below grade, or wash down areas. Rigid conduit connections shall have union fittings to permit removal of equipment without cutting or breaking the conduit.

Conduit connections shall be made with approved flexible nonmetallic conduit if the equipment is subject to adjustment, mechanical movement, or vibration. Flexible conduit connections shall be watertight.

W-76.07 Expansion Fittings

Expansion fittings shall be installed at all expansion joints and where required by codes. Conduit expansion fittings shall be Crouse-Hinds Type XD, O.Z./Gedney Type DX, or equal.

W-76.08 Terminal, Junction, and Pull Boxes

Junction and pull boxes shall be installed as shown and as required.

Surface-mounted junction and pull boxes, unless specified otherwise herein, shall be of cast aluminum complete with mounting lugs, threaded entry bosses and flange or rabbeted gasketed covers.

Surface-mounted junction and pull boxes which would exceed 50 pounds weight if cast or which are shown as fabricated sheet metal boxes shall be made of 1/8-inch sheet aluminum with

sides return channel flanged around the cover opening or with approved welded angle or channel supporting frames. Sheet aluminum boxes shall be provided with mounting lugs or channels and with conduit termination hubs. All seams in sheet aluminum boxes shall be continuously welded and ground smooth. All surface boxes larger than 6 inches square shall be mounted a minimum of 3/4 inch clear of the mounting surface by means of offset lugs or support channels.

Fabricated junction and pull boxes which are partially or fully encased in concrete shall be made of 10-gauge sheet stainless steel and fabricated in a similar manner to the sheet aluminum pull boxes specified herein, complete with mounting lugs or channels and conduit termination hubs. Cast steel boxes shall be provided in smaller sizes where required for full or partial encasement in concrete.

All junction and pull boxes shall be provided with covers or doors as shown or required. Covers and doors shall be fabricated of materials equal in weight, gauge, structure, and metallic composition as the basic box. All covers shall be gasketed and held in place with nonferrous captive knurled head screw slot bolts. All pull and junction boxes shall be provided with hinged doors. Doors shall have continuous hinges, and 3-point catches with external handles and hasps for padlocks. All doors shall be gasketed.

All boxes shall be provided with partitions as shown and as required.

Fabricated boxes shall be rated NEMA 12 for indoor, above grade areas; rated NEMA 4X for outdoor areas; and manufactured by Hoffman, Hope, or equal.

W-76.09 Hazardous Areas

All conduit and equipment installed in or routed through hazardous areas, as well as other electrical appurtenances installed therein, shall be installed to conform in every respect to Chapter 5 of the NEC for Class I, Division 1, Group D hazardous locations. All material installed in hazardous areas shall be listed as complying with the requirements of the U.L. Inc. for use in Class I, Group D atmospheres. Terminal Boxes and Enclosures mounted in Hazardous Areas shall be NEMA 7, cast aluminum.

Sealing shall be provided for all conduits within and leaving hazardous areas as required.

W-76.10 Grounding System

A complete grounding system shall be in accordance with applicable ANSI, IEEE, and NEC Standards and local codes.

All noncurrent-carrying metal parts of the electrical wiring system shall be grounded. The grounding system shall include, but not be limited to, the following:

1. Motor control center controllers, ground bus, and enclosures.
2. All motor frames.
3. All conduit systems.

4. All mechanical equipment and structures.
5. Distribution and lighting panelboards.
6. Control, relay, and instrumentation panels.
7. Lighting fixtures and receptacles.
8. Fans, blowers, pumps, and similar equipment.
9. Hoist beams, cranes, and similar items.

A grounding connection from the transformer to the City water pipe shall be provided. The wire and conduit shall be attached to the City water pipe with a U.L. Inc. listed cast bronze U-bolt connector with silicon bronze bolts and nuts.

Motor frames shall be grounded by means of stranded, 600-volt insulated copper cables installed within the motor feeder conduit system. The cable shall be lug bolted to the motor terminal box and the ground bus of the motor control center serving the motor.

An equipment grounding conductor shall be installed in all electrical raceways, and shall be sized in accordance with Article 250.95 of the National Electrical Code (NEC).

Exposed or buried ground conductors shall be bare copper wires or bars of the proper sizes.

All exposed ground cables or bars shall be firmly and neatly supported in place at proper intervals. Where subjected to mechanical abuse, protective enclosures shall be provided.

Grounding conductors run in conduits with circuit conductors shall be stranded cable with 600-volt green XHHW, TW, THW, or RHW Code insulation.

Stainless steel ground rods shall be 5/8-inch diameter with the length as required, and made up of a 10-foot section with 5-foot sections added as required. Rods shall be driven to permanently moist soil.

Connections to ground rods, transformer case ground bus bars, case grounds, bare ground grid conductors, and the like, shall be made by an exothermic welding process or by clamps specifically designed for this application.

Ground conductor connections to ground bus bars in motor control centers, and the like, shall be cable lug bolted terminations equal to line conductor terminations specified hereinafter.

Welds embedded in the ground or concrete shall be cleaned and painted with an asphaltum base paint.

Tests shall be conducted by the Contractor and witnessed by the Engineer to determine the ground impedance for the entire system. The test shall be accomplished by using a ground loop impedance tester. The result shall not exceed 2 ohms at any point of test. If necessary, additional ground rods shall be installed at locations approved by the Engineer.

Care shall be exercised to ensure good electrical connections between the conduits and metallic enclosures of switchgear, control centers, and the like. Grounding jumpers shall be installed where necessary to accomplish this purpose.

W-76.11 Wires and Cables - General

Wires and cables required for all systems shall be complete, connecting all equipment and control components. Conductors shall be of ample size, with suitable insulation as specified hereinafter.

W-76.12 600-Volt Wire and Cable - Conductors

All ground conductors and power, control, and lighting conductors shall be soft-drawn or annealed stranded copper wire meeting the requirements of ASTM B 3 or B 33. For lighting fixture and convenience outlet wiring only, conductors No. 10 AWG and smaller may be solid conductor. Conductors shall be sized to limit the maximum conductor temperature to less than 75°C, except where specifically stated otherwise. Table 310.16 of the NEC shall be the guide in determining 600-volt conductor sizes. The minimum size of conductor for power and lighting wiring shall be No. 12 AWG.

W-76.13 600-Volt Power and Control Cable - Insulation

Low voltage circuits shall be wired with 600-volt insulated conductors, sized as shown, or as required by the actual load to be served, whichever is larger.

Single Conductor: Insulation for single 600-volt copper conductors shall be cross-linked polyethylene compound, U.L. Inc. listed, NEC Type XHHW-2, with surface print cable identification; as manufactured by Okonite, American, Southwire or equal.

Multiconductor Cables: Individual conductors shall be insulated with 15 mils of polyethylene or PVC and 4-mil nylon jacket. The bundle of conductors shall be wrapped with tape binder and an outer jacket of not less than 45 mils of PVC. Use ICEA Method 1 for color coding wires.

W-76.14 Instrumentation / Data Cables - Insulation

4-20 mA Analog: Shielded two-conductor No. 16 AWG cables for instrumentation shall be properly stranded 600-volt insulated copper wire twisted cables as shown. Conductor insulation shall be polyethylene. Shields shall be overlapped metalized tape providing 100% coverage with tinned copper drain wire. Cable outer jacketing shall be of polyvinyl chloride. Cables shall be Belden #8719, or equal.

Three Conductor: Stranded No. 16 wire, 600 volt polyethylene insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of PVC. Belden Cat. No. 8618.

Category 5: Provide cable having third party verification to TIA/EIA 568-A Category 5 requirements and constructed of four pair of stranded No. 24 AWG solid copper wire, polyethylene or polypropylene insulation, stranded No. 24 AWG tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of gray PVC. Belden Cat. No. 1624R.

Twinaxial (Data Highway): Provide stranded No. 20 AWG tinned copper wire (9.5 ohms/mile), 78 ohm nominal impedance, 300 volt polyethylene insulation, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and 55 percent tinned copper braid shield (4.1 ohms/mile) and outer jacket of blue PVC. Belden Cat. No. 9463.

1-1/2 Pair (RS-485): Provide three stranded No. 22 AWG tinned copper wires with 300 volt FHDPE insulation, a tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage, 90 percent tinned copper braid shield and a PVC outer jacket. Insulated wires shall be configured as one twisted pair and one reference conductor— 120 Ohms characteristic impedance. Belden Cat. No. 3106A.

W-76.15 600-Volt Wire and Cable - Installation

The 600-volt wires and cables pulled into ducts and conduit shall be installed without the use of lubricants, except where such use is necessary and approved by the cable manufacturers and the Engineer. Wires and cables shall be carefully handled to avoid twists and kinks in the conductors or damage to the insulation. All trapped conduit and duct lines shall be swabbed to remove any accumulated moisture or debris before wires or cables are pulled in.

Cable reels shall be stored on concrete or other hard surface, or shall be lagged with 2 x 4 wood laggings providing 100% coverage.

No splicing will be permitted, except in junction boxes.

Lug bolting at terminals, devices, or bus bars shall be made up with a flat washer, a Belleville washer, and a locknut.

Lines of nylon or polypropylene, propelled by carbon dioxide or compressed air, shall be used to snake or pull wire and cable into conduits. Flat steel tapes or steel cables shall not be used.

W-76.16 600-Volt Wire and Cable - Splices and Terminations

Splices between copper conductors, size no. 10 AWG and smaller, shall be made up with compression type butt connections. Splices between copper conductors, size no. 8 AWG and larger, shall be made up with U.L. Inc. listed compression type tube connectors. Lug bolting at devices or bus bars shall be made up with a flat washer, a Belleville washer, and a locknut.

Splices and pigtail connections for lighting and receptacle wiring inside the buildings, no. 10 AWG and smaller, shall be made with a pre-insulated spring connectors, or equal.

Splices and lug terminations in 600-volt insulated cables shall be carefully taped and covered, using materials recommended by the cable manufacturer, to provide watertight insulation equal to that of the conductors.

Splices shall not be made within manholes unless specifically approved by the Engineer.

W-76.17 600-Volt Wire and Cable - Tests

The 600-volt insulated cables shall be factory tested prior to shipment in accordance with IPCEA standards for the insulation specified.

The following 600-volt wires and cable shall be tested after installation but before final connections are made up:

1. All feeders from motor control centers to motors 30 horsepower and larger.
2. All feeders from variable speed drive units.
3. All feeders from motor control centers to lighting panels and dry-type transformers.

For the above listed cables, a test voltage of 1,500 volts AC shall be applied for a period of 1 minute between all conductors in the same conduit, and between each conductor and ground.

All tests shall be made at the Contractor's expense, and certification of the tests shall be submitted to the Engineer. If any failures occur during the tests, the Contractor shall replace the cable.

W-76.18 Identification of Circuits

All wires and cables shall be banded with an identifying number and color code at each end termination and at each splice point in junction boxes. The identifying number of each wire shall be determined at the point of circuit origin, and shall continue unchanged to the point of circuit termination. In each conduit system, the wire identifying numbers shall include the conduit designation with a numeral suffix. The numeral suffix shall start with No. 1 and continue as required.

Where conduits enter motor control centers, switchgear terminal cabinets, and the like, the identification tag shall be fastened to the wire bundle near the conduit termination. The tag shall be held by an adjustable, self-locking nylon "Ty-Rap" as manufactured by Thomas and Betts Co., or equal. The identifying tag shall be of aluminum, brass, rigid fiber, and shall be engraved, stamped, or painted with the scheduled conduit number.

The wire identifying numbers and color code shall be applied as PVC slip-on sleeves, properly fitted to the wire diameter. The sleeves shall be as manufactured by Brady Co., Thomas and Betts Co., or equal. Wires shall be color coded in conformance with the requirements of applicable codes.

W-76.19 Wire and Cable Connections to Equipment

Electrical connections shall be made to all equipment in strict accordance with the manufacturer's approved wiring diagrams, the Plans, or as approved by the Engineer. The Contractor shall be responsible for the accuracy of his work, and shall repair any damage and replace any damaged equipment resulting from erroneous connections.

W-76.20 Painting

Conduit and boxes shall be painted in accordance with the Workmanship and Materials section headed "Painting."

Where aluminum surfaces such as boxes, conduit, or structural supports come in contact with incompatible metals, lime, mortar, concrete, or other masonry materials, the contact areas shall be given one field coat of Koppers Metal Passivator No. 40 and one coat of Koppers Bitumastic Super Service Black or two coats of asphalt varnish conforming to Fed. Spec. TT-V-51.

* * *

SECTION W-800 SERIES - HIGH DENSITY POLYETHYLENE PIPE (HDPE)

W-800.01 General

The purpose of this specification is to cover the requirements for the manufacturing, materials, testing, couplings, fittings and delivery of High Density Polyethylene Pipe (HDPE) to the City of Tampa.

W-800.02 Standards

The HDPE pipe shall be manufactured from a PE 4710 resin. The resin material shall meet the specifications of ASTM D 3350 with a minimum cell classification of 445574CC. Pipe shall have a manufacturing standard of ASTM F 714. The pipe shall have ductile iron size (DIPS) outside diameter unless noted otherwise. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

W-800.03 Fittings

A. BUTT FUSION FITTINGS: Molded butt fusion fittings shall be in accordance with ASTM D 3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe. The fitting shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

B. ELECTROFUSION FITTINGS: Electrofusion Fittings shall be PE 4710 HDPE, minimum cell classification of 445574C meeting ASTM D 3350 and be the same base resin as the pipe. Electrofusion Fittings shall have a manufacturing standard of ASTM F 1055.

C. FLANGED AND MECHANICAL JOINT ADAPTERS: Flanged and Mechanical Joint Adapters shall be PE 4710 HDPE, Cell Classification of 445574C meeting ASTM D 3350 and be the same base resin as the pipe. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.

D. MECHANICAL RESTRAINT: Mechanical restraint for HDPE may be provided by mechanical means separate from the mechanical joint gasket sealing gland. The restrainer shall provide wide, supportive contact around the full circumference of the pipe and be equal to the listed widths. Means of restraint shall be machined serrations on the inside surface of the restrainer equal to or greater than the listed serrations per inch and width. Loading of the restrainer shall be by a ductile iron follower that provides even circumferential loading over the entire restrainer. Design shall be such that restraint shall be increased with increases in line pressure. Serrated restrainer shall be ductile iron ASTM A 536 with a ductile iron follower; bolts and nuts shall be corrosive resistant, high strength alloy steel. The restrainer shall have a pressure rating of, or equal to that of the pipe on which it is used or 150 PSI whichever is lesser. Restrainers shall be EBAA Iron Megalug or approved equal.

Nominal Size	Restraint Width	Serrations per inch
4", 6"	1-1/2"	8
8" 10 & 12"	1-3/4"	8

Pipe stiffeners shall be used in conjunction with restrainers. The pipe stiffeners shall be designed to support the interior wall of the HDPE. The stiffeners shall support the pipe's end and control the "necking down" reaction to the pressure applied during normal installation. The pipe stiffeners shall be formed of 304 or 316 stainless steel to the HDPE manufacturers published average inside diameter of the specific size and DR of the HDPE. Stiffeners shall be by JCM Industries or approved equal.

W-800.04 Joining

A. BUTT FUSION: Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400-450 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself.

B. SIDEWALL FUSION: Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.

C. MECHANICAL: Bolted joining may be used where the butt fusion method cannot be used. Flange joining will be accomplished by using a HDPE flange adapter with a 316 stainless steel back-up ring. Mechanical joint joining will be accomplished using either a molded mechanical joint adapter or the combination of a Megalug Restrainer and Pipe Stiffener as manufactured by EBAA Iron, Inc. or approved equal. Either mechanical joint joining method will have a ductile iron mechanical joint gland.

D. OTHER: Socket fusion, hot gas fusion, threading, solvents, and epoxies may not be used to join HDPE pipe.

W-800.05 Pipe Packaging, Handling & Storage:

The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact and without physical damage. The transportation carriers shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked and restrained during transportation such that the pipe is not nicked, gouged, or physically damaged.

Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.
Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.

Fused segments of the pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

* * *

SECTION 9801

MECHANICAL BAR SCREEN & WASHING COMPACTOR

Part 1 GENERAL

1.1 SCOPE - Supply all labor, materials, equipment and incidentals required to install and place into operation the coarse screening system as shown on the Drawings and as specified herein.

1.2 REFERENCE STANDARDS - The properties of all materials, design, fabrication and performance of the equipment to be furnished under this section shall be in accordance with the latest issue of applicable standard specifications. The governing authorities of these standards are listed below.

A. AICS, American Institute of Steel Construction
B. AISI American Iron and Steel Institute
C. ANSI, American National Standards Institute
D. ASCE, American Society of Civil Engineers
E. ASME, American Society of Mechanical Engineers
F. ASTM, American Society of Testing and Materials
G. AWS, American Welding Society
H. IBC, International Building Code
I. IEC, International Electric Code
J. IEEE, Institute of Electrical and Electronics Engineers
K. NEC, National Electrical Code
L. NEMA, National Electrical Manufacturers Association
M. Underwriters Laboratory (UL and cUL)

1.3 SUBMITTALS - Submittals shall be provided to the engineer that includes the following information:

A. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
B. Descriptive product literature.
C. Schematic electrical wiring diagram and electrical controls information.
D. Complete motor and drive data.
E. The total weight of the equipment.
F. A complete bill of materials of all equipment.
G. All as-built drawings for record and design calculations must be stamped by a professional engineer, registered in the State of Florida.

1.4 QUALIFICATIONS

A. All the equipment specified under this Section shall be supplied by a single manufacturer involved in the manufacture of the screening equipment. Qualified manufacturers shall have a minimum of ten (10) years' experience with wastewater screening systems, including through flow continuous belt screens and washing compactors, for consideration.

B. If equipment is not manufactured by supplier, including welding and machining, the name and contact information of manufacturing facility must be supplied. If more than one manufacturer is used all companies and facilities must be provided.

C. If patents protecting equipment are not owned by supplier then affidavit must be supplied stating owner of design and expiration of licensing agreement.

D. Any manufacturer proposing equipment described herein, prior to the bid date, must conduct independent testing of actual wastewater flow onsite. The testing shall simulate the proposed screen's operation within the channel and shall be capable of measuring screens solids capture, blinding, grid velocity and unloading based on the specified opening size and grid type. A minimum of 10 separate tests must be performed with a minimum of 2,000 gallons of plant wastewater tested at multiple points in the water column to ensure accuracy. Testing shall be conducted by a manufacturer employed factory technician, not a third party representative.

1.5 DESIGN REQUIREMENTS

A. System Description

1. The screen will have a continuous stainless steel belt that automatically rotates within the internal guide system of the static frame.

2. The screen herein specified will be of the straight through type that will present a clean screening grid to the influent flow at all times.

3. The solids will collect as a mat on the front face of the continuous belt. The belt will intermittently rotate and elevate the solids to the discharge point. Larger objects will be picked up by a series of hooks.

4. The solids will be automatically removed at the top of the screen into an internal hopper and be fed to the screening handling system.

5. The continuous belt will be directly driven by drive sprockets that shall support and rotate the grid assembly.

6. The screen will be totally enclosed and have access covers that will be lightweight and easily removable for maintenance. Maintenance, inspection, access and lubrication points shall be no higher than 86 inches above grade level. If any points are higher than this level manufacturer shall include permanent steps, grating and railing attached to screen frame to limit operator reach to this height.

7. The Washing Compactor will be positioned next to the screening channel and will be fed by a short discharge sluice.

8. The Washing Compactor will be adequately sized to handle all the screenings and wash water that will be generated by the screen at peak flow. The system will be required to wash the screenings to reduce the organic content and compact the remaining solids into a dry plug.

9. The Washing Compactor will generally comprise of a screw auger rotating within the washing and drainage trough, a wash water system, a compaction zone and an outlet chute arrangement.

10. All stainless steel (including frame, grid, and drive components) mentioned below as stainless steel shall be T316 stainless steel. All hardware shall be T316 stainless steel.

B. System Performance - The fine screening system will be designed to meet the following design parameters:

1. Number of screens	1
2. Peak flow per screen	14.5 MGD
3. Average flow to screen	3 MGD
4. Screen grid opening	12 mm
5. Head loss at peak flow	6 inches @ 30% blinding
6. Channel width	42 inches
7. Channel depth	306.36 inches
8. Screen discharge height above top channel	72 inches
9. Number of Washing Compactors	1
10. Diameter of screw	12 inches
11. Diameter of shaft	3.5 inches
12. Compactor discharge height above grade	60 inches
13. System wash water requirements	30 GPM @ 40 PSI

Part 2 PRODUCTS

2.1 MANUFACTURER

A. The equipment shall be the Triden Screen (Original Triden Model) and Washing Compactor as provided by Hydro-Dyne Engineering, Inc., Oldsmar, FL, or shall meet Hydro-Dyne's published specifications for these units. Other than the named supplier, all manufacturers proposing the equipment described herein, will provide a detailed submittal package, which will consist, at a minimum, of all information and details prescribed in section 1.3, 1.4 and Part 2 of this Specification.

B. If submitted equipment requires arrangement differing from that specified, prepare and submit for review complete structural, mechanical, and electrical drawings and equipment lists showing all necessary changes and embodying all special features of equipment proposed. Any changes are at no additional compensation and the Manufacturer will be responsible for all engineering costs of redesign by the Engineer, if necessary.

2.2 THE THROUGH FLOW FINE SCREEN

A. Laced Link Grid - The Continuous Screening Belt

1. The screenings belt will consist of heavy duty stainless steel laced links connected in parallel and separated by Delrin spacers to maintain specified opening. Each laced link hook element shall be fabricated from 12 gauge (minimum) stainless steel. Each straight element shall be fabricated from 14 gauge (minimum) stainless steel. All elements shall be a minimum of 1 inch wide forming a slotted opening of the specified

width and minimum 1 inch deep in the direction of flow. Hooks on elements shall form horizontal lifting trays or shelves for removing large solids and rags every 8 inches.

2. The stainless steel laced links will be connected by heavy duty stainless steel axles every 8 inches to form a continuous belt that will rotate within the frame's guide system. The axle design will allow the row of laced links to pivot. The links shall support the screening grid and bear tension loads across the entire width and length of the screen belt.

3. The axles will be extended to fix a UHMWPE guide link to the side of each row of laced link elements. These guides will interlock to create a continuous guide link system that will slide within the frame.

4. The heavy duty guide links will be minimum 2 inches thick to protect against undue wear from grit.

5. The seal shall be continuous from grade level through the water flow forming an uninterrupted closure between the traveling screen grid and the stationary frame. The seal shall be fixed to the screen frame and be adjustable so that it will remain in contact with the rotating screen belt at all times.

6. Guide systems that use rollers, stainless or hardened steel chains will not be acceptable.

7. Grid sealing systems that use neoprene seals or stainless steel hinges will not be acceptable.

8. Grid to frame sealing systems that use adjustable UHMWPE strips attached to the frame will not be acceptable.

9. Intermittent stainless steel laced link elements that form sharp hooks will be regularly placed along the face of each row of the grid to effectively remove larger particles.

B. The Frame

1. The continuous belt will rotate within a heavy duty stainless steel static support frame that shall stand at a 75 degree angle in the channel. The screen will not be fixed within the channel to allow the machine to pivot out of the channel for repair or bypass. All routine maintenance will be achieved without removing the screen from the channel.

2. The guide link system will travel around a guide wear track that is integral to the support frame. Top and bottom wear tracks shall be bolt in field replaceable.

3. The design will ensure that the support frame meshes with the closure seal on each guide link to prevent passage of screening material and grit particles.

4. The frame shall accommodate stainless steel protective covers designed to prevent leakage and contain spray wash. All access covers for maintenance will be lightweight and easily removable. Screens with covers requiring neoprene, rubber or plastic seals are not acceptable.

5. If required the screen manufacturer will supply the stainless steel angled filler plates with neoprene seals to connect from the upstream corners of the support frame to the channel walls.

C. The Offloading of Screenings

1. A stainless steel spray wash header will be located in the head space of the screen to offload the screenings from the continuous belt.

2. The spray bar will incorporate brass nozzles at 2 inch spaces that can easily be replaced or removed for cleaning.

3. The spray bar will be positioned behind the rotating belt and will backwash the solids into a discharge hopper manufactured from stainless steel. The wash water will be used to continuously flush the screenings from this hopper into the extended sluice.

4. The addition of a mechanically rotating brush system to aid offloading will not be acceptable.

5. The spray bars shall have a quick release mechanism allowing them to be quickly removed and changed out for maintenance. Spray bars that bolt in place or that require tools for removal will not be acceptable.

D. The Drive Mechanism

1. Each screen will have a single 1 hp, continuous duty, explosion proof, electric geared motor suitable for a 460/3/60 supply. The motor will be TEFC NEMA rated. The motor will be located outside of the screen covers and above the top of the channel.

2. The gear reducer shall be directly coupled to a heavy duty shaft machined from stainless steel. The gear reducer shall be SEW Eurodrive or shall meet SEW Eurodrive's published specifications.

3. The continuous belt will be supported and rotated around heavy duty stainless steel sprockets located on the drive shaft in the head space of the screen.

4. These sprockets will have lugs that transmit torque directly from the gear reducer to notches on the underside of the UHMWPE guide links. Driving forces shall be transmitted to areas located behind the screen's grid to prevent solids from contacting drive surfaces.

5. Chain driven systems or screens with wheels submerged in the wastewater are not acceptable.

2.3 THE WASHING COMPACTOR

A. The Screenings Transfer Sluice

1. The screenings sluice will collect screenings and wash water from the discharge hopper of the screen and transfer them by gravity directly into the Washing Compactor's washing trough. Mechanically driven conveyors are not acceptable.

2. The sluice will be manufactured from stainless steel. It shall comprise of U-shaped lengths of trough that will be (flange connected/welded) to the desired overall length.

3. The Manufacturer will design and supply the support leg structure manufactured from stainless steel. The legs will be suitable for fixing to a concrete floor.

4. Covers will be a lightweight, no more than 6 feet long and easily removed by a single operator.

B. The Washing Compactor

1. The main body will be the washing trough that will receive screenings and wash water directly from the end of the screenings transfer sluice.

2. The connection between the sluice discharge and Washing Compactor will be a flexible coupling and the compactor base will incorporate locking wheels to allow compactors to be easily removed.

3. The washing trough will house the screw auger and provide a dedicated section to reduce organic content. It will comprise of angled side walls manufactured from 10 gauge stainless steel that will direct the screenings on to the screw auger, and a drainage section in which the screw auger will ride.

4. The trough section will bolt into the compactor and be field replaceable. The drainage section will be manufactured from stainless steel that has been machined with 5mm slots. The slots will be perpendicular to the direction of the screw so that the shearing action will prevent material collecting in the slots. The screw will not require stiff nylon brushes to keep the section clean.

5. The underside of the washing trough will be a catch pan that will collect the contaminated water that passes through the drainage section. The catch pan will feed a 6 inch diameter outlet connection. The Main Contractor will connect the pipe to take the water back to the main flow.

6. The catch pan will include a separate wash water supply to periodically purge the area of accumulated solids. The Contractor will supply a manually operated 1.5" stainless steel ball valve connected to a single spray nozzle that will direct water across the length of the pan toward the outlet.

7. The screw auger will sit in the washing trough. Washing Compactors with shaftless screws are not acceptable as shaft is required to support flight and provide necessary torque and compaction.

8. The auger will be a full pitch screw supported at the compaction end by minimum 7.5" wide UHMWPE Flight Support Bearing that creates a supporting collar around the screw flight. Each bearing ring will be designed to rotate through 180 degrees to

provide a second wear surface below the screw. Each wear surface shall be fitted with a set screw that can be removed for inspection. The operator will be able to inspect and rotate the bearing by removing the outside cover without disassembling the equipment.

9. The end of the screw shall be reinforced with a triangular shaped stainless steel gusset welded behind the final screw flight to provide protection in this high wear/high torque area and to assist in compression of the screenings.

10. The screw will rotate, creating sufficient agitation to break down the organic material and separate it from the non-organic screenings.

11. The wash water system will flush the separated organic material through the drainage section in solution or as small particles.

12. A portion of the washing water will enter the washing trough with the screenings. This will be supplemented by spray nozzles that will direct water on to the screenings prior to compaction. The nozzles will be recessed into the side wall of the washing trough to protect from ragging and blockage.

13. The screw will transfer the washed screenings into the compaction zone. This will be a section of stainless steel pipe followed by the UHMWPE flight support bearing. The total length of this section will at a minimum equal two full pitches of the screw flight.

14. The compacted screenings will be pushed through the compaction zone and pass through an orifice plate into the outlet chute. The outlet chute will be tapered at 1 degree along the full length and will elevate the dewatered screenings to discharge by gravity into the dumpster (supplied by others).

C. The Drive Mechanism

1. Each Washing Compactor will have a single 5 hp, continuous duty, explosion proof, electric geared motor suitable for a 460/3/60 supply. The motor will be TEFC NEMA rated.

2. The gear reducer shall be directly coupled to a heavy duty shaft machined from stainless steel. The gear reducer shall be SEW Eurodrive or shall meet SEW Eurodrive's published specifications.

3. There shall be the ability to change the height of the screw within the washing trough by using adjustment bolts on the gearbox plate. This will prevent excess wear of the screw flights and trough.

2.4 THE CONTROL PANEL

A. General Information - The manufacturer will supply one UL listed 508A stainless steel main control panel that shall automatically control the equipment offered in this section.

B. The Main Control Panel – NEMA 4X – Each based control panel shall consist of, but not be limited to, the following components for each screening system:

1. Stainless steel NEMA 4X, control panel enclosure
2. Hand/Off/Auto switch
3. Fused disconnect
4. Yaskawa Variable Frequency Drive (VFD) Unit
5. Nema 4X, Local Control Station w/
   a) Screen, Compactor and Sluice Flush H/O/A switches
   b) Screen and Compactor Jog Switches
   c) Emergency Stop
   d) Current Monitors for screen and compactor motors
6. Recycle timer
7. Hour run meter
8. Control transformer
9. Fuses and breakers
10. Motor starter
11. Motor overload sensor
12. Screen run light
13. Washing Compactor run light
14. Emergency stop
15. Pneumatic differential level transducer and controller

2.5 SURFACE PREPARATION AND PAINTING

A. All stainless steel materials, including hardware, shall be acid passivated for quality control, removal of heat affected discoloration, surface treatment for corrosive environments and to provide a uniform finish to stainless surfaces.

B. All ferrous surfaces (except stainless steel) shall be coated with a pre-primer, primer, and an exterior top coating, or fusion bonded polyester coating suitable for humid/wet environments for superior corrosion protection.

C. Motor and gearbox shall be manufacturer's standard coating for humid/wet environments for superior corrosion protection.

2.6 SPARE PARTS - The manufacturer will supply the following spare parts, per screen supplied, with the equipment:

A. Ten (10) hook links and elements spacers
B. Two (2) grid axles
C. Two (2) guide links
D. One (1) center support link
E. One (1) brush for the screen
F. One (1) spray bar with nozzles
G. One (1) drainage basket for compactor
H. One (1) set UHMWPE flight support bearings

2.7 ACCESSORIES - The manufacturer will supply the following accessories, with the equipment:

A. One (1) lot of necessary anchor bolts/Anchor Epoxy
B. One (1) 2" wash water strainer

C. One (1) wash water pressure gauge

Part 3 EXECUTION

3.1 WARRANTY – The Manufacturer of the equipment supplied under this specification shall provide a warranty for a period of twelve months commencing on acceptance by the Owner. The Manufacturer shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the Manufacturer shall, at his option, promptly repair, modify or replace the defective equipment.

A. Throughout the warranty period the manufacturer must provide onsite support for the equipment. In the event of an emergency, manufacturer must be capable of having a factory employed service technician on site within 24 hours of notification of an equipment failure.

B. The manufacturer will provide a factory employed service technician to periodically visit the installation after owner's acceptance to inspect the equipment for proper operation, maintenance and provide follow up training to plant personnel. This service will be provided at a minimum of four (4) trips per year over the course of the warranty period.

3.2 FACTORY TESTING

A. The screening system and all components shall be factory assembled and tested for a minimum of 24 hours prior to shipment. The equipment shall be shipped fully assembled and shall be capable of being set in place and field erected by the Contractor with minimal field assembly.

B. During the factory test period the screening system shall be adjusted as required assuring proper operation on completion of the field installation. The Manufacturer shall supply a certification of the completion of the factory testing of the assembled screening system and appurtenances and shall certify as to the equipment being in satisfactory operating condition at time of shipment. The Engineer and/or Owner may, at their own option and expense, witness the factory test.

3.3 DELIVERY AND STORAGE

A. The screening system shall be appropriately crated and delivered to protect against damage during shipment.

B. An authorized representative of the Contractor shall inspect the screens on delivery to the jobsite and shall report any damage or missing components to the Manufacturer and the Engineer within 72 hours of receipt of the shipment.

3.4 INSTALLATION - The installation of the equipment shall be as indicated on the drawings and in strict accordance with the Manufacturer's instructions and recommendations.

A. A Manufacturer employed service technician will be on site for supervising the installation of the equipment by the contractor. The responsibilities of the factory technician will be as follows.

1. Approving lifting points and spreader bar usage.

2. Checking bolt torques and fit-ups.

3. Signing off on all quality control documentation certifying that the following have been checked and completed properly.

    a. Mounting of screen
    b. Plumbing and electrical hookups
    c. Screen to sluice and sluice to compactor connections
    d. Placement of filler plates

B. The Contractor shall include in his bid, the cost of the above referenced service representative to be onsite in order to complete all of the installation supervision and assistance as described in this section.

3.5 FIELD TESTS, ADJUSTMENTS AND COMMISSIONING

A. After completion of the installation, the equipment shall be inspected and certified by a factory employed service technician of the Manufacturer as being in compliance with the Manufacturer's recommendations and requirements. At such time as the Manufacturer has deemed the installation to be acceptable, the Manufacturer's authorized service representative shall make any required adjustments and shall start the equipment to assure proper operation.

B. The Contractor shall include in his bid, the cost of the above referenced service representative to be onsite in order to complete all of the equipment startup certifications described in this section.

C. The Contractor shall include in his bid, the cost of the above referenced service technician for a minimum of two (2) trips at two (2) eight hour days onsite to complete the training of plant personnel.

D. The Manufacturer's authorized representative shall provide instruction to the plant personnel as to the operation and maintenance of the equipment including commissioning, shut down, on-line operations, lubrication and preventative maintenance.

* * *

SECTION 13400

GENERAL INSTRUMENTATION AND CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes requirements for furnishing and installing instrumentation and control systems including all work and materials necessary to perform control and monitoring functions as illustrated on drawings, and as specified in the following sections:

1. Section 13420 - Field Instruments
2. Section 13431 - Panel Devices And Enclosure Construction
3. Section 13451 - PLC Systems

1.2 REFERENCES

A. Codes and Standards referred to in this Section are:

1. IEEE 802.3 10/100/1000 Mbps baseband networks
2. ISA-S5.4 Instrument Loop Diagrams.
3. NFPA 70 National Electrical Code
4. UL Underwriter’s Laboratory
5. NEMA National Electrical Manufacturers Association

1.3 DEFINITIONS

A. Terminologies

1. Systems Integrator: Firms regularly engaged in providing instrumentation, control, and Supervisory Control and Data Acquisition (SCADA) systems.
2. PLC: Programmable Logic Controller system, including power supply, central processing unit (CPU), communication controller, interconnect cables, and input and output interface.
3. OIT: Graphical local Operator Interface Terminal at PLC enclosures.
4. HMI: Operator Workstation. Personal computer (PC) based operator interface system, including hardware, operating system software, and operator interface HMI system software; generally referred to as SCADA or HMI workstation. The HMI workstations are existing and will be modified by the City.
5. SCADA (Supervisory Control and Data Acquisition): SCADA is an integrated network of PLCs, OITs, HMIs, servers, PCs, printers and network switches. It serves as the computer based system-wide monitoring and control system.

1.4 SYSTEM DESCRIPTION

A. General Description of Work

1. Provide new magnetic flow meter on Sewage Screen Spray Water pipe.
2. Provide a new Bubbler Panel to monitor wet well levels upstream and downstream of the proposed Automatic Sewage Screen. New bubbler transmitters and pneumatic circuits shall be provided and installed, including new stainless steel tubing extending from the proposed bubbler panel to the proposed bubbler down tubes (PVC pipes into the wells).
3. Provide a new PLC / Annunciator Panel for monitoring and control of the new and existing station pumps as shown.
4. Provide new I/O signals for the new PLC / Annunciator as shown and required. All wired I/O will be terminated at the new Pump Control PLC as shown and required.

B. Programming and Software Configuration

1. Provide all programming and software configuration for the new Pump Control PLC as part of this contract work.
2. All programming modifications and/or additions for the existing SCADA RTU will be performed by the City.

C. Provide all materials and work necessary for complete and fully functional systems.

1. Provide instrumentation and control components as well as system integration. Provide all mounting hardware and supports. Work shall include panel mounting and the completion of all wiring terminations within control panels.
2. Coordinate work with all electrical, mechanical, and structural work furnished in this contract.
3. Ensure proper interface between PLC, OIT and network systems and equipment furnished in this contract.
4. Install, make final connections, adjust, test, start-up systems per manufacturer’s instructions and recommendations.

D. Design Requirements

1. General: Provide instrumentation and control system for the pumping station as indicated herein and as shown on drawings.
2. Provide the new PLC System to monitor all PLC controlled systems, which include all work performed in this contract.
3. The pumping station will remain linked to the HF Curran Wastewater Treatment Plant via the existing SCADA RTU interfaced through the proposed PLC / Annunciator. The remote SCADA RTU is the responsibility of the City. Any required modifications of the existing SCADA RTU will be performed by the City. The Contractor shall provide new communication cabling between the proposed PLC / Annunciator and existing SCADA RTU as shown and required. Existing conduit systems may be reused if practical. The Contractor shall work closely with City Technicians to ensure that proper data transfer is accomplished.

E. Source Code Ownership

1. Any developed ladder logic (along w/ source code) shall become property of the City of Tampa. This applies to any logic associated with any package control systems as well.

1.5 SUBMITTALS

A. General: Provide submittals as specified in the Specific Provisions and as required below. Submit documents as follows:

1. Provide cover sheet on each submittal with the following information:
   a. Project Title, Location and Owner
   b. Submittal Title
   c. Submittal Order (First Submittal, Re-submittal Number, etc.)
2. Organize and divide documents, using tagged dividers, into logical divisions.
3. Provide index sheets.
4. Minimum drawing size: 8-1/2 by 11 inches. Put drawings, larger than 11 by 17 inches, in three-hole plastic pockets.
5. Type all text.
6. Do not submit faxed documents.

B. Action Submittals

1. Product Data: Submit manufacturer’s official and published product data, specifications, and installation recommendations for each item.
2. Shop Drawings: Submit shop drawings as per the Specific Provisions, and as required below. Include the following information in each submittal:
   a. Instrument index, including tag number, description, location, and calibrated range for each instrument.
   b. Individual instrument specification sheet, including manufacturer's name and complete catalog number.
   c. PLC Input and Output drawings, containing, but not limited to, the following information:
      (1) Instrument tag numbers
      (2) Individual component locations
      (3) Actual equipment wiring terminal designations, point to point wiring, and cable shield terminations
      (4) Wire type, size and identification number
      (5) Signal types (e.g., 120 Volt ac, 4-20 mAdc, pulse frequency, etc.)
      (6) Contact orientations (e.g., normally open, normally closed, etc.)

(7) Equipment grounding requirements

(8) Signal boosters, interposing relays, optical isolators, and shunt resistors.

C. Information Submittals (for owner information, not for approval)

1. Test Reports: Submit all loop field calibration reports.

2. Manufacturer's Instructions: Submit manufacturer published installation manuals for each instrument.

D. Contract Closeout Information Submittals (for owner information, not for approval): Provide submittals as required below.

1. Project Record Documents: In addition to requirements described in the Specific Provisions, provide the following:

a. PLC program documentation: Provide paper copies of all PLC software development and configuration including listing of all PLC register tables.

b. Include functional narrative description of the developed ladder logic to describe each control system. Ladder logic is to be annotated as specified in Section 13451 to include functional alphanumeric description of logic elements to assist Owner in understanding the ladder logic for troubleshooting and future modification.

c. PLC program copies: Provide two digital copies of fully configured PLC systems. Digital copies shall be in CD-ROM format.

d. Operator interface program copies: Provide hard copy printouts and digital copies of new OIT screens and database listings. Digital copies shall be in CD-ROM format.

2. Operation and Maintenance Data: Provide operation and maintenance manuals as specified in the Specific Provisions. Include the following information:

a. Recommended spare parts list.

b. Manufacturer approved repair and service centers list.

c. Replacements part sources.

d. Recommended maintenance procedures and frequencies.

3. Warranty: Provide warranty certificate as described in the Specific Provisions.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements

1. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes, applicable to construction and installation of electrical wiring, devices, material and equipment.

2. NECA Standards: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation".

3. UL Labels: Provide control panel components, power supplies, controllers, relays, etc., which have been listed and labeled by Underwriter's Laboratories.

B. The purpose of contract drawings and specifications is to convey information required for complete and functioning systems. Systems Integrator is responsible for all details necessary to properly install, adjust, and place in operation, intended systems. "Instrument Schedules" and "PLC I/O Summaries" are provided for convenience; their accuracy is not guaranteed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store, and handle all products and materials as specified in the Specific Provisions.

B. Packing and Shipping

C. Acceptance at Site: Inspect all materials and equipment against approved shop drawings at time of delivery. Immediately return for replacement or repair any equipment or materials damaged or not meeting requirements of approved shop drawings.

D. Storage and Protection: Label all equipment and materials after they have been inspected. Store all equipment and materials in dry, covered, ventilated location. Protect from harm in accordance with manufacturer's recommendations.

1.8 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Protect all equipment and instruments specified herein from moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Allowable hardware manufacturers are listed in the respective specification sections.

2.2 MONITORING AND CONTROL – GENERAL

A. These sections contains functional descriptions of the pump station equipment and processes to be monitored and controlled by (or through) the new PLC system.

B. Configure the PLC system to meet the functional requirements specified herein.

C. Make all register and I/O data available to the existing SCADA RTU.

D. PLC shall examine status of operating mode input from each equipment item/group. PLC control logic and outputs shall only be activated if the equipment is in the proper operating mode (auto, computer or remote, as applicable). Computer Mode and Remote Mode inputs to the PLC generally refer to the same thing, i.e. that control is now handed off to the PLC.

E. In general, all PLC control discrete outputs for starting and stopping equipment are to be configured as maintained "Run" signal commands which are maintained during a power failure.

2.3 TYPICAL MONITORING AND CONTROL STRATEGIES

A. Continuous Process Signal Monitoring

1. Indicate each continuous process signal monitored on Operator Interface Terminal in direct engineering units.

2. Include operator adjustable alarm points for each process signal for Low-Low, Low, High, High-High and rate of change.

3. Generate an alarm when the process signal is out-of-range.

B. Typical Setpoint Control Adjustment

1. Provide each operator adjustable timer and process variable setpoint with minimum and maximum limits.

2. Provide numerical fields for setpoint entry. Setpoint entries should be in direct engineering units.

3. Provide out of range warning message if attempts are made to set setpoints less than the minimum limit, or greater than the maximum limit.

2.4 ALARM PROCEDURES

A. Program the PLC and local OIT to annunciate the alarms:

1. When an alarm occurs, program associated PLC to function as follows:

a. Display alarm event in annunciator table format on the OIT at the new PLC Panel.

B. Program the PLC to permit user to acknowledge the alarm from the OIT or from a remote SCADA HMI workstation.

2.5 CONTROL STRATEGY – PUMPING

A. Configure the new PLC to monitor and control the pumps. Develop OIT screens to display the running and alarm status of the pumps. Include display of station flow and pump speed. Include totalized flow values on the display. Configure the OIT with a reset function, password protected, to allow the operator to reset the cumulative flow totalizer value from the OIT.

B. Each pump has a HAND-OFF-AUTO mode selector at the AFD. In HAND mode, the operator starts and stops the pumps manually at the drive.

C. When the HAND-OFF-AUTO selector at the AFD is in AUTO, configure the PLC to control the pump.

D. General Background:

1. There will be four sewage pumps at the pump station. Two pumps will be 60-hp and two pumps will be 120-hp. Normal control strategy is to operate with one lead and three lag pumps.

2. Use 80% of full speed as the typical maximum speed under automatic conditions. This allows the pumps to operate at a good point on their pump curves. Provide ability to manually input the maximum allowable pump speed, as described below.

3. Allow the operator to select the lead, lag1, lag2, lag3 pump sequence from any of the four pumps from the OIT. Configure pump start-stop controls and speed ramps based on adjustable level settings in the wet well as indicated below.

E. The signal from the new down-stream bubbler wet well level transmitter shall be used for the pump control settings.

F. Normal Pump Control: Configure the pump control wet well level settings in accordance with the following tables. Make all settings adjustable from the OIT.

Rising Wet Well Level

Action	***Approximate %-Speed***	***Level El. (Note 1)***
Start Lead pump	**55%**	**-22.5'**
Increase speed of lead pump with rising level to:	**80%**	**-21.5'**
Start Lag-1 pump at 70% speed and reduce speed of Lead pump to match pump speeds so total flow is divided equally	**70%**	**>-21.5'**
Increase speed of both pumps in parallel, linear with demand until:	**80%**	**-20.5'**
Start Lag-2 pump at 70% speed and reduce speed of Lead and Lag-1 pump to match pump speeds so total flow is divided equally	**70%**	**>-20.5'**
Increase speed of the three pumps in parallel, linear with demand until:	**80%**	**-19.5'**
Start Lag-3 pump at 70% speed and reduce speed of Lead, Lag-1, & Lag-2 pump to match pump speeds so total flow is divided equally	**70%**	**>-19.5'**
Increase speed of the four pumps in parallel, linear with demand until:	**80%**	**-19.0'**
Activate high level alarm		**-18.5'**

Decreasing Wet Well Level

Action	*Approximate %-Speed*	*Level*
All pumps at full speed	**80%**	**-19.0'**
Decrease speed of the four pumps in parallel, linear with demand until:	**70%**	**-19.5'**
Stop Lag-3 pump and increase speed of remaining three pumps to:	**80%**	**-20.0'**
Decrease speed of the three pumps in parallel, linear with demand until:	**70%**	**-20.5'**
Stop Lag-2 pump and increase speed of remaining two pumps to:	**80%**	**-21.0'**
Decrease speed of the two pumps in parallel, linear with demand until:	**70%**	**-21.5'**
Stop Lag-1 pump and increase speed of lead pumps to:	**80%**	**-22.0'**
Decrease speed of the lead pump, linear with demand until:	**55%**	**-22.5'**
Shut down lead pump	**55%**	**-22.9'**
Activate low level alarm		**-23.2'**

Note 1: Elevations based on the highest point of the floor elevation on deck above screen channels as El. 0.00'. (This corresponds with an elevation of 11.87' in North American Vertical Datum 1988 (NAVD88))

G. Back-Up Pump Control: Configure the Back-Up pump control settings in accordance with the following tables. The settings will be made at the Back-Up controller module and associated time delay relays.

Back-Up Pump Control

Action	*Time setting*	*Level El. (Note 1)*	*Approximate %-Speed*
Downstream high-level float switch activated		**>-18.5'**	
Start Pump #1	**Immediate**	**>-18.5'**	**80%**
Start Pump #2, turn on time delay	**40 sec.**	**>-18.5'**	**80%**
Start Pump #3, turn on time delay	**80 sec.**	**>-18.5'**	**80%**
Start Pump #4, turn on time delay	**120 sec.**	**>-18.5'**	**80%**
Downstream high-level float switch de-activated		**<-18.5'**	**80%**
Pump #1 thru Pump #4 continue running for this time setting and then shut down.	**8 min.**	**<-18.5'**	**80%**

Note 1: Elevations based on the highest point of the floor elevation on deck above screen channels as El. 0.00'. (This corresponds with an elevation of 11.87' in North American Vertical Datum 1988 (NAVD88))

H. Pump Cleansing Cycle

1. At 9:00am each day, if one pump is operating and the liquid level is above El. -22.0', increase the lead pump speed to the maximum selected speed (80%) and operate at that speed for 5 minutes.

   a. Wet well level, time-of-day and cycle duration shall be field adjustable at the OIT screen.

2. After 5 minutes or if the liquid level falls to El. -19.4', return to normal level control of the lead pump.

I. Develop OIT screen showing pump mode and running status, alarms and pump speed. Each pump has a Hand/Off/Auto mode switch at the AFD control panel. PLC control is active when the local mode selector is in Remote mode.

J. Configure the OIT screen to include wet well levels, discharge flows and totalization values. Provide a reset function to allow the operator to reset the flow totalizer value for "Total flow to Date" from the OIT.

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION AND APPLICATION

A. General

1. Install all instruments and equipment in strict compliance with manufacturer's instructions.
2. Mount all gages and indicators in upright position.
3. Provide sufficient space around equipment for maintenance and removal of equipment.
4. Cover front panels, gages and indicators during construction for protection from dust, weld and paint splatter.
5. Unless otherwise impractical, mount all indicating instruments at eye level (5 feet).
6. Unless otherwise impractical, support instruments independent of process piping.

B. Installation Hardware

1. Provide stainless steel nuts and bolts.
2. Provide aluminum or stainless steel support channels.
3. Provide 1/4-inch thick minimum, clear anodized aluminum equipment mounting plates.
4. Provide gaskets to prevent galvanic reaction between dissimilar metal surfaces.

C. Equipment Identification and Instrument Tags

1. Provide embossed stainless steel tags as specified in Section 13420.
2. Provide an engraved laminated plastic plate at each wall-mounted instrument panel, indicating panel and instrument function and tag.
3. Engraved laminated tag colors: Provide black lettering on white background. Mount tags at eye level.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspection: Provide tests as required in the Specific Provisions.

B. Inspection: Demonstrate that instruments, panels, and PLC equipment,

1. Has not been damaged by transportation or installation,
2. Has been properly installed,
3. Has no mechanical defects,
4. Is in proper alignment, and
5. Has been properly connected.

C. Tests: Perform the following tests:

1. Field-calibrate all field instruments. Test all analog input loop zeroes and spans by disconnecting wiring at each transmitter and by connecting a 4-20 mA generator. PLC Panel OIT shall display correct value based on simulated 4-20 mA signal.
2. Test all external alarm contacts by placing jumpers across normally open contact inputs, or by physically disconnecting wiring on normally closed contact inputs. These procedures shall be done at location of field contacts.
3. Test digital inputs and outputs by actual starting and stopping of equipment when possible, or with jumpers at field equipment terminals.
4. Conduct all tests in presence of Owner personnel or Engineer.

D. Manufacturers Field Service: Provide manufacturer field service for calibration, initial setup, programming and commissioning of each instrument.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 13420

FIELD INSTRUMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Scope:

1. Provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation all primary sensors and field instruments furnished under this Section.

2. Install all in-line flow elements and provide taps in the process piping systems for installation of other flow, pressure, level and temperature sensing instrumentation.

3. Drawings and Specifications illustrate and specify functional and general construction requirements of the sensors and field instruments and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. Provide all components, piping, wiring, accessories and labor required for a complete, workable and integrated system.

B. Instruments furnished under other Sections

1. Certain field instruments are specified to be included with the equipment furnished by the vendor under other specification sections. These instruments shall generally meet the requirements specified in this section where applicable.

2. Instruments furnished by other equipment vendors/manufacturers are not included in the schedule at the end of this section but are generally shown on the P&IDs.

C. Coordination: Coordinate the installation of all items specified herein and required to ensure the complete and proper interfacing of all the components and systems.

D. Related Sections:

1. Section 13400 - General Instrumentation and Control
2. Section 13431 - Panel Devices And Enclosure Construction
3. Section 13451 - PLC Systems

1.2 QUALITY ASSURANCE

A. Comply with the requirements of Section 13400, General Instrumentation and Control.

B. Acceptable Manufacturers:

1. Furnish primary sensors and field instruments by the named manufacturers or equal equipment by other manufacturers.

2. The named manufacturers have been specified to establish the standard of quality and performance of the equipment to be supplied.

3. Obtain all sensors and field instruments of a given type from the same manufacturer.

4. The primary sensors and field devices shall be interchangeable with similar function existing primary sensors and field devices to minimize spare parts inventory.

C. Manufacturer's Responsibilities and Services:

1. Design and manufacture the primary sensors and field instruments in accordance with the applicable general design requirements specified in Section 13400, General Requirements, and the detailed specifications herein.

2. Field supervision, inspection, start-up and training in accordance with the requirements of the Specific Provisions.

1.3 SUBMITTALS

A. Comply with the requirements specified in the Specific Provisions and Section 13400, General Instrumentation and Control.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements specified in Section 13400, General Instrumentation and Control.

B. Primary sensors and field instruments shall not be delivered to the site until all product information and system Shop Drawings for the sensors and instruments have been approved.

1.5 IDENTIFICATION TAGS

A. All sensors and field instruments shall have an identification tag meeting the following requirements:

1. Tag numbers for sensors and field instruments shall be as listed on the Drawings as the equipment number.

2. The identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self tapping screws of appropriate size.

3. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.

4. All sensors and field instruments mounted on or within panels shall have the stainless steel identification tag installed so that the numbers are easily visible to service personnel.

1.6 SPARE PARTS:

A. Provide the following spare parts:

1. One complete bubbler level transmitter system package including spare air filter, air flow regulator, purge meter and transmitter.
2. One spare magmeter flow converter.

PART 2 PRODUCTS

2.1 GENERAL:

A. Provide components to operate on 115 volt ac, single phase, 60 hertz electrical service unless otherwise specified.

B. Provide two-wire transmitter power supplies as required. Loop power supplies are to be installed in the PLC cabinets complete with a separate fuse and blown fuse indicator for each analog circuit.

C. Provide fuses or switches for equipment as recommended by the instrument manufacturer.

D. Provide contacts for control of motor operated or electrically operated equipment rated minimum 10 amp at 115 volts ac, 60 hertz. Provide contacts for low level analog signal switching of the gold bifurcated, cross bar type.

E. Provide 4-20 mA dc analog output signals from all process transmitters.

F. Where interposing relays are required to provide proper contact rating from devices interfacing to the PLCs, install the relays in the PLC cabinets. See Section 13431.

G. Furnish all necessary accessories for installation, including mounting brackets, floor stands, hardware and like items.

H. Provide tool kits and test equipment, as recommended by the manufacturer, necessary for assembling, calibrating and maintaining equipment.

2.2 MAGNETIC FLOW METER

A. Flow Elements

1. Electromagnetic type with pulsed dc coil excitation for zero stability. Suitable for aqueous solutions with minimum conductivity of 50 micromhos/cm. Insensitive to changes in fluid viscosity and density.

2. Flanged body design for 150 pound ANSI flanged pipe connections.

3. Sensor flow tube material: stainless steel with hard elastomer (hard rubber) liner.

4. Provide meter with Type 316 stainless steel electrodes.

5. Enclosure classification: NEMA 6P / IP68 suitable for continuous submergence and permanent direct buried service.

6. Provide meter electrodes equipped for electrolysis AC burnoff for electrode coating removal. This feature must be available to be performed above ground in buried service meters.

7. Electrical terminal boxes for flow sensors located in underground vaults or direct buried, shall be backfilled with non-setting transparent potting material after installation of meter field wiring.

8. Hydraulically calibrate each meter at a flow facility against a master meter or other device which is traceable to the United States NIST. Submit certified calibration data and a calibration curve substantiating the stated accuracy. Submit information regarding the location of the flow facility and procedure being used to calibrate the meter.

9. Provide each meter with stainless steel grounding rings. Grounding electrodes alone will not be acceptable.

10. Meter accuracy: ±0.5 percent of actual flow rate for a range of 10 to 100 percent of maximum calibrated flow. Guarantee accuracy with no more than five pipe diameters of straight pipe run upstream from the meter.

11. Manufacturer: The flow meter system, including the flow elements and remote signal converter (transmitter) shall be manufactured by ABB Ltd., Watermaster Electromagnetic Flowmeter with Remote Electronics and matched stainless steel Grounding Rings. A letter of standardization for the meter manufacturer has been included in the Contract documents and no other manufacturer will be considered.

B. Signal Converter (remote mounted):

1. Smart "Hart" protocol.

2. Provide remote mounted flow transmitter/converter, microprocessor based. Provide transmitter with integral LCD display of flow rate.

3. Provide input of configuration data, stored in EEPROM memory without need for battery backup.

4. Provide manufacturer supplied cables between the flow element and remote mounted signal converter. Contractor to determine length of cable necessary to connect the buried meter to the transmitter mounted in the pump station.

5. Outputs:
   a. 4-20 mAdc into 0-600 ohm load linearly proportional to flow, calibrated as scheduled.
   b. 24-volt dc scaled pulse totalizer output, 150 mA minimum, calibrated 100 gallon per pulse to drive a remote interposing relay for PLC input. Pulse width of 100 milliseconds.

6. Accuracy: ±0.5 percent of actual flow over 10:1 flow range.

7. Provide input span adjustment from 1.5-30 feet per second at full scale flow. Meters requiring circuit or component changes to effect calibration changes will not be acceptable.

8. Operating ambient temperature: -4 to 140 degrees F.

9. Enclosure classification: NEMA 4X suitable for wall mount

10. Power requirement: 115 volts ac, 60 hertz.

2.3 BUBBLER LEVEL TRANSMITTERS

A. Provide air bubbler-type level transmitter components assembled in a separate bubbler control panel, complete with air pressure regulators, constant differential relays, pneumatic tubing, valves and pressure transmitter as shown.

B. Air Filter: Provide coalescing air filter for moisture and particulate removal. Provide ½" NPT air connections, Grade 6 filter element, auto drain and DPI indicator. Provide Parker model HN2S-6QUW or equal.

C. Pressure Regulator: Provide air supply filter-regulator with 0-120 psi output range adjustment, 3-micron filter with self-relieving design. Provide Siemens Model 91-HF or equal.

D. Constant Differential Relays: Provide a constant differential relay for each bubbler to maintain a constant volumetric flow rate of bubbler air to the liquid level bubbler downtube. Provide integral needle valve to adjust the air flow rate. Design the differential relay to ensure a constant volumetric rate of flow, regardless of variations in the process or supply pressure. Provide integral purgemeter (rotameter) to indicate the air flow. Indicator to have a scale suitable for 0-2.5 scfh air flow. Provide Siemens Model 62-VA or equal.

E. Level Gauges:
   1. Provide bronze bourdon tube actuated, 4 ½ -inch size, phenolic case with glass or clear plastic window.
   2. Scale: 0-15 psi / 0-34 feet combination gauge
   3. Accuracy: 0.5 percent of range (Grade 2A per ANSI B40.1)
   4. Manufacturer: Ashcroft, Weksler, US Gauge or equal.

F. Stainless Steel Tubing: Fully annealed, type 304 seamless meeting ASTM A269 with stainless steel compression type fittings.

G. Tubing Valves: instrument grade, ball type shutoff. Stainless steel construction.

H. Level Transmitter:

   1. Differential capacitance cell type. Two-wire, 4-20 mAdc output signal. Loop powered from 24 volts dc nominal. Output load impedance of at least 550 ohms.

   2. Microprocessor based "smart" electronics. HART protocol compatible.

   3. Accuracy: +\- 0.10 percent of calibrated span.

4. Span and zero continuously adjustable, either locally or via hand-held digital interface.

5. NEMA 4 housing. Suitable for operation over ambient temperature range of 20-120 degrees F.

6. Ceramic or stainless steel wetted parts. Stainless steel bleed and drain fittings. All metal external parts.

7. Integral 4-digit LCD output indicator graduated 0-100 percent. Provide integral mounting bracket suitable for wall or pipestand mounting.

8. ½-inch NPT process connections.

9. Manufacturer: Yokogawa EJA430 or equal

2.4 BACK-UP PUMP CONTROLLER

A. The back-up pump controller module shall be designed to run one or two pumps for a fixed time interval, set by the user, when the primary wet well level controls fail. The unit shall monitor a backup level alarm in the wet well, and start up to two pumps when the high alarm switch closes. When the high level switch closes, the back-up unit closes a relay that starts Pump #1 and starts an internal Timer #1. When Timer #1 reaches its set time, and the level alarm switch is still closed, Pump #2 is started. Pump #1 and Pump #2 will run until the level alarm switch opens. When the switch opens, Timer #2 is started and both pumps continue to run until Timer #2 reaches its set time.

B. Module Characteristics

Power:	85/250 VAC ±10% 50/60 Hz, 2 VA
Alarm Inputs:	NO or NC switch contact, isolated switch or open collector transistor.
Outputs:	two NO 10A (Form A) relay contacts (closes for P#1 & P#2 run).
Timers:	Timer 1- P#2 Delay, adjustable from 2 to 126 seconds (2 second increments)
	Timer 2- Pump Run Time, adjustable from 5 to 1,275 seconds (5 second increments)
	Timers are set with binary coded DIP switches inside the enclosure.
Reset Input:	Stops pumps and resets timers (requires contact closure or open collector transistor).
Indicators:	LED type; P#1 green “OFF”, red “RUN”; P#2 green “OFF”, red “RUN”

Enclosure: DIN rail mount with plug-in screw terminals.

The back-up pump controller shall be Wilkerson model DR1920; DCR Engineering Services, Inc. model BR560, or equal.

C. The following components are required to expand the back-up controls to serve four (4) pumps:

(2) Control Relays: 120VAC coil, 3PDT, with sockets and hold-down springs. Telemecanique model RXM3AB2F7, or equal.

(2) Time Delay Relays 120VAC operation, DPDT, with sockets and hold-down springs. SSAC TRU series, universal, or equal.

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION AND APPLICATION

A. General

1. Strictly follow manufacturer recommendation for installation of the field instruments. The Contractor shall be responsible for any problems resulting from any deviation from manufacturer installation instructions.

2. Mount all transmitters vertically, with the integral indicators facing front or sides. For pipe mounted instruments, provide sufficient clearance to permit 360° access to the units.

3. Seal all conduit and wiring entries into all instruments installed below ground or in vaults with non-setting transparent potting material. Seals shall be water tight, suitable for submergence in 30 feet of water.

B. Magnetic Flowmeter Installation

1. Install flow element with suitable length of interconnect cable to ensure no cable joints are located in conduit.

2. Ensure upstream and downstream pipe lengths satisfy manufacturer’s requirements.

3. If buried, provide a surround of at least 12-inches of sand all around the flow element when backfilling to ensure the meter protective coating is not damaged. Cover the sand with pea gravel to near grade to aid drainage and assist in locating the meter if required in the future.

4. If buried, make certain the meter serial number and product code are recorded and given to the owner prior to burial of the meter.

3.2 FIELD QUALITY CONTROL

A. Manufacturers Field Service

1. Secure the services of factory personnel for instrument start-up and calibration. Calibrate each instrument, including its complete instrument loop. Indication at remote receiving instruments, including any SCADA system operator interface screens, shall be equal to readings at local transmitter indicators.

2. Provide written loop-calibration report for each instrument loop, which shall include, but not limited to the following:

a. Date and time the final calibration was completed.

b. Weather conditions at the time the final calibration was performed.

c. Comparison of readings at the local transmitters with readings at the remote receiving instruments.

d. Verification of operation of all contact outputs, including those at the receiving instruments.

e. Description of method of calibration.

f. Provide a table showing calculated and measured values at 0%, 25%, 50%, 75%, and 100%.

g. Names and signatures of factory personnel performing calibration.

h. Names and signatures of Owner representative witnessing calibration process.

3.3 INSTRUMENT SCHEDULE

Flow Meter FE/FIT-1

Type:	Magnetic
Pipe Size:	2-inch
Operating range:	0-100 gpm
Calibration:	0-50 gpm
Location:	Flow element in Sewage Screen Spray Water supply pipe

Comment:	Transmitter located remotely in pump station

Wet Well Level Transmitters LIT-1, 2

Number of Units:	Two— (1) upstream, (1) downstream
Type:	Bubbler
Calibration:	0-30 feet
Location:	Bubbler circuits and transmitters in new bubbler panel. Connect to 2" PVC bubbler down tubes as shown.
Comment:	Bottom of downstream bubbler tube assumed as level of having 0.5 feet of water in wet well.

***** END OF SECTION *****

(NO TEXT FOR THIS PAGE)

SECTION 13431

PANEL DEVICES AND ENCLOSURE CONSTRUCTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes technical requirements for fabrication, engineering, wiring and installation of instrument panels and enclosures and providing the panel mounted instruments and equipment. These include, but are not limited to the following:

1. Panel Construction
2. Panel Wiring
3. Panel Mounted Equipment

B. Related Sections:

1. Section 13400 - General Instrumentation and Control
2. Section 13420 - Field Instruments
3. Section 13451 - PLC Systems

1.2 SUBMITTALS

A. General: Provide submittals as specified in the Specific Provisions and as required in section 13400.

B. Pre-Construction Submittals

1. Product Data: Submit manufacturer’s official and published product data, specifications, and installation recommendations for each item. Product data shall include terminal wiring details, and manufacturing and calibration data.
2. Shop Drawings: Include the following information:
   a. Bill of materials
   b. Front panel layout
   c. Internal panel layout
   d. Internal wiring diagrams, including wire type, size and identification number
   e. Terminal block layout
   f. Nameplate lists

g. Color schedules

h. Elementary control diagrams

3. Provide loop diagrams conforming to ISA-S5.4 “Instrument Loop Diagrams”.

1.3 QUALITY ASSURANCE

A. Comply with the applicable provision of the following codes and standards:

1. Underwriters Laboratory (UL)

2. Electrical Testing Laboratory (ETL)

3. National Electrical Code (NEC)

4. National Fire Protection Association (NFPA) 79, Electrical Standard for Industrial Machinery

5. Instrumentation Society of America (ISA)

B. All electrical materials and equipment shall be new and shall bear the label of the Underwriters’ Laboratory (UL), Inc., Factory Mutual (FM) or equivalent where standards have been established and label service regularly applies. All control panels to be UL508 certified.

C. All PLC/SCADA/I&C control panels, when required by Code(s), shall comply with the requirements of UL-508A, and NEC 409, Industrial Control Panels, as specified in Section 16055, Electrical Requirements for Shop-Assembled Equipment.

D. Provide integrated instrumentation systems. Assign complete responsibility for furnishing, coordination, assembly, and installation supervision of all equipment to one Systems Integrator regularly engaged in the manufacture, assembly and production of systems of type specified. Provide complete, satisfactory, and trouble-free operating installation.

E. Furnish like instruments from the same manufacturer. Minimize number of different manufacturers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers include the following:

1. Enclosure: Hoffman, Hammond or equal

2. Terminal Blocks: Phoenix Contact, Weidmuller
3. Power Supplies: Phoenix Contact, Action Instruments
4. Signal Isolators: Action Instrument, Moore Industries, Phoenix Contact
5. Pushbuttons, selector switches and pilot lights: Allen Bradley, Square D
6. Digital Panel Indicators: Precision Digital PD765 Trident, Newport or equal.
7. Electronic bar graph indicators: Metrix Electronics Model LS 40 or equal.
8. UPS: Powerware, APC or equal.

2.2 GENERAL REQUIREMENTS

A. Panels and enclosures shall meet the NEMA requirements for the type specified.

B. Sizes shown are estimates. Furnish panels and enclosures amply sized to house all equipment, instruments, front panel mounted devices, power supplies, power distribution panels, wiring, tubing and other components installed within.

C. Panels located inside control or electrical room areas shall be NEMA 12 rated unless specified otherwise.

D. Panels located in process areas or outdoors (except areas classified as hazardous locations) shall be NEMA 4X stainless steel unless specified otherwise.

E. Provide lifting rings on panels in excess of 100 pounds.

F. Panels are to be sized by the integrator based on the equipment furnished. Intended panel sizes are shown on the drawings. Panels may be increased in size only upon prior approval by the Engineer.

G. Provide panel fabrication such that all internal installed devices are located on a back plate of the panel. Devices mounted on the sides of the panel will not be allowed.

H. Panel Mounted Equipment

1. Unless otherwise specified, provide components to operate on 120 Volts AC single phase 60-Hertz power.
2. Provide 24Vdc two-wire transmitter power supplies as required.
3. Provide interposing relays and signal isolators to protect panel mounted equipment from electrical surges induced in field wiring.

4. Provide engraved laminated nameplates to identify each panel mounted component. The nameplates shall have black lettering on white background. Lettering height shall be 3/16-inch minimum.

I. Panel Accessories

1. Provide panel heaters, corrosion inhibitors and breather drains for condensation and corrosion control inside panel. Panel heaters shall be of forced air types, provided with integral thermostatic control.
2. One UPS supply receptacle (PLC Panels only), 120 VAC, 20A duplex type.
3. One “service receptacle”, 120 VAC, 20A duplex, grounding type receptacle.
4. One 120 VAC fluorescent light fixture with lamp and protective plastic shield.
5. One 120 VAC, 20A, snap switch, to turn on the light, mounted in an outlet box with a cover and located so that it is easily accessible from access door.
6. Each PLC panel has two power feed circuits.
    a. Provide the service light with switch, panel heater and the duplex service receptacle with its own circuit breaker and power feed (from separate lighting panel circuit).
    b. Provide UPS supply receptacle with its own circuit breaker and power feed (from separate lighting panel circuit).
7. Provide a UPS inside the PLC panel to provide surge protection and backup power to the PLC equipment and network equipment. Size the UPS for the PLC and communication components furnished, designed to give 15 minute operation under full load. Provide rating of 500-VA minimum. Provide unit with hot-swappable batteries.
    a. Connect UPS to UPS supply receptacle via plug and cable.
    b. Wire PLC enclosure via plug and cable into UPS output receptacle so that PLC equipment and network adapter are powered by the UPS. (When UPS fails, enable user to power PLC enclosure directly from duplex UPS supply receptacle.)

2.3 PANEL CONSTRUCTION

A. NEMA 12 Panels

1. Fabricate enclosures using minimum 14 gage steel for wall or frame mounted enclosures and minimum 12 gage for free standing enclosures. Steel shall be free of pitting and surface blemishes.
2. Continuously weld all exterior seams and grind smooth.

3. Provide stiffening members for strength and stiffness as required.
4. Panel shall be flat within 1/16-inch over a 24-inch by 24-inch area, or flat
5. Use pan type construction for doors. Door widths shall not exceed 36-inches.
6. Mount doors with full length heavy duty piano hinge with stainless steel pin.
7. Provide oil resistant gasket completely around each door or opening.
8. Provide handle-operated, oil-tight, key-lockable three point stainless steel latches.
9. Use stainless steel fasteners throughout.
10. Provide interior mounting panels and shelves constructed of minimum 12 gage steel.
11. Provide steel print pocket with white enamel finish.
12. Provide enclosure mounting supports as required for floor, frame, or wall mount.
13. Provide all holes and cutouts for installation of conduit and equipment. Provide water tight conduit hubs. (Double locknuts are not acceptable.)
14. Completely clean all interior and exterior surfaces so they are free of dirt and corrosion.
15. One coat of primer shall be applied to all interior and exterior surfaces
16. All interior surfaces shall be painted with two coats of semi-gloss white
17. All exterior surfaces shall be painted with a minimum of three finish coats, ANSI 61 grey.
18. Provide one extra quart of touch-up paint for each exterior finish color.

B. NEMA 4X Panels

1. Fabricate NEMA 4X enclosures from 14 gauge (minimum) stainless steel.
2. Provide non-corrodible metal hardware including hinge and cover clamps.
3. Do not paint stainless steel enclosure exterior surface.
4. Sandblast, roughen, or chemically etch stainless steel enclosures to reduce gloss, reflections and glare.
5. Provide conduit knock-outs prior to installation of equipment inside enclosure. Provide water tight conduit hubs. (Double locknuts are not acceptable.)

6. Provide door clamps on three sides of enclosure door. Clamps shall be quarter-turn or similar tool-less means.
7. Rolled lip around three sides of door and along top of enclosure opening.
8. Hasp and staple for padlocking.
9. Provide a clear plastic, gasketed lockable hinged door to encompass all non-NEMA 4 front of panel instruments.

2.4 PANEL GROUNDING

A. Provide ground busbars, which shall be directly wired and connected to facility grounding system.

B. Provide dc ground bus (for analog cable shield termination) bonded to chassis ground.

C. Provide nickel-plated copper busbars, with current rating of 100 amperes.

D. Provide each busbar with at least twenty (20) screw clamp terminal blocks, each capable of accepting #10 AWG conductors.

2.5 PANEL WIRING

A. Terminate all wiring, to and from field devices, at panel terminal blocks, not on equipment terminals.

B. Do not terminate more than two wires at the same terminal. Wiring splices and wire nuts will not be permitted within the enclosure.

C. Provide wire identification at each wire end. Utilize computer-generated, heat-shrink type wire markers.

D. Install all wiring in plastic wiring ducts, provided with snap-on covers. Size ducts to include at least 100% spare capacity. Restrain all wiring outside of ducts with plastic ties.

E. Group and wrap all wires passing a door hinge in protective wire harness. Provide abrasion protection for wire bundles passing through holes or across sheet metal edges.

F. Provide panel wiring of stranded copper with 600-volt rated thermoplastic insulation.

1. Power wiring: No. 14 AWG minimum
2. Control wiring: No. 18 AWG minimum

3. Electronic signal wiring: No. 18 twisted shielded pair minimum
4. Ethernet network wiring: Category 5e minimum
5. Other serial communication cables: As recommended by equipment manufacturer.

G. Wire color convention shall comply with NFPA 79 (1994), part 16:

1. Line, load, and control conductors: black.
2. Neutral: white.
3. Equipment safety ground: green.
4. AC control circuit: red
5. DC control circuit: blue
6. Foreign voltage control wire: orange

H. Physically separate AC wiring from DC wiring.

1. Where AC and DC wiring runs in parallel, provide at least 2-inch separation.
2. Where AC and DC wiring cross, they shall cross at 90°.

I. Do not daisy-chain neutral wiring and grounding conductors at equipment terminals. Provide terminal blocks that accept jumper bridges.

2.6 TERMINAL BLOCKS

A. Provide terminal blocks for field wiring and equipment wiring terminations. Provide unique identification at each terminal block.

1. Arrange terminal blocks in consecutively, based on standard alphanumeric order.
2. Group terminal blocks based on voltage level and function.
3. Color code foreign voltage terminal block identification to match wire insulation.

B. Provide at least 25% spare terminal blocks for each type used in each enclosure.

C. Provide high-density modular type terminal blocks suitable for mounting on standard DIN rails.

1. Material: Nylon
2. Termination type: tubular screw with serrated pressure plate.
3. Current carrying parts (metal bodies): nickel or tin-plated copper.

4. Ground terminal blocks shall be dual color type: Green and Yellow.
5. Maximum conductor size: No. 8 AWG stranded.
6. Current rating: Up to 15 amperes at 250 volts AC.
7. Supply manufacturer jumper bridges, designed to fit on terminal blocks. Do not daisy-chain wiring.

D. Provide fused terminal blocks for panel power distribution.

1. Provide disconnect lever and fuse-puller mechanism.
2. Provide illuminated indication to indicate status of load-side power.
3. Fuses shall be standard 1/4" by 1-1/4", and sized to protect load.

E. Provide two-level type terminal blocks for PLC discrete input and outputs. Both levels shall be of the feed through types.

F. Provide three-level type terminal blocks for analog signal wiring. Top and center terminations shall be feed through types. Bottom termination shall be grounded to isolated mounting railing, connected to the dc ground bus.

2.7 PANEL MOUNTED EQUIPMENT

A. DIN Rails: Provide all DIN rails of aluminum construction.

B. Interposing Relays

1. Provide interposing relays to interface all PLC discrete outputs with field-mounted equipment.
2. Provide high density, DIN rail mounted type relays, with coils, contacts, and voltage ratings as required. Contacts shall be rated 10 Amperes at 120 volts minimum. Relays shall have LED indicator to indicate coil status.
3. Relays for control of motor starters larger than NEMA size 1 shall be DPDT, rated 15 Amperes at 250 VAC.

C. Regulated Power Supplies

1. Provide regulated DC power supply as required for PLC discrete inputs, 2-wire analog loops and instrument power. Size power supplies to include 100% spare capacity.
2. Power supplies shall be as follows:
   a. Input power: 110 Volts AC, 60 Hz.
   b. Output power: 24 Volts DC at 200 mA or 500 mA

c. Output regulation: <1%

d. Operating temperature: 0 to 50° C

e. DIN Rail mountable.

D. Control Devices and Pilot Lights

1. General: Pushbuttons, selector switches, and indicating lights shall be 30mm diameter heavy-duty types, oiltight, watertight and corrosion resistant. Provide a legend plat at each device.

2. Contact block current rating: 10 amperes at 240 volts AC.

3. Pilot lights shall be super-bright LED type with 120V lamps, color cap, and push-to-test feature. Provide flashing types where indicated.

E. Signal Isolators

1. Provide 4-wire type for use as a signal isolator, converter and/or repeater.

2. Input Signal: 4-20 mA dc, field configurable for other signal ranges.

3. Input Impedance: No greater than 50 ohms.

4. Isolation: 1000-volt RMS output from input, power and ground; fully floating

5. Output Signal: 4-20 mA dc into 800 ohms minimum. Where dual signal isolator is shown, provide isolator that "splits" a 4-20 mAdc process signal input and delivers two identical, completely isolated outputs to two separate control devices.

6. Accuracy: +/- 0.1% of span

7. Power Supply: 120-volt ac, 60 hertz or 24-volts dc

8. Enclosure: designed for high density DIN rail mount

9. Isolators are not scheduled.

a. Provide as shown and as necessary to eliminate ground loop problems when connecting instruments to other instrument loops.

F. Digital Panel Indicators

1. Type: Electronic, 3-1/2 Digit LED, 0.56-inch high display

2. Input Impedance: no greater than 250 ohms.

3. Power Source: 110-volt ac, 60 hertz

4. Input Signal: 4-20 mAdc

5. Input Dampening: Adjustable

6. Enclosure: 1/8 DIN, general purpose for indoor flush panel mount. Indicators for outdoor panels shall have a NEMA 4 bezel rating or be mounted behind a weatherproof gasketed door assembly.
7. Accuracy: +/- 0.05 percent of span +/- 1 count
8. Decimal Point: Selectable via DIP switches or keypad.
9. Input Connections: Compression type screw terminals
10. Range Selection: DIP switches, multiturn potentiometers, or keypad.
11. Power: 115 Vac or 24 Vdc.

G. Electronic Bargraph-type Panel Indicators

1. LED light bar with 41 individual LEDs, vertical panel mounted.
2. Measureing range adjustable via DIP switches.
3. Red LED with dot or bar display selectable.
4. 1" x 4" nominal size indicator with 0-100% scale calibration.
5. Power: 24 Vdc.

2.8 SOURCE QUALITY CONTROL

A. Tests and Inspection

1. Test each panel in conjunction with factory acceptance test as described in Section 13400.

PART 3 EXECUTION

3.1 PREPARATION

A. Sequence enclosure installation as follows:

1. Install enclosures and conduits, and pull field wiring into enclosures.
2. Seal all wire entries with non-setting silicon compound to prevent moisture from entering enclosure.
3. Cover enclosure installation thoroughly with heavy-duty plastic sheet to protect against moisture, paint splatter and dirt. Cover until 120-volt power is available, and enclosure is ready to receive internal panel.
4. Terminate field wiring on terminal blocks.

5. Energize panel heater and keep enclosure door closed when no work is being performed in enclosure. (Do not energize any other equipment prior to field wiring termination check.)

6. Check accuracy of field wiring termination. Thoroughly test for continuity.

7. Energize panel mounted equipment only after all wiring has been thoroughly checked and tested.

8. Energize panel heater to prevent condensation inside the panel.

3.2 ERECTION, INSTALLATION AND APPLICATION

A. Do not install control panels or enclosures directly against concrete walls. Provide stainless steel channels between wall and enclosure. Mount enclosure to stainless steel channels.

B. Install enclosures and panels level and plumb. Touch up all nicks, scratches, etc. with materials recommended by enclosure manufacturer.

C. Vacuum and clean all panel interior surfaces prior to system commissioning.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspection

1. Demonstrate that each enclosure and each panel mounted equipment:

a. Has not been damaged during transportation or installation.

b. Has been properly installed.

c. Has no mechanical defects.

d. Is in proper alignment.

e. Has been properly wired and connected.

3.4 DEMONSTRATION

A. Test all control function as described in the Specific Provisions and Section 13400. In addition, perform the following:

1. Calibrate all process variable indications.

2. Adjust all alarm setpoints.

3. Tune all control function to achieve optimum and stable control.

3.5 SCHEDULES

A. Provide the following panels and enclosures:

Panel	Quant	NEMA Rating	Comment
PLC / Annunciator	1	NEMA 12	In MCC -64 Line-Up
Sewage Screen Control	1	NEMA 12	IN Control Room
Bubbler Panel	1	NEMA 12	In MCC -64 Line-Up

B. Provide other control panels for equipment package control systems which meet the general requirements of this section.

C. See drawings and specification Section 13400 for enclosure function and enclosure mounted equipment.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 13451

PROGRAMMABLE LOGIC CONTROL (PLC) SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes requirements for providing a Programmable Logic Control (PLC) system, local operator interface systems and all appurtenances required for monitoring and control of equipment and unit processes. The PLC will serve as: 1.) the data interface/concentrator system for pumping station field devices and signals; 2.) the Sewage Pump Controller; 3.) the controller for a local 15" touch-screen display/annunciator and; 4.) communication port for the existing SCADA RTU. The SCADA system may include multiple PLCs throughout the facility connected to a SCADA HMI workstation located remotely at the HF Curren Wastewater Treatment Plant.

B. Programming and Software Configuration

1. All programming and software configuration for the new PLC shall be included as part of this contract work.

2. All programming and software configuration for any existing PLC or HMI workstations will be performed by the City of Tampa and are not part of this contract work

C. Provide all submittal documents within 90 days of Notice to Proceed.

D. Work includes all elements of the systems specified. Provide all control hardware complete with power supplies, enclosures, accessories, and other appurtenances. Provide installation of new equipment, and testing necessary for the proper operation of the control system.

E. Related Sections

1. Section 13400 - General Instrumentation and Control
2. Section 13420 - Field Instruments
3. Section 13431 - Panel Devices and Enclosure Construction

1.2 SYSTEM DESCRIPTION

A. Existing System

1. An existing SCADA RTU is located in the general vicinity of the Raw Sewage Pumping Station Control Room. This RTU is currently receiving discrete data from the existing Raw Sewage P.S. PLC and will be modified, by City Technicians, to communicate, via Ethernet, with the proposed Raw Sewage P.S. PLC. The Contractor shall supply the necessary cabling between the proposed PLC and the

existing SCADA RTU. The Contractor shall work closely with City Technicians to ensure that communication is established between the existing and proposed systems and that the correct data is transmitted.

B. Design Requirements

1. Program the PLC to achieve pump station control and monitoring described in Section 13400.

2. Fully configure PLC system and appurtenances to form a complete working system.

C. Provide complete systems, which shall include, but not be limited to I/O racks or chassis, power supplies, input and output modules, special communication modules, local operator interface systems, and power and communication cables.

D. Provide one copy of PLC programming software and one copy of operator interface system programming software as specified herein. Software licensing to be for the City of Tampa. Turn all software and manuals over to Owner personnel at job completion.

1.3 SUBMITTALS

A. Submit product data as required in Section 13400.

1. Submit data sheets and catalog literature on each type of equipment.
2. Submit programming and installation manuals for each type of equipment.

B. Documentation:

1. Provide all documentation related to PLC configuration.
2. Furnish all manuals, PLC logic documentation and application programmer’s notes.
3. Furnish listing of PLC register tables.
4. Furnish hard copy printout of all PLC logic at project closeout.

C. Operation and Maintenance Manuals: Submit operation and maintenance manuals.

1.4 SPARE PARTS

A. Provide the following spare parts:

1. One PLC processor
2. One digital input module of each type utilized
3. One digital output module of each type utilized
4. One analog input module of each type utilized
5. One analog output module of each type utilized
6. One power supply assembly of each size utilized
7. One communications module of each type utilized
8. One Serial Data Converter of each type utilized
9. One dozen fuses of each size furnished

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General

1. Provide PLC as a versatile system that is easily user programmable, and assembled from a wide variety of modular, plug-together components. The PLC system shall comprise the following categories of components: Baseplates, Power Supplies, CPUs, I/O Modules, Option Modules, and Cables.

B. Manufacturer

1. To ensure compatibility with other Department of Sanitary Sewer control systems, and to limit the City's inventory of spare parts, the Programmable Logic Controller shall be a GE Intelligent Platforms Series RX3i. A Standardization Certificate of Conditions and Circumstances is included with these Contract Documents.

C. Baseplates

1. Provide as a basic minimum, at least one baseplate onto which all other PLC modules attach. If the system requires more modules than can be mounted on one baseplate, provide Expansion or Remote baseplates that connect together. Provide a baseplate of sufficient size (5 or 10 slot) to accommodate a minimum of two spare input/output (I/O) modules.

D. Power Supplies

1. Provide the power supply module to plug into the baseplate's left-most slot and be rated to power a fully loaded baseplate (CPU and maximum I/O). Provide power supply suitable for 120-VAC single phase input power.

E. CPU

1. Provide CPU to use the instructions in its firmware and application program to direct the PLC’s operation and to monitor the system to make sure there are no basic faults. Design the CPU to plug into the baseplate as a module; a CPU built into the baseplate is not acceptable. Provide a 1GHz CPU with 64 Mbytes of non-volatile memory for program storage, and two serial ports.

F. Input and Output (I/O) Modules

1. Provide the required I/O modules to enable the PLC to interface with input and output field devices such as switches, sensors, relays, and solenoids. Provide both discrete and analog I/O types as required by the application. Provide 16 channel discrete and analog input modules. Provide a minimum of 25% spare I/O, or 2 spare I/O, (whichever is greater) for each type used.

G. Option Modules

1. Provide Option Modules as required for this application. These modules shall extend the capability of the PLC beyond the basic functions providing such things as communications and networking options, motion control, high speed counting, temperature control, interfacing to operator interface stations, etc. Provide modules which plug into the baseplate as part of the integrated PLC system; stand-alone converters, etc, are not acceptable. Provide Ethernet module for connection to the Operator Interface Terminal and existing GE series 90-30 PLC in the SCADA RTU.

H. Cables

1. Provide PLC manufacturer's standard prefabricated cables to connect the PLC components together or to other systems. For example, cables shall be provided to:
   a. interconnect baseplates
   b. connect a programmer to the CPU or to an option module
   c. connect option modules to field devices or other systems.
2. Provide cables of the proper length. No splices shall be allowed.

I. Serial Data Converters

1. Provide serial data converter at each end of the serial links between the PLCs since this is an electrically noisy environment. Use differential input RS-422 or RS-485 communications between PLCs to replace single ended RS-232 signals which have poor common mode rejection.

2. Provide a port-powered, two channel RS-232 to RS-422 or RS-485 converter which converts TD and RD RS-232 lines to balanced RS-422 or RS-485 signals.

3. Power: Port powered from handshake lines on the RS-232 side, or 12-16 Vdc power on the terminal blocks. Provide power supply as required.

4. Data Rate: 115.2 kbps.

5. Manufacturer: B&B Electronics model 422PP9TB or equal.

J. Software and Documentation

1. Program the PLC in ladder logic using IBM compatible software. Provide all configuration software and all necessary interface hardware and cables under this Contract to become the property of the City. The software is to be designed, developed, and documented by the Contractor. The Contractor shall be responsible for providing the details of the design and supplying the City with a set of reproducible as-built drawings. The Operation and Maintenance Manual shall include program documentation containing ample comments and a narrative of the actual working program with a symbol cross-reference legend for the system.

K. Annunciator Operator Interface Terminal

1. Provide 15-inch diagonal color graphic Operator Interface Terminal (OIT).
2. Display: 1024x768 TFT color.
3. Touchscreen: analog resistive
4. Communications:
   a. Ethernet port
   b. 3 serial ports, RS-232/RS-485
   c. 2 USB ports
5. Multiple simultaneous protocols for multi-controller communications.
6. 256MB flash memory, 256MB SDRAM.
7. NEMA 4 enclosure suitable for 32-122 degrees F.
8. Power: 24VDC. Integrator to provide suitable DC power supply for the OIT or power from the PLC panel 24VDC loop power supply.
9. Provide complete with Windows based configuration software and cables for the OIT.
10. Manufacturer: Maple Systems model HMI5150X or equal.

L. Pump Control Operator Interface Terminal

1. Provide 7-inch diagonal color graphic Operator Interface Terminal (OIT).
2. Display: 800x480 TFT color.
3. Touchscreen: analog resistive
4. Communications:
   a. USB Host Port
   b. USB Client Port
   c. 3 serial ports, RS-232/RS-485
   d. 2 USB ports
5. Multiple simultaneous protocols for multi-controller communications.
6. 128MB flash memory, 64MB DRAM.
7. NEMA 4 enclosure suitable for 14-113 degrees F.
8. Power: 24VDC. Integrator to provide suitable DC power supply for the OIT or power from the PLC panel 24VDC loop power supply.
9. Provide complete with Windows based configuration software and cables for the OIT.
10. Manufacturer: Maple Systems model HMI5070NH or equal.

2.2 ENCLOSURES

A. Provide the PLC in the enclosures specified in Section 13431.

2.3 POWER SUPPLY

A. Provide a small UPS at PLC panel as described in Section 13431 for power conditioning and short duration power outages.

PART 3 EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Inputs and Outputs Isolation

1. Design PLC discrete inputs to monitor dry contact closures, sourced from the PLC enclosure.

2. Design PLC discrete outputs to energize terminal block style interposing relays as specified in Section 13431.

B. Provide all communication cables necessary for complete working systems. Provide surge protection on all communication ports as necessary.

C. Interface with Other Products

1. Provide all special interface modules necessary for complete working systems. These shall include all necessary cables and connectors as required.

D. Testing

1. Test all control function as described in Section 13400.

3.2 INPUT/OUTPUT SIGNAL SUMMARY SCHEDULE

A. Input and output signals for the Pump Control PLC are shown on the drawings.

B. Provide minimum 25 percent installed spare I/O of each type, or 2 I/O, whichever is greater. Round up to the nearest whole signal number.

1. Spare I/O shall be installed, wired and interfaced to the terminal strips.

2. Expandability. Allow any or all prewired spare points to become active points. Include related documentation changes. Spares utilization will be subject to following limitation.

a. Change will not be made subsequent to Submittal approval of PLC panel or process area loop drawings.
b. Treat changing of active points to spare points in same manner as incorporation of spares.

C. Signal types are as follows:
1. DI Digital (discrete) Input
2. DO Digital (discrete) Output
3. AI Analog Input
4. AO Analog Output

SECTION 16080

ELECTRICAL TESTING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements of field acceptance testing of materials and equipment provided under various other sections to determine suitability for installation and energization. Requirements of field testing and certification of electrical equipment and materials provided under various other sections to assess their equivalence to UL Inc. listing/labeling.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. All relevant electrical sections.

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. NETA - International Electrical Testing Association

2. NIST - National Institute of Standards and Technology

1.3 SUBMITTALS

A. General: Furnish all submittals including the following, as specified in Section 16050.

1. Acceptance Testing Reports: Furnish acceptance testing reports for all equipment and materials including the following information:

a. Summary of the test
b. Description of material or equipment tested
c. Description of test including acceptable test values
d. Test results
e. Analysis of test results with recommendations

2. UL Testing: Furnish standard test parameters in accordance with the acceptable codes and standards for all the equipment and materials tested for equivalence to UL listing.

3. UL Test Reports and Certificates: Furnish test reports and certificates for all equipment and materials tested for equivalence to UL listing, for approval.

PART 2 PRODUCTS

2.1 TESTING COMPANIES

A. Acceptable Testing Companies: Acceptable testing companies are as listed below:

1. MET Electrical Testing Co., Inc.

2. ASET Power Systems Services, Inc.

3. Electric Power Systems, Inc.

4. Electro-Test, Inc.

5. High Voltage Maintenance Corp.

6. UL Underwriters Laboratories, Inc.

7. Other OSHA and NETA approved testing facilities

2.2 SOURCE QUALITY CONTROL

A. Tests: Furnish all testing and certification in accordance with the latest NETA, ANSI, IEEE and NEMA Standards to meet the UL requirements, NFPA Standards and NEC.

B. Test Equipment: Furnish all testing equipment, cables and appurtenances required to perform all tests and certifications in accordance with the following:

1. Use instruments that have been calibrated, to assure that they are within rated accuracy in accordance with NIST.

2. Select test instruments that are appropriate for the variable being measured.

PART 3 EXECUTION

3.1 UL TESTING AND CERTIFICATION

A. General: Furnish the test reports and certifications for UL equivalence prior to acceptance of all materials and equipment requiring such tests and certifications.

3.2 ACCEPTANCE TESTING

A. General: Furnish acceptance test reports prior to acceptance of all materials, equipment and installations requiring such tests.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 16085

SHORT CIRCUIT AND COORDINATION STUDY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Short circuit and coordination study for the Raw Sewage Pumping Station power distribution system.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 16430 - 480 Volt Switchgear
2. Section W-65 - Motor Control Centers
3. Section 16080 - Electrical Testing Requirements

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. IEEE 242, "IEEE Recommended Practices for Protection and Coordination of Industrial and Commercial Power Systems"

2. IEEE 399, "IEEE Recommended Practices for Industrial and Commercial Power Systems Analysis"

3. NEC - National Electrical Code

1.3 SYSTEM DESCRIPTION

A. Requirements: Furnish a short circuit and coordination study for the entire distribution system. Include the following in the short circuit study:

1. One-line diagram of the entire distribution system identifying all components considered and ratings of all power devices. Use ANSI device numbers to identify all protective devices.

2. Calculation of momentary and interrupting fault duties for each bus.

3. Calculation of bus-to-bus impedance values reduced to a common MVA base.

4. Individually consider all motors 50 horsepower and greater. Group motors less than 50 horsepower into one equivalent motor at the motor control center bus or switchboard distribution section.

5. A table indicating the rating of each interrupting device related to the calculated duty and suggest changes when appropriate.

6. A table showing settings for all adjustable devices. Furnish these settings as a practical compromise between protection of equipment and coordination of downstream devices.

7. Time-current coordination curves to illustrate the protection and coordination achieved. Furnish these curves that include:

   a. Appropriate NEC protection points

   b. Appropriate ANSI protection points

   c. Transformer magnetizing inrush and through-fault protective curve

   d. Motor starting characteristics

   e. Cable damage limit levels

   f. One-line diagram of system plotted

   g. Short circuit current levels

8. Analysis and recommended settings for all adjustable overvoltage, undervoltage and voltage unbalance protective devices. Include voltage and time delay settings.

1.4 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

1. An executive summary of the study results and data

2. A tabulation of all protective device ratings compared with calculated fault duties

3. A tabulation of settings for all adjustable protective devices

4. Copies of all time-current coordination curves

5. Analysis of the data that led to the conclusions and recommendations included in the executive summary

6. The one-line diagram of the system studied, including all rating and identifications

7. Copies of all computed results referenced to the one-line diagram and the impedance listing

8. Furnish six bound copies of the final report

9. Furnish four CD-ROM containing the following:

   a. Complete copy of the report in PDF format
   b. Acrobat Reader
   c. Distribution system one-line diagrams in AutoDesk AutoCAD latest version drawing format.
   d. All short circuit and coordination study input data and component library files in format suitable for input into SKM PowerTools.
   e. All voltage data.

1.5 QUALITY ASSURANCE

A. Qualifications: Conduct the study using a power-system engineering, study or analysis organization with the following qualifications:

1. Five or more years experience on this type of work

2. A proven computer program for performing 3-phase fault-duty calculations

3. Demonstrated capability for calibrating and setting protective devices.

4. Furnish the services of a lead individual for the study who has a minimum of five years experience in performing 3-phase, fault-duty calculations.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 PREPARATION

A. General: Gather the necessary data to complete the short circuit and protective curve coordination calculations. Obtain from field surveys and shop drawings

informational data pertaining to product manufacturer, type and rating of PT's, CT's circuit breakers, fusing, relays, auxiliaries, and the like. Distribution equipment and shop drawing data may be reviewed at the site.

B. Data: Estimate the lengths and sizes of cables shown on the one-line diagrams from the Contract Drawings or from field observations and measurements.

3.2 SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE EVALUATION STUDY

A. General: Include in the input data for the short circuit study the power company's short circuit contribution, resistance and reactance components of the branch impedances, the X/R ratios, base quantities selected, and other source impedances.

B. Calculations: Calculate the three-phase, bolted, short circuit and single-phase, line-to-ground short circuit current values. Calculate close and latch duty values and interrupting duty values on the basis of calculated three-phase, bolted, short circuit currents at each bus. Buses include, but are not limited to, transformers, switchgears, low-voltage motor control centers, distribution panelboards, pertinent branch circuit panels and other significant locations throughout the system. Include in the short circuit tabulations symmetrical fault currents and X/R ratios. List for each fault location, the total duty on the bus, as well as the individual contribution from each connected branch, with its respective X/R ratio.

C. Protective Device Evaluation Study: Perform a protective device evaluation study to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Apply appropriate multiplying factors based on system X/R ratios and protective device rating standards.

3.3 PROTECTIVE DEVICE COORDINATION STUDY

A. General: Perform a protective device coordination study to provide the necessary calculations and logic decisions required to select or to check the selection of power-fuse ratings, protective-relay characteristics and settings, ratios and characteristics of associated current transformers, and low-voltage, breaker trip characteristics and settings.

B. Study Items: Include in the coordination study all medium and low voltage classes of equipment from the building service protective devices down to and including the highest rated device in the low-voltage motor control centers and panelboards. Include the phase and ground overcurrent protection as well as the settings of all other adjustable protective devices.

C. Plotted Data: Plot the time-current characteristics of the specified protective devices on log-log paper. On the plots, include complete titles, representative one-line diagram and legends, significant motor starting characteristics, complete

parameters of transformers, and the complete operating bands of low-voltage, circuit breaker, trip curves and fuses. Indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. Adhere to all restrictions of the National Electrical Code and proper coordination intervals and maintain separation of characteristic curves. Furnish the coordination plots for phase and ground protective devices on a system basis. Use a sufficient number of separate curves to clearly indicate the coordination achieved.

D. Tabulation of Data: Furnish the selections and settings of the protective devices separately, in tabulated form, listing circuit identification; IEEE device number; current transformer ratios and connection; manufacturer and type; range of adjustment and recommended settings. Furnish a tabulation of the recommended power fuse selection for the medium-voltage fuses where applied in the system.

E. Settings: Furnish the protective relay characteristics; tap and time dial settings required by the coordination study to the switchgear manufacturer for selection of protective devices.

3.4 STUDY REPORT

A. General: Summarize the results of the power system study in a final report.

B. Presentation of Report: Include the following sections in the report.

1. Executive Summary

2. Description, purpose, basis and scope of the study and a one line diagram of that portion of the power system which is included within the scope of the study

3. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding the same

4. Protective-device, time–versus-current, coordination curves; tabulations of relay and circuit breaker trip settings; fuse selections, and commentary regarding the same

5. Fault current calculations including a definition of terms and guide for interpretation of computer printout

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 16266

ADJUSTABLE FREQUENCY DRIVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing, installing and testing the 480-volt adjustable frequency drives (AFD). AFDs shall be installed as part of the MCC-64 lineup, as shown. Furnish harmonic studies as specified.

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEMA ICS 1 - General Standards for Industrial Control and Systems
2. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.
3. NEMA ICS 3 - Industrial Control and Systems Factory Built Assemblies
4. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives
5. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems
6. NEMA 250 - Enclosures for Electrical Equipment
7. NFPA 70 - National Electrical Code
8. IEEE 85 - Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery
9. IEEE 519 - IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
10. UL 845 - Motor Control Centers

1.3 SYSTEM DESCRIPTION

A. Design Requirements:

1. Provide adjustable frequency drives to vary the speed of NEMA standard, 3-phase, 460-volt, induction motors and driven equipment by varying the frequency and voltage applied to the motors.

2. Provide adjustable frequency drives that fit in the space shown. Units exceeding the dimensions shown will not be acceptable.

3. Provide adjustable frequency drives that automatically restart when power is restored after a power outage. Provide control logic so the drive is allowed to restart when power is restored.

B. Rated Output Power: Provide adjustable frequency drives with an output that is at least 3 percent greater than the driven motor's full nameplate rating.

C. Torque Output: Provide variable torque or constant torque output drives as required by driven equipment.

D. 6-Pulse Drive Technology: Provide adjustable frequency drives serving motors 75 HP or smaller that utilize 6-pulse drive technology.

E. 12-Pulse Drive Technology: Provide adjustable frequency drives serving motors 100 HP or larger that utilize 12-pulse drive technology.

F. Performance Requirements: Provide adjustable frequency drives to meet the following requirements of IEEE 519:

1. Total harmonic distortion THD (Voltage): Maximum of five percent for general distribution systems as measured at the point of common coupling.

2. Total current harmonic distortion: Not to exceed the values in Table 10.3, Current Distortion Limits for General Distribution Systems (120 V through 69000 V) of IEEE-519 at the point of common coupling.

3. Capacitor traps for controlling harmonics that require tuning to the power system are not acceptable.

4. Operate at a minimum efficiency of 95 percent at rated load.

5. Operate from a 480-volt, 3-phase, 60-hertz supply with a voltage variation of plus 10-percent or minus 20-percent and a frequency variation of plus or minus 2-hertz.

6. Input power factor: Maintain a 95 percent minimum power factor over a 20 to 100 percent speed range.

7. Operate an induction motor as specified, including a high-efficiency, high-power factor, premium-duty motor, with no detriment to motor life.

8. Operate an induction motor without exceeding a motor sound and power level of 96-decibels, A-weighted, when measured in accordance with IEEE 85.

9. Operate under the following ambient conditions:

   a. Ambient Temperature: 0 to 50 degrees C
   b. Humidity: 0 to 95 percent

1.4 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 16050.

B. Product Data and Information: Furnish catalog data including rating and descriptive literature of all components and systems.

C. Shop Drawings: Furnish the following shop drawings customized for the project:

1. Bill of materials including manufacturers name and catalog number

2. Outline drawings showing dimensions, arrangement, elevations, identification of components and nameplate schedule for all units

3. Interconnection wiring diagrams

4. Individual schematic control diagrams for each unit

5. One line diagrams

6. Obtain and enter full performance data for all motors shown

7. Certification that the adjustable frequency drives are compatible with the motors and the equipment loads to be driven

D. System harmonic distortion study: Furnish a system harmonic distortion study as follows:

1. Obtain data on utility services, plant loads and plant operation. Verify electrical service rating including transformer size, short circuit capacity and X/R ratio.

2. Prepare a harmonic distortion study of plant electrical system to determine voltage and current harmonics at the point of common coupling for worst case speed and load settings.

3. Confirm that the submitted adjustable frequency drives limit the electrical disturbances below the 5 percent THD (voltage) and below the harmonic current distortion per Table 10.3 as established by IEEE 519.

4. Point of Common Coupling: The point of common coupling is the switchgear directly upstream of the adjustable frequency drive.

5. Include analysis of all data with recommendations.

E. Quality Control: Furnish test reports, certificates of inspection and manufacturer's instructions.

F. Operations and Maintenance Manuals: Furnish operations and maintenance manuals as specified in the Specific/General Provisions.

1.5 QUALITY ASSURANCE

A. Standards: Provide all adjustable frequency drives manufactured in accordance with referenced standards.

B. UL Label: Provide a UL Inc. Label or certification of listing by C.S.A. or other recognized testing organization for each adjustable frequency drive.

C. Codes: Manufacture and install each adjustable frequency drive in accordance with the NEC and local codes.

D. Failure to Meet the Harmonic Requirement: Failure to meet the harmonic requirement as determined by field measurement: If the installed adjustable frequency drives fail to meet the harmonic limits specified, modify the adjustable frequency drives as follows:

1. Perform work at no additional cost to the City.

2. Install additional harmonic reduction equipment until the specified limit is achieved.

3. In the event that harmonic distortion limits cannot be achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

B. Shipping and Packing: Rigidly brace and protect against weather, damage, and undue strain, all structures, equipment and materials.

C. Storage and Protection: Furnish clean storage facilities for all equipment delivered but not installed. Provide conditioned air for storage facilities in accordance with the equipment manufacturer's recommendations.

D. Spare Parts: Furnish spare parts at the same time as pertaining equipment. Deliver the spare parts to the City after completion of the work.

1.7 SPARE PARTS

A. General: Furnish the following spare parts per each group of similar sized units.

1. All parts recommended by the manufacturer in published literature as spare parts. As a minimum, provide the following:

a. Six of all sizes and types of power and control fuses

b. Six LED displays of each color

c. One speed indicator meter relay

d. Two of each type of push button and selector switch used

e. Two keypads of each type used

f. Two printed circuit boards of each type used

g. Four filter capacitors of each size used

h. Four diodes of each type used

i. Four transistors, gate turn off thyristors IGBT’s or SCRs of each type used

j. Three 12-ounce spray cans of the final finish for touch-up

B. Packaging: Package spare parts in containers bearing labels and identify all spare parts for reordering. Deliver spare parts in original factory packages.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers are not acceptable. The Standardization Certificate of Conditions and Circumstances is on file with the City.

1. Yaskawa

2.2 DESIGN

A. Input Disconnect: Provide an input circuit breaker with an interrupting rating of 65,000 rms symmetrical amperes.

B. Input Reactor: Provide input reactor or isolation transformer, if required, as determined by system harmonic distortion analysis.

C. Converter Section: Provide input section that converts 480-volts, 60-hertz, 3-phase input to a fixed dc voltage using diodes, bridged rectifiers or SCR's.

D. Filter Sections: Provide dc link reactor and filter capacitors as required.

E. Inverter Section: Provide adjustable frequency drive inverter section that converts the fixed dc voltage to an adjustable frequency output utilizing a pulse-width modulation inverter. Maintain constant volts per hertz ratio on the output with voltage boost for startup as required.

F. Digital Control Devices: Provide a digital operator keypad located on the front door to allow setting of all programmable parameters and the following control functions:

1. Speed control settings
2. Speed meter with hertz and 0-100 percent scales
3. Output ammeter
4. Diagnostics package with fault indication and reset push button

G. Hard Wired Control Devices: Provide control devices (pushbuttons, selector switches, elapsed time meter and indicating lights) on the front door of the adjustable frequency drive as noted on the drawings.

H. Control Features: Provide a control system for each drive that allows the following functions:

1. Remote, isolated 4-20 ma speed control input
2. Isolated 4-20 ma speed output
3. Alarm outputs
4. ON/OFF status output
5. Additional features and controls as specified with the driven equipment

I. Internal Control Adjustments: Include the following control adjustments for each drive:

1. Acceleration time, 4 to 60 seconds
2. Deceleration time, 4 to 60 seconds
3. Minimum speed limit
4. Maximum speed limit
5. Inverter current limit
6. Supply undervoltage trip

J. Protection Features: Provide the following drive protection features:

1. Input line current limiting fuses rated 200,000 rms symmetrical amperes short circuit current.

2. Electronic overcurrent protection for instantaneous overload

3. AC input line undervoltage protection, adjustable from 60-100 percent nominal voltage with time delay adjustment and low speed override.

4. Overfrequency protection

5. Phase loss protection

6. DC overvoltage protection

7. Logic supply voltage low level protection

8. Line-to-line and line-to-ground output short circuit protection

9. Line-to-line and line-to-ground surge arresters sized for 480-volt 3-phase grounded wye system

10. Overload capability of 110% of the motor FLA based on the NEC ratings for 60 seconds

11. Control circuit fuses

12. Overtemperature protection

13. Diagnostics module to indicate protection trip conditions

K. Communications: Provide Modbus communications via RS-485 port capable of transmitting the following data over a two-wire multi-drop network to the pump station SCADA System:

1. Status (ON, OFF, TRIPPED, NO RESPONSE)

2. Input and output current in each phase

3. Output frequency

4. Input and output kW

5. Cause of trip

2.3 COMPONENTS

A. General: Provide circuit breakers, fuses, transformers, push buttons, switches, indicating lights, relays and timers as specified in the Controls Section of these Specifications.

B. Power Solid State Components: Provide power solid state switching components with a one minute current rating greater than 110 percent of rated current for variable torque drives or 150 percent of rated current for constant torque drives.

C. Control Power Transformer: Furnish a constant voltage control power transformer to maintain control power with supply voltage variations from 70-110 percent nominal.

D. Printed Circuit Boards: Apply a clear conformal coating of acrylic to all printed circuit boards.

2.4 ENCLOSURES

A. General: Provide adjustable frequency drives in NEMA 12 filtered and gasketed enclosures with full rear cover plates and the ability to externally duct all heat generated to the outside of the enclosure.

2.5 IDENTIFICATION

A. General: Provide identification of the adjustable frequency drives and their components as specified elsewhere in this document.

B. Nameplates: Install nameplates for devices located on doors so they are readable to a person 5'-8” tall standing 3'-0" in front of the equipment.

C. Location: Locate nameplates so that they are readily associated with items labeled.

D. Additional Nameplate: Where nameplates are installed on removable relay or device doors, install an additional nameplate within the relay or device.

E. Additional Engraving: Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

2.6 WIRING:

A. General: Provide internal wiring with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Use No. 14 AWG wire for control interconnections. Provide power connections as required for the service.

B. Wire Marker: Provide wire markers at each end of all wires.

C. Wiring to Door Mounted Devices: Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.

D. Terminal Blocks: Provide wiring of all control connections to all external connections through individual, positive-latch, pull-apart type control terminal blocks rated 600-volts. Locate terminal blocks for front access.

E. Terminal for External Connections: Provide sufficient terminals for all devices external to the adjustable frequency drive.

2.7 SOURCE QUALITY CONTROL

A. Shop Test: Shop test each adjustable frequency drive in accordance with IEEE and NEMA standards, including high potential tests and other standard tests for that particular class of equipment. Notify the City fourteen (14) days prior to start of factory testing so that the City, at his option, may witness the testing.

1. After final assembly, test each adjustable frequency drive at full load with application of line-to-line and line-to-ground bolted faults and show that the adjustable frequency drive trips electronically without device failure.

2. After all tests have been performed, burn-in each adjustable frequency drive for 40 hours at 100 percent inductive or motor load.

3. After the burn-in cycle is complete, subject each adjustable frequency drive to a 30 minute cycling motor load test before inspection and shipping.

B. Operational Tests: After the equipment has been completely assembled, perform operational test to determine operating conditions and circuit continuity. Provide pushbuttons and selector switches to simulate all control input contacts and indicating lights to indicate all control outputs. Provide a 4-20ma signal generator to simulate analog signals.

C. Test Equipment: Provide all equipment, devices, instrumentation, and personnel required to perform the tests. Upon satisfactory completion of the test, submit two (2) certified copies of the test report to the ENGINEER. Component failure during testing will require repeating any test associated with the failure or modified components to demonstrate proper operation.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings.

B. Protective Adjustments: Set all circuit breakers per the approved short circuit and coordination study.

C. Operational Adjustments: Set all operational devices for proper system operation.

D. Cable Connections: Terminate and label all field wiring per approved drawings.

3.2 FIELD QUALITY CONTROL

A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

B. Tests: Perform the following field tests:

1. Close and open each circuit breaker to test operation

2. When site conditions permit, energize and de-energize each equipment item served by each drive, testing the complete control sequence of each item including acceleration and deceleration over complete operating range.

3. Harmonic Measurement: Perform a harmonic system analysis to demonstrate full compliance with IEEE 519 voltage and current harmonic distortion requirements specified. Accurately measure the amplitude of the harmonic current imposed on the 60 hertz sine wave with a harmonic spectrum analyzer. Provide additional harmonic reduction equipment to meet the specified limits. If the harmonic distortion limits are not achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

4. Operate each adjustable frequency drive with driven equipment at full load and test for hot spots.

5. Test Reports: Furnish detailed test reports of all tests indicating test performed, discrepancies found, and corrective action taken.

C. Manufacturer's Field Services Representative: Provide the services of a factory-trained service engineer, specifically trained on the adjustable frequency equipment to assist in installation, start-up, testing, calibration, placing into operation and provide training as specified in the Specific/General Provisions.

1. Provide a service engineer when each drive is placed into operation.

2. Provide a service engineer at the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.

3. Following completion of installation and field testing provide training for 6 employees of the City in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the City's facilities at a time agreeable to the City:

   a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

   b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

4. Provide service engineer at the job site as often as necessary to assist in the programming of the SCADA system in accessing the memory map of each device.

3.3 CLEANING AND PAINTING

A. Shop Painting: Paint the adjustable frequency drive equipment as specified in Section 24.

B. Field Painting: Furnish three 12-ounce spray cans of the final finish for touch-up. Touch-up scratched and marred surfaces to meet the requirements of Section 24.

END OF SECTION

SECTION 16415

AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing automatic transfer switches including control modules to provide completely automatic operation.

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. NFPA 70 - National Electrical Code (NEC)
2. NEMA ICS 10 - AC Automatic Transfer Switches
3. UL 486A - Wire Connectors and Soldering Lugs For Use With Copper Conductors
4. UL 1008 - Standard for Automatic Transfer Switches

1.3 SYSTEM DESCRIPTION

A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent noncondensing.

1. Arrange the equipment for convenient and ready accessibility from the front, for inspection and maintenance of all devices, terminals and wiring.

1.4 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific Provisions section of the Specifications.

B. Product Data and Information: Furnish manufacturer’s data for all associated equipment and devices indicating dimensions, size, voltage ratings, current ratings, withstand and interrupting ratings.

C. Shop Drawings: Furnish shop drawings for automatic transfer switches to include the following:

1. Outline drawings showing arrangement, elevations and identification of components.

2. Bill of materials including manufacturers' name and catalog number.

3. Interconnecting wiring diagrams, where required.

4. Individual schematic and wiring diagrams.

D. Quality Control: Furnish the following test reports and certificates as specified in the Specific Provisions:

1. Certified Shop Test Reports for the automatic transfer switch and related components.

E. Operation and Maintenance Manuals: Furnish operation and maintenance manuals as specified in the Specific/General Provisions.

1.5 QUALITY ASSURANCE

A. Codes: Manufacture all automatic transfer switches in accordance with NEMA ICS10, and UL 1008.

1. Manufacture and install each automatic transfer switch in accordance with the NFPA 70 and local codes.

B. UL Label: Provide a UL Label on each automatic transfer switch.

1.6 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store, and handle all products and materials as specified in Specific/General Provisions.

B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.

C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

1.7 SPARE PARTS

A. General: Furnish the following spare parts:

1. Two complete replacements of all indicating lamps and fuses used in the installation.
2. Two of each special tool required for maintenance.
3. Three 12-ounce spray cans of the final finish.

B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Automatic Transfer Switch

a. ASCO Controls 7000
b. General Electric Zenith ZTS
c. Russelectric RMT

2.2 AUTOMATIC TRANSFER SWITCHES

A. Description: Provide enclosed, double-throw automatic transfer switches with single operating mechanism.

B. Configuration: Electrically-operated, mechanically held with required relays, controls, and contacts.

2.3 RATINGS

A. Voltage: 480V

B. Switched Poles: 3

C. Amperage: 60A

D. Loads: Combination tungsten, ballast, resistance, and inductive loads.

E. Withstand and Closing Ratings: 22,000 minimum rms symmetrical amperes at 480V, when used with molded-case circuit breaker.

F. Thermal capacity: 20 times continuous ampere rating at 60 cycles.

2.4 COMPONENTS

A. Phase Sequence: A-B-C, left to right, front to back, top to bottom.

B. Contacts: Provide silver alloy surfaced main contacts protected by a separate renewable arcing contact. Mechanically lock normal and emergency contacts by the operating linkage when in the open or closed position. Provide an operating linkage that will not permit a neutral position when a failure of any coil or disarrangement of any part occurs.

C. Operating Mechanism: Isolate the mechanical driving system and mechanical interlocks to be electrically dead. Do not use molded plastic parts for the operating linkage between the electrical operator and the main operating shaft of the switch.

D. Main Bearings: Radial, ball-bearing type.

E. Sensing and Control Relays: Continuous-duty, industrial type with wiping contacts rated 10 amperes minimum.

F. Control Logic: Solid-state, microprocessor-based.

G. Arc Barriers: Provide arc barriers and arc suppression for each pole.

2.5 ACCESSORIES

A. Indicating Lights: Provide 30.5 mm, LED type indicating lights mounted in the cover of the enclosure to indicate the following:

1. Source “A” available
2. Source “B” available
3. Load connected to Source “A”
4. Load connected to Source “B”.

B. Test Switches: Mount in the cover of the enclosure to simulate failure of each source.

C. Manual Source Select: Mount in the cover of the enclosure a 3-posion rotary momentary switch “Source A—OFF—Source B” (spring return to center).

D. Transfer Switch Auxiliary Contacts: Provide the following auxiliary contacts rated for 10 amperes at 120 volts.

1. Source “A” power position: 2 set N.O., 2 set N.C.
2. Source “B” power position: 2 set N.O., 2 set N.C.
3. Source “A” power failure monitor: 2 sets N.O., 2 sets N.C.
4. Source “B” power failure monitor: 2 sets N.O., 2 sets N.C.

E. Source “A” Monitor: Monitor voltage and frequency on each phase of the normal source.

F. Source “B” Monitor: Monitor voltage and frequency on each phase of the standby source.

G. In-Phase Monitor: Monitor phase timing of the normal and standby sources.

2.6 ENCLOSURE

A. Enclosure: NEMA Type 12 - Industrial

B. Accessibility: Provide an enclosure with all current carrying contacts and parts readily accessible from the front for maintenance and inspection without removal of the switch panel, disconnecting of the operating linkage, or disconnecting of power conductors.

2.7 AUTOMATIC SEQUENCE OF OPERATION

A. Controller: Provide a programmable, microprocessor-based controller to provide an automatic sequence of operation as follows:

1. The controls shall initiate a transfer to the Alternate Source when the power feeder manually selected (see 2.5.C) falls below the following thresholds:

a. Source “A” Monitor: Initiate transfer when Source “A” voltage drops below 70 percent from rated nominal value or frequency varies more than 10 percent from rated nominal value.

b. Source “B” Monitor: Initiate transfer when Source “B” voltage drops below 70 percent of rated nominal value or frequency varies more than 10 percent of rated nominal value.

c. Time Delay to Transfer Load to Alternate Source: set to minimum delay or five seconds depending on response time of voltage monitors.

2. The transfer switch shall use voltage seeking logic. There is no normal/preferred or emergency source. The switch should not initiate a transfer unless the active source fails, or an Operator initiates a manual transfer.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the Specific Provisions.

B. Cable Connections: Terminate and label all field wiring per the approved diagrams.

C. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.

3.2 FIELD QUALITY CONTROL

A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

B. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation upon completion of the Contract.

C. Tests: Perform field tests as follows:

1. Inspect and test the installation with respect to the safety requirements of NFPA 70 pertaining to grounding and insulation resistance.

2. Demonstrate proper operation of the automatic transfer switch by simulating conditions.

3. Repair or replace defective materials at no cost to the City.

3.3 OPERATION DEMONSTRATION

A. Manufacturer's Representative: Provide the services of the automatic transfer switch manufacturer's representative to assist in installation, start-up, field testing, calibration, placing into operation and providing training, as specified in the Specific/General Provisions. The representative is required to carry out a thorough inspection of the installation and certify that the installation is correct and complete in accordance with the manufacturer's instruction and to confirm that the automatic transfer switch is ready for the final acceptance. Also to instruct operating personnel in the operation and maintenance of the automatic transfer switch.

B. Training: Following completion of installation and field testing provide training for 6 employees of the OWNER in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the OWNER'S facilities at a time agreeable to the OWNER:

1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

3.4 CLEANING AND PAINTING

A. Shop Painting: Paint automatic transfer switches in accordance with Section 24.

B. Field Painting: Clean and touch up any scratched or marred surface to match original finish.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 16430

480 VOLT SWITCHGEAR

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing, installing and testing front accessible only 480-volt switchgear including the following major components:

1. Stationary structure including bus bars
2. Main and tie power air circuit breakers
3. Distribution power air circuit breakers
4. Control, protection, monitoring and metering equipment

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEC - National Electrical Code (NEC).
2. IEEE C37.13 - Low-Voltage AC Power Circuit Breakers Used in Enclosures
3. IEEE C37.20.1 - Metal-Enclosed Low Voltage Power Circuit Breaker
4. ANSI C37.51 - Conformance Testing of Metal-Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies.
5. IEEE C37.90 - IEEE Standard for Relays and Relay-Systems Associated with Electric Power Apparatus
6. NEMA SG3 - Low-Voltage Power Circuit Breakers.
7. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits
8. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits
9. MIL-STD-220A - Method of Insertion-loss Measurement 12/1/59; with N1 and N2 (Fed/mil H-q)

10. NEMA SG5 - Power Switchgear Assemblies.

11. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors

12. UL 1283 - Electromagnetic Interference Filters

13. UL 1449 - Transient voltage surge suppressors

14. UL 1558 - Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear

B. Material Workmanship Requirements: Provide all materials and workmanship meeting the requirements of NFPA Standards and Codes.

C. Design and Testing Requirements: Provide all switchgear components designed, manufactured and tested in accordance with the latest NEMA, IEEE and ANSI Standards; and UL listed.

D. Installation Requirements: Install the switchgear assemblies meeting the requirements of NEC and local Electrical Codes.

1.3 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish the following.

1. Manufacturers catalog data on switchgear assemblies and on each component detailing materials, ratings, type, model and reference number.

2. Layout drawings customized for the project including physical details, dimensions, clearances, mounting, elevations, sections, and nameplates.

3. Electrical control schematics, wiring diagrams, internal interconnection diagrams and interconnection diagrams, including equipment external to the switchgear.

4. Terminal lists for all connections.

5. Furnish instruction booklets and time-current curves for each circuit breaker supplied.

6. Furnish microprocessor-based metering system and overload protection systems address, memory map and instruction booklets.

7. Furnish the following information on surge protection devices (SPDs):

   a. Verification that the SPDs comply with UL 1449.

   b. Actual let through voltage test data in the form of oscillograph results for both the ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (ringwave) tests in accordance with ANSI/IEEE C62.45.

   c. Spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying that the device's noise attenuation exceeds 50 dB at 100 kHz.

   d. Test reports from a recognized independent testing laboratory verifying the suppressor components can survive published surge current ratings on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Note: Test data on individual modules are not acceptable.

C. Contractors Drawings: Furnish switchgear installation details including concrete pad details, mounting details, conduit and cable termination details and shipping section split field connection details.

1.4 QUALITY CONTROL

A. Test Reports: Furnish the manufacturer's certified shop test report and field test report for each 480-volt switchgear.

1.5 OPERATIONS AND MAINTENANCE MANUALS

A. Furnish operation and maintenance manuals, including spare parts lists, as specified in the Specific/General Provisions.

1.6 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

B. Storage and Protection: Store all equipment in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

1.7 SPARE PARTS

A. General: Furnish the following spare parts:

1. One transfer truck with fixed and swivel wheels and rubber tires suitable for moving the largest circuit breakers.

2. One portable circuit breaker test kit.

3. Two auxiliary power modules to power breaker trip units when breaker is not in the "connected" position.

4. One complete solid-state sensor unit for each size furnished.

5. Six replacement indicating light color lens for each color furnished.

6. Three current transformers of each type and rating.

7. Two potential transformers of each type and rating.

8. Twelve potential transformer primary fuses.

9. Twelve potential transformer secondary fuses.

10. Two sets of control jumpers.

11. One hand crank per switchgear for circuit breaker withdrawal and insertion.

12. Three 12-ounce spray cans of the final finish for touch-up

B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. 480-Volt Switchgear
   a. Cutler-Hammer Magnum DS Low Voltage Metal Enclosed Switchgear with Magnum DS drawout power circuit breakers with Digitrip RMS solid state tripping units.

2. Microprocessor Based Protective Relays and Metering Systems
   a. Cutler-Hammer Power Xpert 6000 Series

3. Surge Protection Devices (SPDs):
   a. Cutler-Hammer Model SPD250480Y3B
   b. Advanced Protection Technology

4. Power Transducers
   a. Scientific Columbus Type Exceltronic
   b. Rochester Instrument Systems

2.2 SERVICE CONDITIONS

A. The power supply to the proposed switchgear will be from feeder circuit breakers in the existing Switchgear 60 (SG-60). Coordinate the circuit breaker trip units with SG-60 feeder protection.

B. Switchgear:

1. Provide switchgear with the following features:

   a. Individually mounted, drawout power air circuit breakers

   b. Front accessible cable compartments

   c. Full insulated and isolated bus

   d. Insulated run back bus

   e. Circuit breakers rated for 100 percent continuous ampere when installed in the switchgear enclosure

   f. Interrupting rating of 65,000 rms symmetrical amperes at rated voltage

2. Label the switchgear suitable for use as service entrance equipment where appropriate.

3. Provide all components required for complete functioning units as specified and as shown using factory built standardized units, completely dead front, totally enclosed and freestanding. Each unit comprises a stationary structure and a drawout circuit breaker.

4. Design, manufacture and test all equipment in accordance with the NFPA 70, NEMA SG3, and SG5; IEEE C37.13, C37.20.1 and C37.51 and UL 1558 Standards.

5. Provide the required number of units based on the necessary controls and metering as shown and specified.

C. Distribution System: Connect the switchgear to 480-volt, 3-phase, 60-hertz, 3 wire, solidly grounded neutral power system.

2.3 COMPONENTS

A. Stationary Structure: Construct the stationary structure of the switchgear as follows:

1. Build each unit out of bolted structural steel members, together with formed or fitted sections of smooth sheet steel approximately 90 inches high.

2. Form completely enclosed compartments for various combinations of circuit breakers and auxiliary equipment.

3. Provide sufficient structural strength to support all the equipment mounted within, withstand the handling and shipment of the units, maintaining the proper alignment, and be rigid and freestanding.

4. Provide a formed front door panel for each compartment consisting of concealed type hinges.

5. Reinforce panels as required to retain alignment and to support instruments, relays, and control equipment mounted thereon.

6. Provide removable plates to permit access to all compartments individually.

7. Isolate circuit breaker, buses, and incoming or outgoing cables with separate compartments formed by sheet steel barriers.

8. Provide a circuit breaker cubicle that allows the front face of the circuit breaker to extend to the front of the switchgear enclosure or be enclosed behind the circuit breaker compartment door.

9. Provide suitable ventilation for the individual compartments to keep the temperature of devices and buses within the permissible temperature limits as specified by the Standards.

10. Include insulated buses, fixed portion of primary disconnect devices, insulated connections, instrument transformers, control devices and fuses in the stationary structure. Provide removable boots to give access to bus joint for inspection and maintenance.

11. Provide a positioning mechanism for moving the removable circuit breaker to or from the connected position.

12. Provide guides for proper alignment of all engaging parts during movement of circuit breakers between the connected or disconnected position.

13. Provide stationary structure and circuit breakers that are interchangeable with every other circuit breaker of the same rating.

14. Extend the control and potential buses across units of the switchgear as required.

15. Fully isolate the main bus compartment from the circuit breaker compartment and cable terminations.

16. Provide main buses rated not less than shown, consisting of rigidly supported insulated copper bars of suitable design and cross-sectional area to satisfactorily carry the rated current without exceeding the temperature rise as specified in the IEEE and NEMA standards.

17. Connect the bus with bolts having Belleville type lock washers.

18. Copper bus bars shall be tin plated.

19. Insulate all standard bus joints with preformed insulating boots secured by nylon hardware. Insulate nonstandard joints with tape and insulating compound.

20. Equip each switchgear unit with a 1/4-inch by 2-inch bare copper ground bus with a momentary rating at least equal to the highest momentary rating of the unit's circuit breakers. Extend the ground bus the entire length of the structure and comply with all applicable codes and regulations.

21. Ground each stationary unit directly to the ground bus.

22. Provide suitable lug terminals on the ground bus for connections to the station grounding system.

23. Construct and arrange the stationary structure so that circuit breakers are completely isolated from each other within the same section and that sections are isolated from adjoining sections.

24. Provide steel floor channels suitable for embedding into the concrete floor for leveling and anchoring the switchgear. Drill and tap the floor channels as required. Provide bolts, nuts, and washers for anchoring the switchgear to the channel.

B. Switchgear Enclosure:

1. Provide front accessible switchgear suitable for installation indoors.

C. Drawout Circuit Breakers and Tripping Units:

1. Provide 480 volt, 3-pole, 600-volt class, drawout-type, power air circuit breakers with solid-state trip units rated as shown, having 65,000 rms amperes interrupting rating without current limiting fuses. Provide breakers having a 100 percent ampere rating when installed in the switchgear enclosure.

2. Provide circuit breakers with trip free, manual-operating handles, stored-energy type trip mechanism and push-to-trip button; rated for 40 degrees C ambient operation.

3. Provide main and tie circuit breakers with key interlocks as shown. Locks and keys shall be of stainless steel construction.

4. Equip the circuit breaker with mechanical interlocks to prevent moving the circuit breaker to and from the connected position without the circuit breaker open.

5. Provide circuit breakers that cannot be closed at any point between the operating and test positions or when the key interlock is engaged.

6. Provide means to padlock the circuit breaker in the disconnect position.

7. Provide control connections between the stationary structure and removable circuit breaker that have floating terminals mounted in the stationary structure and engaging mating contacts on the breaker that are engaged when the breaker is in either the connected or test position.

8. Provide all circuit breakers with true rms sensing and microprocessor-based logic circuitry having the following protection features for tripping the circuit breaker.

   a. Trip Indicators
   b. Long time setting and time delay
   c. Short time setting, time delay and I^2t response.
   d. Instantaneous setting (distribution circuit breakers only).
   e. Ground fault setting, time delay and I^2t response.
   f. Short time and ground fault zone interlocking.

9. Provide all breakers with a maintenance switch enabling the reduction of arc flash potential by overriding the breaker protective settings. Furnish with an auxiliary dry contact for the purpose of remote monitoring.

D. Switchgear Connections and Terminals:

1. Construct all current-carrying connections of copper having suitable capacity, bracing, insulation, temperature rating as the main bus.

2. Connect current transformers in such a way that the transformers may be removed and changed without damaging the connection.

E. Instrument Transformers:

1. Current Transformers

a. Provide dry type current transformers, suitable for indoor service and rated as shown.

b. Provide sufficient thermal and mechanical capacity to withstand the maximum momentary current rating of the circuit breaker.

c. Provide solderless, clamp type shorting terminal blocks for secondary connections.

d. Properly identify the polarity of all current transformers with standard marking symbols.

e. Provide current transformers having an accuracy suitable for the instruments and meters specified using the normal burdens of the various devices, and not less than ANSI Standard requirements.

2. Potential Transformers

a. Provide dry type potential transformers, suitable for indoor service. single-phase, 60 hertz, 120 volts.

b. Provide potential transformers that fit into and coordinate with the complete switchgear units, and with the instruments, relays, meters, and devices specified.

c. Rate the potential transformers not less than 100-volt-amperes at 55 degrees C ambient or 150-volt-amperes at 30 degrees C ambient thermal rating.

d. Provide potential transformers that can withstand a secondary short circuit for at least one second.

e. Provide the transformers meeting the requirements of the ANSI Standard accuracy classifications.

f. Provide current-limiting type primary fuses.

g. Provide secondary fuses sized for the protection of potential transformers.

3. Grounding

a. Ground current and potential transformer secondaries with copper conductors not smaller than No. 10 AWG and connecting to the ground bus.

b. Ground potential transformer neutrals, where shown or required with a 600-volt green insulated copper conductor not smaller than No. 10 AWG.

c. Provide connections to the bus that can be easily disconnected and isolated for field testing individually.

d. Install each ground wire as a continuous run without intervening splices or terminal blocks.

e. Ground secondary circuits of metering and relaying transformers at one point only.

f. Effectively ground meter, relay and instrument transformer cases.

F. Lightning Arresters and Surge Capacitors:

1. Provide lightning arresters and surge capacitors for each incoming service.

G. Control Devices:

1. Provide control switches of the standard rotary, multistage type suitable for the use specified.

2. Provide auxiliary relays, switches and mechanisms required for the particular manufacture of the breaker.

3. Provide a manually-operated trip bar or lever for each circuit breaker.

4. Equip with provisions for manual closing of each circuit breaker.

H. Instruments:

1. Provide flush- or semiflush-mounted instruments with cases of similar design in accordance with the following:

a. Antiglare glass fronts,

b. Antiparallax scales consisting of white faces with black numerals and markings.

c. Length of the scale arc not less than 7 inches.

d. Approximately 4-1/2 inches square.

e. Scales based on the instrument transformers provided, unless otherwise specified.

f. Accuracy: One percent of full scale values.

g. Drawout Watt-hour meters with test disconnect facilities.

I. Current Transducers:

1. Provide Current Transducers for each feeder circuit breaker as shown or required in accordance with the following:

a. Solid state devices.

b. Outputs: 4-20 ma into a 750 ohm load and Modbus via RS-485 multi-drop connections.

c. Provisions for zero and span adjustment with 0.25 percent accuracy.

d. Operate on external 120 volts ac, single phase, 60-hertz or derive their power supply from input signals.

J. Microprocessor-Based Metering System: Provide a microprocessor-based metering system for each main circuit breaker having the following features:

1. LCD Graphic Display Module with Meter Modules as indicated.

2. Embedded LAN/WAN Web Server for managing the electrical distribution system by providing real time circuit information with energy and demand readings and trending capabilities.

3. Output: Modbus via RS-485 multi-drop connections.

4. LCD Graphic Display Module

5. Sag/Swell/Transient Capture and Recording

6. Historical Trend Logging

7. Energy Profile Data

8. Energy and Demand Comparisons capability

9. Event Triggers

10. Event Logging

11. Digital I/O Card

12. Derive control power from metered line

13. Multiple communications ports

14. Metering / monitoring parameters:

    a. Volts: L-L, L-N Avg., L-L Avg., L-N, N-G
    b. Phase neutral and ground currents
    c. Power: real, reactive and apparent
    d. Frequency
    e. Power Factor: apparent and displacement
    f. Energy
    g. Demand
    h. % THD
    i. Minimum and maximum values
    j. Harmonics
    k. Flicker
    l. Individual harmonics
    m. Interharmonics
    n. % TDD
    o. ITIC events plot, duration, magnitude
    p. Energy and demand comparisons
    q. Event calendar
    r. Event time line and sequence

s. Phasors
t. Sequence components
u. Crest factor
v. K-factor
w. PQ index

15. Separate relay trip and alarm outputs contacts rated 5 amperes at 240-volt ac or 30-volt dc resistive.

K. Surge Protection Devices (SPDs):

1. Provide surge protection devices that comply with UL 1449.

2. Provide units with a maximum continuous operating voltage that exceeds 115 percent of the nominal system operating voltage.

3. Provide SPDs suitable for wye-configured systems.

4. Provide SPDs having directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G).

5. Provide SPDs that distributes the surge current to all MOV components to ensure equal stressing and maximum performance and provides equal impedance paths to each matched MOV.

6. Provide high-performance EMI/RFI noise rejection filters that attenuate the electric line noise at least 50 dB at 100 kHz using the MIL-STD-220A insertion loss test method.

7. Wire internal components with connections utilizing low impedance conductors and compression fittings.

8. Provide a monitoring panel for each system that incorporates the following features:

a. Green/red solid state indicator light to indicate which phase(s) have been damaged.
b. A flashing trouble light to indicate fault detection
c. Transient event counter
d. Audible alarm
e. Form C dry contacts for remote indication of the unit status.

9. Provide SPDs for service entrance application with a minimum total surge current capable of withstanding 250kA per phase respectively or as shown.

L. Wiring:

1. Completely assemble, wire and test each switchgear section at the factory, including buses, phase, neutral and ground connections, insulators, cleats, terminals, and terminal blocks.

2. Insulate all current-carrying parts.

3. Route all secondary wiring in the front of secondary compartments in wiring troughs and terminate at approved, molded-type terminal blocks with numbered marking strips, conveniently located with respect to the control conduits.

4. Provide terminal blocks with covers mounted so that the wires can be grouped and laced together.

5. Mark and identify all wiring in accordance with the manufacturer's wiring diagrams.

6. Label control wiring with an identification tag that indicates the terminal number of the opposite end connection.

7. Include wire labels and terminal numbers on schematic control and wiring diagrams.

8. Provide spade connectors for wires No. 12 and smaller and solderless lugs for larger sizes.

9. Provide terminals for all connections and an additional 15 percent spare terminals for all control and instrument wiring.

10. Provide No. 10 AWG stranded copper or larger with NEC Type SIS insulation for all current transformer secondary wiring.

11. Provide No. 14 AWG stranded copper or larger with NEC Type SIS insulation for all other control wiring.

12. Provide a fused switch or circuit breaker for the control power supply in each breaker compartment.

M. Identification:

1. Provide identification of the switchgear and its components as specified in Section 16075.

2. Install nameplates for devices located on doors so they are readable to a person 5'-8" tall standing 3'-0" in front of the equipment.

3. Locate nameplates so that they are readily associated with the items labeled.

4. Where nameplates are installed on removable relays or removable device doors, install a nameplate within the relay or device.

5. Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

2.4 ACCESSORIES

A. Circuit Breaker Lifting Device: Provide a traveling type circuit breaker lifting device rail mounted on the top of each switchgear assembly. Provide all accessories required for lifting and lowering circuit breakers.

B. Remote Breaker Operating Station: Provide a remote station with control cable and receptacle for remote racking out a circuit breaker from the stationary structure.

2.5 SOURCE QUALITY CONTROL

A. Tests:

1. Conduct shop tests after the switchgear has been assembled to determine general operating condition and circuit continuity, high voltage withstand and other safety standards.

2. Witness Tests: Carry out inspection and witness test of the completed switchgear assembly to assess its state of workmanship and standard of performance.

3. Notify the ENGINEER of the proposed date of testing a minimum of ten working days prior to the test.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install the switchgears in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the Specific/General Provisions.

B. Conformance: Install the switchgears as shown, in conformance with manufacturers written instruction and recognized industry practices. Comply with requirements of NEMA standards, and applicable ANSI publications.

C. Coordination: Coordinate with other work including cabling and wiring work as necessary to interface installation of switchgears with other work.

D. Torque Requirements: Tighten electrical connectors and terminals including screws and bolts, in accordance with equipment manufacturer's published torque tightening values of equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.

E. Fuses: Provide fuses in switchgear assemblies as required.

F. Circuit Breaker Parameters: Set the circuit breaker protection parameters in accordance with the protective coordination study specified in Section 16085.

G. Grounding Connections: Make equipment grounding connections for the switchgear as shown. Tighten connections in accordance with UL standard 486A for permanent and effective grounding.

H. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation of the system.

3.2 FIELD QUALITY CONTROL

A. Manufacturer’s Representative: Provide a factory-trained experienced, competent, and authorized representative of the switchgear manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in the General Provisions. Provide all instruments and equipment necessary to conduct required tests, adjustments and training. Have the manufacturer's representative utilize prepared comprehensive check sheets covering inspections, checks and tests required for the assembly of the switchgear. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.

B. Certified Report: Furnish a written report certifying that the equipment:

1. Has been properly installed

2. Is in accurate alignment

3. Is free from any undue stress imposed by connections or anchor bolts, and

4. Has been operated under full load conditions and that it operated satisfactorily

C. SCADA Programming: Provide manufacturers representative at the job site as often as necessary to assist in the programming of the SCADA system for accessing the memory map of each device.

D. Tests and Inspections: Perform the following tests and inspections. Record all tests and submit a written report for approval. Retest as necessary.

1. Check all breakers, relays, meters, power and control fuses and auxiliaries for proper size, rating, and location. Clean control panels and cubicles. Remove all shipping materials.

2. Inspect equipment and each breaker and report installation or shipping damage, loose materials, shipping blocks or contamination.

3. Torque test bus connections where field joints are made.

4. Test key interlock systems to demonstrate proper function.

5. Check that all control and panel circuits are numbered and tagged and panel door legends are engraved and installed as per drawings.

6. Check equipment to determine that it is level, secured to foundations and that doors operate properly.

7. Test insulation of all control and relay circuits to ground with a suitable megohmmeter. Take suitable precautions where electronic devices, instruments and instrument transformers are involved.

8. After installation, but before any external connections are made to the switchgear, subject the switchgear to a 10-minute high potential test applied on the stationary structure and breakers. Use a test voltage of 75 percent of the standard factory production tests.

9. Test all bus, cable, wire and other equipment operating at the service voltage that is energized by closing the incoming main line breakers. This test may be witnessed by the ENGINEER.

10. Test protective relays to verify settings and determine proper operation.

11. Demonstrate the operation of all breakers to confirm correct operation per the contract drawings.

E. Training: Following completion of installation and field testing provide training for 6 employees of the CITY in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the CITY'S facilities at a time agreeable to the CITY:

1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

3.3 GROUNDING

A. System Inspections: Inspect ground system for compliance with the latest approved drawings.

B. Connection Inspections: Inspect all ground connections for evidence of looseness and/or corrosion.

3.4 CLEANING AND PAINTING

A. Shop Painting: Paint the switchgear as specified in Section 24.

B. Field Painting: Touch up scratched and marred surfaces to match with original finishes.

3.5 IDENTIFICATION

A. General: Provide identification meeting the requirements of Section 16075.

B. Component Identification: Identify all system components, cables and wires by labels indicating unit numbers, circuit numbers and date of installation.

END OF SECTION