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 13-C-00055

HOWARD F. CURREN AWTP RECLAIMED WATER PUMPING IMPROVEMENTS

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

MARCH 2014

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

****

BID NOTICE MEMO
****

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

CONTRACT NO.: 13-C-00055; Howard F. Curren AWTP Reclaimed Water Pumping Improvements
BID DATE: April 22, 2014 ESTIMATE: $500,000 SCOPE: The project comprises removal of existing pumps, piping, valves, and appurtenances; furnishing and installing new variable frequency drive (VFD) pump and motor, variable frequency drive, electrical transformer, piping configurations to facilitate the new pump and motor, and all necessary controls to provide a complete pumping system, painting of all above-grade pipes, with all associated work required for a complete project in accordance with the Contract Documents. PRE-BID CONFERENCE: Tuesday, April 8, 2014, 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.
****

Only City of Tampa Certified Small Local Business Enterprises may submit bids for this project.
CONTRACT NO.: 14-C-00026; Howard F. Curren Transformer Replacement Phase II – Sheltered Market
BID DATE: April 22, 2014 ESTIMATE: $300,000 SCOPE: The project comprises removal and replacement of six (6) 13.2 kV - 480 V electrical distribution transformers, feeder replacement conductors and installations, and conduit installation, with all associated work required for a complete project in accordance with the Contract Documents. PRE-BID CONFERENCE: Tuesday, April 8, 2014, 11:00 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.
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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 .

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NOTICE TO BIDDERS
CITY OF TAMPA, FLORIDA
Contract 13-C-00055; Howard F. Curren AWTP Reclaimed Water Pumping Improvements

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., April 22, 2014, 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, demolition of an existing vertical pump, and associated piping, valves, and appurtenances; furnishing and installing new variable frequency drive (VFD) pump and motor, variable frequency drive, electrical transformer, piping configurations to facilitate the new pump and motor, and all necessary controls to provide a complete pumping system; painting of all above-grade pipes; as shown on the plans, 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 Reclaimed Water Pumping 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 190 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 30% 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-1.12 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.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.13 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.

I-1.14 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-1.15 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-1.16 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.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.17 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-1.18 PAYMENT DISPUTE RESOLUTION

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

I-1.19 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-1.20 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

U-WMBE Goal Setting Firms Report

2/24/14

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

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

MDH Enterprises, Inc. **Federal**
55-0849332
281 E C St.
Orange City, FL 32763
Phone (386) 789-2672
Fax (866) 681-5026
Minority African American
Contact Matize Hoskins
E-mail matize@my-es.com

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 2/24/2014

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
Fax (813) 645-3351
E-mail tkamprath@apollo-construction.com

Minority Small Business
Contact Thomas Kamprath

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

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 2/24/2014

ELECTRICAL SERVICES

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

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

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 2/24/2014

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 2/24/2014

SLBE Contract Goal

Goal
30%

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

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.

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)

City of Tampa
Official Letter of Intent
(Form MBD-40)

A Letter of Intent is required for each WMBE/SLBE listed on the Schedule of Subcontractors to be Utilized (MBD 20 Form). Letter of Intent must be signed by both the Bidder/Service Provider and WMBE/SLBE firm.

Bid/Proposal/Contract Number: _____

Bid/Proposal/Contract Name: _____

A. To be completed by the Bidder/Service Provider

Name of Bidder: _____
Address: _____
_____

Contact Person: _____
Telephone: _____ Fax: _____
Email: _____

B. To be completed by WMBE/SLBE

Name of WMBE/SLBE: _____
Address: _____
_____

Contract Person: _____
Telephone: _____Fax: _____
Email: _____

C. Identify the scope of work to be performed or item(s) to be supplied by the WMBE/SLBE. On unit price bids, identify to which bid line item the WMBE/SLBE's work scope or supply corresponds:

_____
_____
_____

D. Cost of work to be performed by WMBE/SLBE: _____

E. Cost of work to be performed by WMBE/SLBE as a percent of total City contract amount:_____

Bidder/Proposer certifies that it intends to utilize the WMBE/SLBE listed above, and that the work described above is accurate. Bidder/Proposer will provide City with copy of the related subcontract agreement and/or purchase order prior to commencement of the WMBE/SLBE's work. The WMBE/SLBE firm certifies that it has agreed to provide such work/supplies for the amount stated above.

Bidder/Proposer: _____ Date: _____
Signature and Title

WMBE/SLBE Firm: _____ Date: _____
Signature and Title

Official Letter of Intent Instructions
City of Tampa
Equal Business Opportunity Program

The Official Letter of Intent must be submitted to the soliciting department within ten (10) work days of the bid opening, prior to award. Not providing all letters of intent within the prescribed time frame may be cause to delay award or declare the bid to be non-responsive.

Bid/Proposal/Contract Number- Please provide bid/proposal/contract number provided by City of Tampa procuring department.

Bid/Proposal/Contract Name – Please provide bid/proposal/contract name provided by City of Tampa procuring department.

To be Completed by the Bidder/Service Provide – Please provide prime contractor or main bidders detailed company information as indicated.

To be completed by the WMBE/SLBE – Please provide WMBE/SLBE subcontractor detailed company information as indicated.

Bidder is to Identify the scope of work to be performed or item(s) to be supplied by the WMBE/SLBE. On unit price bids indentify, which bid line item the WMBE/SLBE's scope of work or supply corresponds – Please provide details of the services or supplies the WMBE/SLBE will provide.

Cost of work to be performed by WMBE/SLBE – Provide agreed upon estimate of work or supplies total price (Unit prices are accepted if specific quantities have yet to be determined).

Bidder/Proposer – Signature of authorized agent for the prime contractor or main bidder with date signed.

WMBE/SLBE firm – Signature of authorized agent for the WMBE/SLBE subcontractor or supplier with date signed.

Contract Confirmation – A copy of the executed subcontract agreement and/or purchase order with the WMBE/SLBE must be filed with the City of Tampa immediately upon execution and/or prior to commencement of work by WMBE/SLBE.

Contract 13-C-00055; Howard F. Curren AWTP Reclaimed Water Pumping 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 demolition of an existing vertical pump, and associated piping, valves, and appurtenances; furnishing and installing new variable frequency drive (VFD) pump and motor, variable frequency drive, electrical transformer, piping configurations to facilitate the new pump and motor, and all necessary controls to provide a complete pumping system; painting of all above-grade pipes; as shown on the plans, and any Contingency Allowances as stated in SP-131, and with all associated work required for a complete project in accordance with the Contract Documents. The Total Lump Sum Price for Contract 13-C-00055, Howard F. Curren AWTP Reclaimed Water Pumping Improvements is: $_____	

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 _____, 2014

_____
(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 _____, 2014 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 _____, 2014 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 _____, 2014 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 13-C-00055; Howard F. Curren AWTP Reclaimed Water Pumping 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 13-C-00055, Howard F. Curren AWTP Reclaimed Water Pumping 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 Public Construction 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 _____, 2014.

Principal _____

BY _____

TITLE _____

BY _____

TITLE _____

(SEAL)

_____
Producing Agent

_____
Producing Agent's Address

_____
Name of 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 13-C-00055 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 _____, 2014, 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 13-C-00055; Howard F. Curren AWTP Reclaimed Water Pumping Improvements, shall include, but not be limited to, demolition of existing pumps, piping, valves, and appurtenances; furnishing and installing new variable frequency drive (VFD) pump and motor, variable frequency drive, electrical transformer, piping configurations to facilitate the new pump and motor, and all necessary controls to provide a complete pumping system, painting of all above-grade pipes 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 _____, 2014 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 _____, 2014 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 _____, 2014 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.P Scope

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

All work shall be constructed, installed and maintained complete in place as specifically described in these Specifications, as shown on the Plans and as described and directed by the Engineer in accordance with the obvious or expressed intent of the Contract.

This work also includes general cleanup, start-up and testing of all installed equipment to ensure satisfactory operation of the pumping station and all other work required by the Contract Documents necessary to make the pumping station complete and functional.

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-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-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.PS Salvage

All salvageable material, as determined by the Engineer, shall be removed by the Contractor and shall remain the property of the City.

All such salvaged items shall be removed by the Contractor, delivered, and unloaded at a location within the Department’s service area, as directed by the Engineer. The Contractor shall include all necessary labor and equipment to unload the materials at a location designated by the City. The cost of removing, disposing, delivering, and unloading as salvage items of pipe and appurtenances shall be included in the various Contract Unit Prices or the 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 facility 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-18 Dewatering

Dewatering is the responsibility of the Contractor. All costs associated with dewatering shall be included in the appropriate contract price for items to which dewatering is incidental, or in the total Lump Sum Price, as applicable and no separate payment shall be made therefor.

Before commencing any excavation at the site of the work, the Contractor shall submit to the Engineer and obtain his approval of the methods and equipment and arrangement of facilities proposed for the removal and disposal of water at the site and of all water entering any excavation or other part of the work from any source whatsoever. Adequate standby facilities shall be provided to ensure that the excavation will be kept dry in the event of power failure or mechanical breakdown. Facilities for removal and disposal of water shall be of sufficient capacity to keep the excavation dry under all circumstances with one-half of the facilities out of service. If well points are used, provision shall be made for removing and resetting individual well points without taking the system of which they are a part out of service.

SP-19 Prevention, Control and Abatement of Erosion and Water Pollution

The Contractor shall be responsible for prevention, control and abatement of erosion, siltation and water pollution resulting from construction of the project until final acceptance of the project.

He shall provide, install, construct, and maintain any covering, mulching, sodding, sand bagging, berms, slope drains, sedimentation structures, or other devices necessary to meet City, County, State and Federal regulatory agency codes, rules and laws.

The Contractor shall take sufficient precautions to prevent pollution of streams, canals, lakes, reservoirs and other water impoundments with fuels, oils, bitumen, calcium chloride or other harmful materials. Also, he shall conduct and schedule his operations so as to avoid or otherwise minimize pollution or siltation of such streams, and the like, and to avoid interference with movement of migratory fish. No residue from dust collectors or washers shall be dumped into any live stream.

Storm drainage facilities, both open and closed conduit, serving the construction area shall be protected by the Contractor from pollutant and contaminants. If the Engineer determines that siltation of drainage facilities has resulted due to the project, the Engineer will advise the Contractor to remove and properly dispose of the deposited material. Should the Contractor fail to or elect not to remove the deposits, the City will provide maintenance cleaning as needed and will charge all costs of such service against the amount of money due or to become due the Contractor.

Construction operations in rivers, channels, streams, tidal waters, canals and other impoundments shall be restricted to those areas where it is necessary to perform filling or excavation to accomplish the work shown in the Plans and to those areas which must be entered to construct temporary or permanent structures. As soon as conditions permit, rivers, channels, streams and impoundments shall be promptly cleared of all obstructions placed therein or caused by construction operations.

Except as necessary for construction, excavated materials shall not be deposited in rivers, streams, canals or impoundments, or in a position close enough thereto to be washed away by high water or runoff.

The Contractor shall not disturb lands or waters outside the limits of construction except as may be found necessary and authorized by the Engineer.

The location of and methods of operation in all detention areas, borrow pits, material supply pits and disposal areas furnished by the Contractor shall meet the approval of the Engineer as being such that erosion during and after completion of the work will not likely result in detrimental siltation or water pollution.

The Contractor shall comply with the applicable provisions of the Hillsborough County Land Development Code concerning grading, filling, excavation, soil removal, and the like, as amended.

The Contractor shall schedule his operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations; and the duration of exposed, uncompleted construction to the elements shall be as short as practicable.

Clearing and grubbing shall be so scheduled and performed that grading operations can follow immediately thereafter and grading operations shall be so scheduled and performed that permanent erosion control features can follow immediately thereafter if conditions on the project permit.

The Engineer may limit the surface areas of unprotected erodible earth exposed by clearing and grubbing, excavation or filling operations and may direct the Contractor to provide immediate erosion or pollution control measures to prevent siltation or contamination of any river, stream, channel, tidal waters, reservoir, canal or other impoundment or to prevent damage to the project or property outside the project right of way.

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-29 Utility Protection Considerations

The Contractor shall protect all utilities and other facilities within and adjacent to the construction as covered in Section G-1.03, unless a utility firm has conclusively indicated, or such is shown on the Plans, that the certain adjustment, removal, reconstruction, or protection of the utility's facility will be performed by that respective utility.

SP-40 Concrete Requirements

Workmanship and Materials Section 4 shall apply to all concrete 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-70 Electrical Equipment Certification

All equipment and materials shall be UL listed or listed and labeled as complying with the requirements of an independent testing laboratory recognized by the Florida Building Code. (SBCCI no longer exists).

An electrical product that is not available as a standard UL listed assembly (e.g. industrial equipment of unique configuration or custom design) shall be composed of UL listed components, whenever they are available, and constructed in accordance with the design documents, and the latest nationally recognized industry standards. The Contractor shall certify in writing the equipment satisfies the above requirements and that it has been installed in compliance with the latest edition of the National Electrical Code (NEC) and Chapter 5 of the City of Tampa Code. The certification shall be submitted to the City's Electrical Inspection Bureau, with a copy sent to the Project Engineer, prior to final inspection. A sample certification document is attached to these Specific Provisions as a formatting guide.

The Contractor shall secure all required permits and arrange for progress and final inspections as the work develops.

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. All equipment and materials shall be UL listed.

Where UL listing is not available for the device or an assembly as a whole, refer to the provision entitled "Electrical Equipment Certification" for submittal requirements.

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 90 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 protective relay settings and control and alarm set points.

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-80 Vibration Requirements for Rotating Equipment

The Contractor shall obtain the services of an independent test and balance company that specializes in vibration testing, dynamic balancing, and alignment of rotating equipment. The company selected shall have personnel with experience as an industrial mechanical repairman, plus advanced factory training in dynamic balancing, vibrational analyses and troubleshooting by companies such as Spectral Dynamics, IRD Mechanalysis, B & K, Palomar, or Bentley Nevada.

Testing and balancing shall be performed in accordance with standards for field measurements from companies such as IRD Mechanalysis, Bentley Nevada, Balmad, CSI, or Palomar. Instruments used for testing and balancing of rotating equipment must have been calibrated within a period of six (6) months and checked for accuracy prior to start of work. The Contractor shall submit the name of the test and balance company to the Engineer for approval within 30 days after receipt of notice to proceed.

The tests shall include vibration signatures taken while the equipment is operating under normal load at full speed. The signatures shall be plots of filtered vibration velocity in inches per second peak versus frequency for a range of 100 to 60,000 cycles per minute (cpm). Signatures shall be taken at the bearing radially in two planes and axially.

The vibration limits specified herein shall apply to equipment operational speeds and frequencies. The independent test and balance company shall review and interpret vibration peaks at other frequencies and shall make recommendations regarding whether or not corrective action is required. If the independent test and balance company recommends corrective action, the Contractor shall implement such corrective action in a timely manner and at no change in contract price. If minimum acceptable vibration limits as specified herein for dynamic balance and vibration cannot be demonstrated by the test results, the Contractor shall be responsible for correcting the problem. Modifications proposed shall be submitted to the Engineer for approval. No additional payment will be made for any modification required or for retesting of equipment.

Results of all tests including the initial installation readings and the final readings after any modification or correction shall be submitted to the Engineer for approval.

Dynamic balance and vibration requirements for rotating equipment shall be a follows:

1. Coupling Alignment - All drivers and driven equipment shall be checked for looseness, and tightened to proper bolt torque specifications. Alignment of couplings between driver and driven equipment shall be obtained by the use of solid stainless steel shim plates. However, if required shimming is greater than .125 inch, final shimming shall be of brass shim plates with an area as large as the driver and driven base feet.

Coupling alignment shall be checked in both the offset and angular directions, initial installation readings and final readings after any modification or correction shall be recorded and submitted as historical data and shall meet the following tolerances or manufacturer's recommended tolerances, whichever are more stringent:

a. Couplings less than 4-inch diameter shall have no more than 0.002-inch Total Indicator Runout (TIR).

b. Couplings greater than 4 inches but less than 6 inches shall have no more than 0.003-inch TIR.

c. Couplings greater than 6 inches but less than 10 inches shall have no more than 0.004-inch TIR.

2. Rotating Equipment "Soft Foot" Condition Check - The driver and driven equipment shall have four (4) individual support feet and shall be checked for a condition known as "soft foot." The condition check shall be as follows:

   a. All mounting bolts shall be tight before proceeding.

   b. A dial indicator shall be set on the equipment base next to the foot to be checked. The dial on the foot to be checked shall be set to zero. The bolt on the designated foot shall be loosened. A maximum dial reading tolerance (deflection) of 0.001 inch shall be allowed. Any reading greater than 0.001 inch shall be shimmed until the tolerance level is achieved. This procedure shall be conducted for all four feet of both the driver and the driven equipment.

   c. The driver unit shall be properly aligned to the driven equipment. Shims shall be placed or removed under two adjacent feet to raise or lower the unit. The equipment shall be moved side to side or front to back to bring coupling faces to within tolerance as specified above.

3. Vibration Severity - The equipment as installed shall have no natural frequencies which occur within 25 percent of any exciting frequency over the range of operating speeds. Exciting frequencies are periodic forces that may occur as the result of unbalance (one times rotation), misalignment (two times rotational), vane pass (multiples of vane numbers), etc.

   Vibration shall be expressed in inches per second (IN/SEC) velocity peak. The values below are consistent with similar existing equipment histories. Four copies of the final report for each piece of equipment shall be submitted to the Engineer for final approval.

   a. Rotary lobe blowers mounted on resilient vibration isolators, operating at 1200 RPM or less shall not exceed 0.450 IN/SEC in any one direction.

b. Rotary lobe blowers, reciprocating type compressors and rotary lobe pumps which are mounted on fixed bases and operating at 1800 RPM or less shall not exceed 0.150 IN/SEC in any one direction.

c. Progressive cavity pumps, centrifugal pumps, centrifugal fans and centrifugal blowers and motors operating from 900 RPM to 1800 RPM shall not exceed 0.075 IN/SEC in any one direction.

d. Centrifugal compressors, centrifugal fans, blowers and motors operating at 3600 RPM shall not exceed 0.050 IN/SEC in any one direction.

e. Vertical mounted motor and pump units operating at 1100 RPM or less shall not exceed 0.100 IN/SEC in any one direction.

f. Vertical mounted motor and pump units operating at 1100 RPM to 1800 RPM shall not exceed 0.075 IN/SEC in any one direction.

4. General Machinery Vibration Severity Chart - The Chart, attached at this end of this section, shall be used to cross-reference displacement with frequency to determine vibration severity. For the equipment whose vibration requirements are not specified hereinbefore, the acceptable level of vibration shall be within "VERY GOOD" region or better (vibration velocity of 0.0392 IN/SEC or lower) in the Chart.

   When using the General Machinery Vibration Severity Chart, the following factors shall be taken into consideration:

   a. The Chart applies only to measurements taken on the bearings or structure of the machine. The Chart does not apply to measurements of shaft vibration.

   b. The Chart applies primarily to machines which are rigidly mounted or bolted to a fairly rigid foundation. Machines mounted on resilient vibration isolators such as coil springs or rubber pads will generally have higher amplitudes of vibration than those rigidly mounted. However, this rule should not be applied to high frequencies of vibration such as those characteristic of gears and defective rolling-element bearings, as the amplitudes measured at these frequencies are less dependent on the method of machine mounting.

SP-81 Services of Manufacturers' Representatives

The services of manufacturers' representatives shall be provided on the site as required for the supervision of installation, the adjustment and placing in satisfactory trouble-free operation of such equipment, and instructing City personnel in the operation and maintenance of such equipment for which such specialized services are specified, directed, or required.

Such manufacturers' services shall be of sufficient time and include a minimum period of one 8-hour day for instruction of City personnel. Additional time shall be provided if necessary.

The cost of all services of manufacturers' representatives shall be included in the various Contract Unit Price Items, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

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 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-98 Valves

Valves shall be handled with care to avoid damage. All valves shall be loaded and unloaded by lifting, and under no circumstances shall valves be dropped, skidded, or rolled. Valves shall not be placed, under any circumstances; against pipe or other fittings in such a manner that damage could result. Slings, hooks or tongs used for lifting shall be padded in such a manner as to prevent damage. If any part of the valves' coating and lining is damaged by the Contractor, the repair and replacement shall be made by the Contractor at his expense in manner satisfactory to the Engineer before installing. Valves shall also be stored at all times in a safe manner to prevent damage and kept free of dirt, mud or other foreign matter. All valve gaskets shall be stored and placed in a cool location out of direct sunlight and out of contact with petroleum products. All gaskets shall be used on a first-in, first-out basis.

Gate valves and butterfly valves shall be set and joined to new pipe in a manner heretofore specified for cleaning, laying and joining pipe. Valves shall be installed such that the operating nut is plumb.

The work shall include all labor, materials, equipment, tools and any incidentals required for the completion of the work.

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 (813-274-5704).

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, eyewash 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-131 Contingency

As directed by the Engineer, this item is to allow payment for unforeseen circumstances not mentioned in the specifications.

The upset limit for contingency allowance is $40,000 and shall be included in the base bid.

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

scale: 3" = 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.

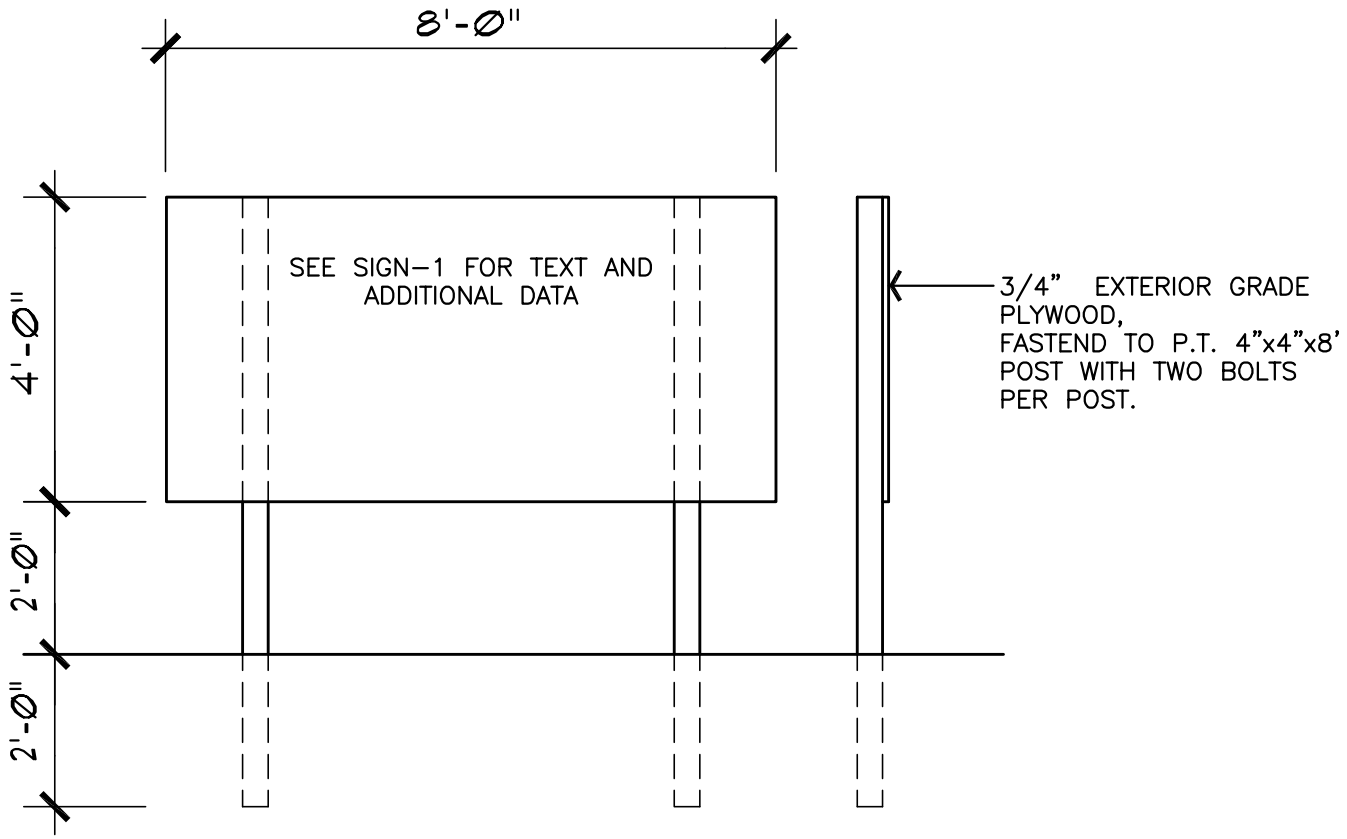
Colors

Blue: Sherwin Williams Naval SW6244
Green: Sherwin Williams Center Stage SW6920
White: Sherwin Williams Pure White SW7005

Font

Franklin Gothic

K:\CA\edr\dpw project sign 4-28-04.dwg, 08/22/2005 12:32:38 PM, pw1m



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:

	Compressive Strength - psi		Maximum Water
Class	7-day Test	28-day Test	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	Minimum and Maximum Slump in Inches	
Placement	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.

* * *

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 8 - METAL CASTINGS

W-8.01 General

Metal castings include all miscellaneous ferrous and nonferrous castings.

Wheel guards, valve boxes, manhole frames and covers, stop log grooves, brackets and supports for piping, gutter inlets, floor, roof and gallery drains, stormwater inlets, beehive grates and frames, cleanout covers, and special malleable iron castings and inserts are included in this classification.

W-8.02 Materials

Metal castings shall meet the requirements of the following standards, except as otherwise specified herein.

Gray Iron	ASTM Des: A 48
Malleable Iron	ASTM Des: A 47
Carbon Steel	ASTM Des: A 27
Alloy Steel	ASTM Des: A 148
Aluminum	ASTM Des: B 26
Aluminum Bronze	ASTM Des: B 148
Silicon Bronze	Navy Spec. 46B28
Manganese Bronze	ASTM Des: B 132 or B 147
Ductile Iron	ASTM Des: A 536

W-8.03 Workmanship

Castings shall be made accurately to approved dimensions and shall be planed or ground where marked or where otherwise necessary to secure perfectly flat and true surfaces. Allowance shall be made in the patterns so that the specified thickness shall not be reduced. Manhole and cleanout frames and covers shall conform to the details shown on the Plans and shall be true and shall seat at all points. No plugging of defective castings will be permitted. All castings shall be erected to accurate grades and alignment, and when placed in concrete, they shall be carefully supported to prevent movement during concreting.

W-8.04 Weights

No castings weighing less than 95 percent of the theoretical weight, based on required dimensions, will be accepted. The Contractor shall provide facilities for weighing castings in the presence of the Engineer, or shall furnish invoices showing true weights, certified by the supplier.

* * *

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. 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 shall have a minimum thickness of Class 52 unless specified otherwise as shown on the Plans.

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 or AWWA C153, 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

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 shall conform to the following:

Restraint devices for nominal pipe sizes 3 inch through 36 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure rating equal to that of the pipe on which it is used. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.

Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.

Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8. Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

Mechanical joint gasket shall be of a design that causes the gasket to deflect approximately 30% during assembly of the mechanical joint. The gasket material shall conform to the requirements of ANSI/AWWA C111/A21.11, section 11-6.4, of the latest revision.

An identification number consisting of year, day, plant and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body. All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.

Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.

Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

Joint Restraints, 4 inch through 24 inch, shall meet or exceed the requirements of ASTM F1674 of the latest revision. Mechanical joint restraint shall be Series 2100 Megaflange Adapter produced by EBAA Iron Inc.

Coating (manufacturer applied) for restraint devices shall consist of the following:

All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid Xylan® fluoropolymer coating with heat cure to follow each coat.

All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

The coating system shall be MEGA-BOND by EBAA Iron, Inc. or approved equal. Requests for approved equal must submit coating material and process details for review.

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 thickness' 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 water tightness 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. Above-ground pipe shall be coated and lined as specified in the Plans and Specifications.

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 – (not used)

W-10.12 Polyethylene Encasement

Polyethylene encasement shall be installed on all buried 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 – (not used)

W-11.0 Testing

Refer to Section 18 Leakage Tests

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SECTION 16 - RESTORATION OF STREET PAVEMENTS

W-16.01 General

The various street surfaces disturbed, damaged, or destroyed during the performance of the work under this Contract shall be restored and maintained as shown, specified, and directed. Included in this classification are permanent pavement surfaces of all types, pavement bases, curb, curb and gutter, alleys, driveways, and sidewalks.

The quality of workmanship and materials used in the restoration shall produce a street surface equal to or better than the condition before the work began.

Service boxes, manhole frames and covers, and similar structures not conforming to the new work shall be set to established grade at the Contractor's expense, and no separate payment will be made therefor.

All portland cement and asphaltic concrete pavements shall be removed in rectangular sections with sawed vertical cuts, or to existing joints, as directed by the Engineer. Concrete pavements shall be cut with a concrete saw. Asphaltic concrete pavements one-inch thick or greater shall be cut with a tool having a square neat edge. The edges of adjacent pavement shall be trimmed to straight lines which a roller can follow. Where reinforced concrete pavement is removed, one foot of existing reinforcement on each side of the excavation shall be left exposed and tied to the replaced reinforcing steel.

The equipment necessary for the proper performance of pavement replacement shall be on the site in satisfactory working condition and shall be subject to approval of the Engineer before the work is started.

All replaced concrete pavements shall have a minimum bearing on undisturbed earth outside the line of excavations of at least nine (9) inches.

W-16.02 Standards

The restoration of street pavement shall be performed in strict conformance with the standards relating to equipment, materials, and methods of construction of the authority having jurisdiction over the pavements, unless otherwise specified herein. Pavements to be restored are under the jurisdiction of the several agencies as follows:

1. State Highways are under the jurisdiction of the State of Florida Department of Transportation. Work on such pavements shall conform to the Department of Transportation Standard Specifications for Road and Bridge Construction.

2. City Streets are under the jurisdiction of the City of Tampa Department of Public Works. Work on such pavements shall conform to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, except that densities (including for subgrade) and other testing requirements

shall follow current Department of Public Works specifications. The type and thickness of pavement, base and stabilization shall be as shown, specified, and directed by the Engineer.

3. County Roads are under the jurisdiction of the Hillsborough County Engineering Department. Work on such pavements shall conform to County specifications.

All specifications of the several agencies having jurisdiction over pavement restoration work shall be the current issue of such specifications as of the date of the "Notice to Bidders," except as specified otherwise herein.

W-16.03 Temporary Restoration

Upon completion of backfilling, the street or sidewalk surface damaged or destroyed shall be promptly placed in condition for safe temporary use. Temporary work shall be maintained in a suitable and safe condition for traffic until the permanent pavement is laid, or until final acceptance of the work.

Where the area over which existing pavement has been disturbed is to be repaved as part of an overall project by the agency having jurisdiction, any special temporary pavement replacement shall be as specified in the "Specific Provisions."

Pavement surfaces shall be temporarily restored by placing thereon, to proper line, grade and transverse profile, a layer or layers of compacted base material, as specified, conforming to all requirements regarding configuration, thickness, and density as detailed in the Plans, specified, and directed by the Engineer. When the compacted thickness of the base layer is greater than 6 inches, the base shall be constructed in multiple courses. Each course shall not exceed 6 inches in compacted thickness. Where the existing pavement has a permanent wearing surface, the temporary pavement shall be finished with a suitable grade of asphalt and sand to provide a temporary wearing course and to eliminate dust nuisance.

Curbs, where possible, shall be temporarily reset in place, as part of the work of temporary restoration of pavement.

Damaged or destroyed sidewalks shall be temporarily restored, immediately upon placing of the backfill, by placing a compacted layer of crushed concrete or similar material, which shall have a minimum thickness of three inches below the existing finished sidewalk grade.

The temporary pavement shall be maintained by the Contractor and all holes and depressions filled until the permanent pavement is placed.

Crushed concrete or similar material placed in areas where the existing pavement is shell, limerock, crushed stone, or other similar material shall be classified as nonpermanent pavement, will not be measured for separate payment.

Temporary sand and asphalt wearing courses placed on base on which a permanent pavement surface will be constructed shall be incidental to the permanent pavement base work, and no separate payment will be made therefor.

Limestone screenings for temporary sidewalk surface shall be incidental to sidewalk replacement, and no separate payment will be made therefor.

Base material placed in areas to receive a permanent pavement surface will be measured for payment under the appropriate Contract Item for permanent pavement base or as part of the Lump Sum price.

W-16.04 Preparation of Temporary Pavement for Permanent Pavement Replacement

After due notice and within the time specified, the temporary pavement shall be prepared as the base to receive the new permanent pavement surface.

Prior to construction of the pavement base, the City will furnish the Contractor with the preconstruction survey notes for the streets disturbed by construction. The Contractor shall use these notes in bringing the base installed to grade allowing for the permanent pavement surface to be constructed.

The preparation of the base shall consist of bringing the area to be replaced to a grade conforming to the required grade and cross section, of uniform density, ready to receive the permanent pavement. This is to be accomplished by excavating or backfilling as needed, shaping, watering as required, or permitting to dry to proper consistency, and rolling the entire area with an approved self-propelled roller. Shaping and rolling shall be continued until the base has been properly prepared and shows that no further compaction of any practical benefit would result from continued rolling. The base shall be tested as to cross section, crown, and elevation. After being properly prepared, it shall be so maintained until the permanent pavement is constructed. Any part of the base area not accessible to the roller shall be thoroughly compacted by hand or by mechanical compaction in a manner acceptable to the Engineer. Preparation shall include sawing, cutting and trimming edges of existing pavements to provide a neat, uniform edge to abut the new pavement.

After completion of the base, the Contractor shall furnish the Engineer with survey notes verifying the base has been constructed to grade. Upon approval, payment will be made for permanent pavement base.

W-16.06 Permanent Pavement Base Densities

Permanent base material shall be installed and compacted to the required densities (98% modified proctor) in layers not exceeding six inches.

W-16.07 Permanent Pavement Surface Restoration

Permanent restoration of pavement shall be pavement of the type and thickness detailed in the Plans, Specific Provisions, or as directed by the Engineer.

If the existing type of pavement is classified as nonpermanent pavement, the temporary restoration shall be reworked and completed and left in a condition at least equivalent to the existing nonpermanent pavement.

W-16.08 Replacement of Curb, Curb and Gutter, Sidewalk and Driveways

All permanent restoration of street curb or curb and gutter shall be of the same type and thickness as the curb or curb gutter which abuts. The grade of the restored curb and curb and gutter shall conform with the grade of the existing adjacent curb or curb and gutter.

Except as otherwise specified herein or detailed in the Plans, all permanent restoration of driveways and sidewalks shall conform to the manner of construction as originally placed and to the lines and grades as given by the Engineer. No patching of concrete driveway areas will be allowed between joints or dummy joints.

Where sidewalks are replaced, the replacement shall be the full width of the walk and minimum lengths shall be 60 inches. Restoration of adjacent lawn is incidental to sidewalk replacement, and no separate payment will be made therefor.

W-16.09 Replacement of Traffic Markings and Signalization Loops

The Contractor shall furnish all labor, equipment and materials to replace, test and maintain all traffic markings (temporary and permanent) and signalization loops removed or damaged by pipeline construction and appurtenance work as shown on the Plans, specified and directed by the Engineer.

The replacement of traffic markings (temporary and permanent), signalization loops and all appurtenant work shall be replaced by the Contractor in kind.

It shall be the Contractor's responsibility to field verify before construction begins all markings and signalization loops to be replaced.

All traffic markings and signalization loops shall conform to the Workmanship and Materials standards set forth in the latest edition of the Florida Department of Transportation Standard and Supplemental Specifications.

Payment for the replacement of temporary and permanent traffic markings, signalization loops and all appurtenant work shall be included in the unit bid price for Permanent Pavement Surface Replacement, Asphaltic Concrete, or as part of the Lump Sum price and no separate payment shall be made therefor.

W-16.10 Hot Bituminous Mixtures (Section 330) Type S Asphaltic Concrete (Section 331)

This Subsection shall Replace and/or Modify Portions of F.D.O.T. Standard Specifications for Road and Bridge Construction (1991) Sections 330 and 331.

330-10.3 Density Control

330-10.3.1 Density Control Nuclear Method:

The in-place density of each course of asphalt mix construction, with the exceptions of patching courses, leveling and intermediate courses less than 1 inch thick or a specified spread rate less than 100 pounds per square yard, overbuild courses where the minimum thickness is less than 1 inch, and open-graded friction courses, shall be determined by the use of the Nuclear Density Backscatter Method as specified by FM 1-T238 (Method B). The required density of a completed course shall be at least 95% of the job mix design laboratory density submitted by the Contractor and approved by the construction engineer or 96% of the laboratory density which results from a sample of the same day's productions and determined by the City laboratory performing all acceptance testing.

330-10.3.2 Control Strips:

Control strips may be constructed by the Contractor for the purpose of determining the necessary pattern of compacting procedures to achieve the density requirements specified. However, control strips are not used for the validity of acceptance testing.

330-10.3.3 Lots:

For the purpose of acceptance and partial payments, each day's production will be divided into lots. The standard lot size shall be 500 linear feet and consist of one sublot with its appropriate test per every 100 linear feet of any pass made by the paving train, regardless of the width or thickness of the course being laid. Any partial lot will be redefined as a whole lot and the evaluation of it will be based on its sublot test determinations.

For the standard lot (500 linear feet), five density determinations - one for each sublot - will be made at random locations within the lot, but not to be taken within one foot of any unsupported edge.

For the Contractor to receive full payment for density, the average density of a lot will be a minimum of 95% of the submitted and approved job mix design laboratory density or 96% of the same day sampled laboratory density performed by the City laboratory performing acceptance testing. To calculate the average density of a lot, the lowest sublot test will be discarded and the remaining four sublots will be averaged. Once the average density of a lot has been determined, the Contractor will not be permitted to provide additional compaction to raise the average. The average density will be rounded off according to City standards.

330-10.3.4 Acceptance:

The completed pavement will be accepted with respect to density on a lot basis. Partial payment will be made for those lots that have an average density less than the specified 95% of the approved job mix design laboratory density or 96% of the same day sampled laboratory density based on the following table:

City of Tampa Revised Table 330-3
Payment Schedule for Density

Percent of Control Strip Density	Percent of Payment
95.0 (job mix design)$_1$ or 96.0 (lab density sample)$_2$ & above	100
94.0 to < 95.0$_1$ or 96.0$_2$	95

Percent of Control Strip Density	Percent of Payment
93.0 to < 94.0 (Applies to both $_1$ & $_2$)	90
< 93.0 (Applies to both $_1$ & $_2$)	75

330-10.3.5 Density Requirements for Small Projects:

For projects less than 500 linear feet in length including intersections, turnouts, patches, crossings, etc., the requirements for specified densities are the same as a standard lot. For the purpose of acceptance and partial payment determination, the project less than 500 linear feet will be considered as a lot in its entirety and payment will apply accordingly with Table 330-3. The Contractor will use standard rolling procedures in 330-10.

331-5 Acceptance of the Mixture

331-5.1 General:

The bituminous mixture will be accepted at the site with respects to a gradation and asphalt content on a lot to lot basis. The material will be tested for acceptance in accordance with the provisions of 6-8.2 and the following requirements. However, any load or loads of mixture which, in the opinion of the City representative, are found unacceptable for reasons of being excessively segregated, aggregates improperly coated, or of excessively high or low temperature shall be rejected for use in the work. The composition and physical test properties for all mixes must meet the specification ranges provided in Tables 331-1 and 331-2.

A standard size lot at the site shall consist of one day's placement or equivalent to a standard quantity of 1,000 tons. The number of samples required to evaluate the lot will be divided into one or two sublots as indicated below. Testing for acceptance of the lot will be performed by the City material testing laboratory or by a licensed private testing laboratory of the City's choice. Quantities between 500 tons and 1,000 tons shall have 2 sublots; quantities between 50 tons and 500 tons shall have 1 sublot; quantities up to 50 tons will be accepted by the City representative on the basis of visual inspection.

331-5.2 Acceptance Procedures:

Sample selection for acceptance tests will be by random sampling of loaded trucks on site at the discretion of the City testing technician in accordance with FM-T168. The use of a random sample chart may be used but it is not required. Sampling shall not be taken in any of the following circumstances:

1) First load produced that day.
2) Last load produced that day.
3) Near end of quantity reached because of an underrun.

The Contractor and/or the plant quality control technician (Q.C.T.) will be notified of the time of sampling and may:

1) Observe the sampling.
2) Take a sample at the same time and run the tests.
3) Ask for a split sample and run the tests.
4) Observe the City testing technician run the tests.

The five acceptance determinations made from the sample are:

1) The % bitumen content per F.M.I. - T164.
2) The % passing the No. 4 sieve per F.M.I. - T030.
3) The % passing the No. 10 sieve per F.M.I. - T030.
4) The % passing the No. 40 sieve per F.M.I. - T030.
5) The % passing the No. 200 sieve per F.M.I. - T030.

For each acceptance sample taken, the technician will box and keep two split portions for referee tests. If the lot receives 100% payment, the referee sample will be discarded. If the lot sample shows a pay reduction, then one or both of the referee samples will be submitted for a second analysis to determine the validity of the acceptance test results. Referee samples will be tested by a licensed private laboratory of the City's choice. This second analysis will only be done at the request of the Contractor and will be paid for by the Contractor in the event that the original analysis results requiring a pay reduction is confirmed.

In the event that the second analysis does not confirm the pay reduction, the City will pay for the second analysis.

Acceptance of the mixture shall be on the basis of test results on consecutive random samples from each lot. One random sample shall be taken from each sublot. The bituminous mixture will be sampled at the site in accordance with FM 1-T168, except that samples may be collected from the paving machine at the receiving hopper. The percent bitumen content of the mixture will be determined in accordance with FM 1-T164 (as modified by DOT test procedures). The percents passing the No. 4, No. 10 and No. 200 sieves will be determined in accordance with FM 1-T030.

Calculations for the acceptance test results for bitumen content and gradation (percent pass No. 4, percent pass No. 10, percent pass No. 40 and percent pass No. 200) shall be shown to the nearest hundredth (0.01). Calculations for arithmetic averages shall be carried to the thousandths (0.001) and rounded to the nearest hundredth (0.01) in accordance with the Department's rules of rounding.

When the Contractor or producer chooses to use a storage bin for mix storage overnight or longer, the material processed in this manner will be sampled and tested for acceptance after the mix has been removed from the storage bin. The City representative may reject a mix at any time that is obviously defective due to asphalt content, insufficiency of mixing, inadequacy of coating, improper proportions of fine and coarse aggregates, temperature, contamination, etc. The Contractor and/or the L.Q.C.T. will be given the option of not placing the mix and sampling the following truck, or if it has been placed, sample it. The City reserves the right to test or have the mix tested by a licensed private testing laboratory of their choice. Payment will be made on the basis of the City's revised Table 331-6 "Acceptance Schedule of Payment."

City of Tampa Revised Table 331-6
Acceptance Schedule of Payment
(Asphalt Plant Mix Characteristics)

Characteristics	Factor	Deviation of the Arithmetic Average of the Lot Acceptance Tests from Job Mix Formula: One Test	Two Tests
Asphalt Cement Content (Extraction)	1.00	0.00 - 0.55	0.00 - 0.43
	0.95	0.56 - 0.65	0.44 - 0.50
	0.90	0.66 - 0.75	0.51 - 0.57
	0.80*	Over 0.75	Over 0.57
No. 4 Sieve**	1.00	0.00 - 8.00	0.00 - 5.95
	0.95	8.01 - 9.00	5.96 - 6.66
	0.90	9.01 -10.00	6.67 - 7.36
	0.80	Over 10.00	Over 7.36
No. 10 Sieve**	1.00	0.00 - 6.50	0.00 - 5.04
	0.95	6.51 - 7.50	5.05 - 5.74
	0.90	7.51 - 8.50	5.75 - 6.45
	0.80*	Over 8.50	Over 6.45
No. 40 Sieve**	1.00	0.00 - 5.50	0.00 - 4.62
	0.95	5.51 - 6.50	4.63 - 5.33
	0.90	6.51 - 7.50	5.34 - 6.04
	0.80*	Over 7.50	Over 6.04

No. 200 Sieve**	1.00	0.00 - 2.00	0.00 - 1.71
	0.95	2.01 - 2.40	1.72 - 1.99
	0.90	2.41 - 2.80	2.00 - 2.04
	0.80*	Over 2.80	Over 2.04

* If approved by the City, the Contractor may accept the indicated partial pay. The City may require removal and replacement at no cost. The Contractor has the option to remove and replace at no cost to the City at any time.

** When there are two or more reduced payments for these items in one lot of material, only the greatest reduction in payment will be applied. CAUTION: This rule applies only to these four gradation test results.

Note: 1) The No. 40 sieve applies only to Types S-I, S-II, S-III, FC-1, and FC-4.
2) Deviations are absolute value with no plus or minus signs.

* * *

SECTION 17 - LAWN REPLACEMENT

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 18 - LEAKAGE TESTS

W-18.01 General

All reclaimed water (RCW) pipelines will be tested and inspected for leakage by the Engineer with the assistance of the Contractor prior to final acceptance of the work. All tests and inspections will be conducted in a manner to minimize as much as possible any interference with the Contractor's work or progress.

The Contractor shall notify the Engineer when the work is ready for testing and inspecting, and tests and inspections shall be made as soon thereafter as practicable under the direction of the Engineer. Personnel for reading meters, gauges, or other measuring devices will be furnished by the Engineer. The Contractor shall furnish all other labor, materials, services, and equipment, including power, fuel, meters and gauges, pumps, bulkheads, backflow preventers, water, and other items and apparatus necessary for making leakage tests, preparing pipelines for testing, assembling, placing, and removing testing equipment, and placing pipelines in service, all to the satisfaction of the Engineer. After testing, the water shall be disposed of by the Contractor into storm sewers or drainage courses approved by the Engineer.

W-18.02 Tests of RCW Pipes - General

All RCW pipes shall be tested for leakage after constructed.

W-18.06 Leakage and Pressure Tests of RCW Mains

Pressure test RCW pipelines for leakage by maintaining water in the pipe at the specified pressure for a minimum period of 4 hours.

Pressure test the piping for leakage as a whole or in sections, valved or bulkheaded at the ends. Apply the specified pressure to the piping through a tap in the pipe by means of a hand pump or other approved method. Do not use air for testing.

Fill water mains with water a minimum of 24 hours prior to conducting tests.

Test new water mains at the test pressure of 150 psi for 4 hours.

Allowable Leakage: Stop all visible leakage. Do not allow leakage for any piping, as determined by the above test, to exceed the allowable leakage as given by the following formula:

$$L = \frac{S \times D \times (P)^{1/2}}{133{,}200}$$

in which L is the allowable leakage in gallons per hour, S is the length of water main tested in feet, D is the nominal diameter of the pipe in inches and P is the average test pressure in psi gauge.

W-18.07 REPAIR OF PIPING LEAKS

Repair leaks as follows:

Replace broken pipe or joint assemblies found to leak.

When leakage occurs in excess of the specified amount, locate and repair defective valves, pipe, or joints.

If the excess leakage is determined to be caused by defective materials furnished, improper workmanship, or damage to the materials, make the necessary repairs or replacements at no addition to the Contract Price.

If defective portions cannot be located, remove and reconstruct as much of the original work as necessary to obtain piping that meets the leakage requirements specified herein and retest, all at no addition to the Contract Price.

Repair or replace pipe, fittings, valves with visible leakage.

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 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."

* * *

SECTION 32 - VALVES

W-32.01 General

This section includes all valves to be used at 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.

Valves 2-inches in diameter and smaller shall be stainless steel and shall have screwed ends. Valves 2-1/2 inches in diameter and larger shall be iron body with flanged ends.

All gate 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 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 w/Handwheels (OS&Y) – Resilient Seat

GENERAL

Outside stem & yoke (OS&Y) Resilient Seat Gate Valves ("Valves") provided under this specification shall be suitable for installation on ductile iron pipe. Valves shall be manufactured in accordance with AWWA C509 (or C515), latest editions, or as specified herein.

Valves shall have flange joints at both ends drilled in accordance with the American National Standard B16.1 for Class 125 cast iron pipe flanges.

Valves shall be operated by a handwheel, with an indicating arrow cast on the rim of the handwheel noting the opening direction.

Valves shall open by turning the handwheel counter-clockwise.

Resilient seats shall be made of EPDM rubber.

PRODUCT

Valve stems shall be stainless steel and manufactured in accordance with AWWA C509 (or C515). Stems, stem nuts and wedges shall act independently. Stems shall be sealed by at least two O-ring seals, one located both above and below the thrust collar. Stems shall be provided with low friction torque reducing thrust bearings. Thrust washers may be used to separate the thrust collar from iron surfaces.

Valve bodies and gates shall be cast iron or ductile iron manufactured in accordance with ASTM A126 or ASTM A536 respectively, and AWWA C509 (or C515), latest revisions. All internal and external exposed ferrous surfaces of the valve body and gate shall have an epoxy coating applied to a minimum of eight mils, in accordance with AWWA C550 latest edition. Non-metallic resilient seats shall be bonded to the gate, mechanically attached seats will not be accepted. The method of bonding shall be approved by ASTM D429 A or B as specified in AWWA C509. Hollow gates shall be provided with a drain in the bottom to flush the internal cavity of foreign material and stagnant water each time the valve is operated.

Hex-head cover and flange accessory bolts and nuts shall be stainless steel.

QUALITY CONTROL AND TESTING

Valves shall meet or exceed test specifications as set forth in AWWA C509 (or C515), latest revisions.

The resilient seat shall be bubble-tight against a 200-psi water working pressure and maintain zero leakage at all times.

MANUFACTURER

Valves shall be domestically assembled and shall be equal to or better than Clow F-6136 OS&Y, U.S. Pipe Metroseal 250, or American Flow Control Series 2500-1.

W-32.05 Butterfly Valves

GENERAL

All Rubber-Seated Butterfly Valves ("Valves") provided shall be manufactured in accordance with AWWA C504, latest edition or as specified herein.

PRODUCT

Valves provided shall have a minimum rating of Class 150B. Valve bodies shall be manufactured in accordance with AWWA C504. All flanges shall be ductile iron and shall be manufactured and installed on the ductile iron pipe in accordance with ANSI/AWWA Standard C-115/A21.15, and the National Association of Pipe Fabricators (NAPF) Product Standard 300-01, latest revisions. Bolt circle and bolt holes shall be drilled and faced to match American National Standards Institute (ANSI) B16.1, Class 125 Flanges. All necessary bolts and nuts, and full-faced gaskets for each joint size shall be furnished as a Flange Accessory Package. Bolts and nuts shall be made of 316 Stainless Steel.

The valve seat shall be located on the valve body or disc and shall provide drip-tight shutoff for pressure differential of 150 psig versus 0 psig in either direction. The seat shall be made of EPDM. For valve seats mounted on the disc, the valve seat shall be vulcanized to a stainless steel seat ring that shall be mechanically attached to the disc with stainless steel bolts. For valve seats mounted on the body, the valve seat shall be bonded to the body and shall meet test procedures as outlined in ASTM D-429 Method A or B. Valve seat mating surfaces shall be 316 Stainless Steel.

The valve shaft shall be a one-piece unit extending completely through the valve disc or may be stub shaft construction for valves 18 inches and above. Shaft materials shall conform to AWWA Standard C-504, Section 3.3, latest revision. Valve shaft shall be 316 Stainless Steel minimum.

The valve disc shall have no external ribs transverse to the flow and shall be constructed of material as specified in AWWA C-504, Section 3.4, latest revision.

Shaft seals shall be standard "O" ring or "V" packing seals, and all seals shall be replaceable without disassembly of the valve.

The operator shall be manual type opening to the left (counter-clockwise). The operator shall be traveling-nut type. All operators shall be totally enclosed, sealed, gasketed, and lubricated as specified in AWWA C-504, Section 3.8. The operator shall also be able to apply output torque required to operate the valve under adverse conditions without exceeding input torque as allowed under AWWA Standard C-504. It shall also be capable of withstanding overload input torque of 450 ft. lbs. against the disc stop. Disc stops shall be not in the waterway.

Valve body interior and disc shall have an epoxy protective coating meeting AWWA Standard C-550.

QUALITY CONTROL AND TESTING

Flow Characteristics - The maximum non-shock shutoff pressure shall be 150 psi.

Certification - The manufacturer shall provide the Engineer with an affidavit certifying that all valves supplied have been manufactured and tested in accordance with all of the aforementioned standards.

Manufacturer - Valves shall be domestically assembled and shall be equal to or better than Valmatic Series 2000 or Mueller Lineseal.

W-32.06 Globe and Angle Valves-N/A

W-32.07 Hose Valves-N/A

W-32.08 Check Valves

Check valves, unless otherwise specified, shall be APCO Series 800T of the slanted disc type with a top-mounted oil dashpot for controlled open and non-slam controlled closing to minimize surge and water hammer. A Letter of Standardization has been executed for this valve and is included at the end of this section. 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 ASTM A48, Class 30. Check valve body shall have integrally cast-on end flanges. The flapper shall be rubber and have an "O" ring seating edge and be internally reinforced with steel. The flapper shall be easily replaced while the valve remains in place.

The exterior of the check valve shall be factory coated with an approved 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-32.09 Pump-Check Eccentric Plug Valve-N/A

W-32.10 Eccentric Plug Valves-N/A

W-32.11 Knife Gate Valves-N/A

W-32.12 Multiport Valves-N/A

W-32.13 Solenoid Valves-N/A

W-32.14 Ball Valves for CPVC Piping-N/A

W-32.15 Ball Valves

Ball valves shall be constructed of 316 stainless steel. The ball valve shall have a full flow design that provides a free open area that is equivalent to the connecting pipe size. The ball valves shall have NPT threaded end connectors with mounted pad drilled and tapped locking handle. Ball valves for piping shall be as manufactured by Ohio Valve Company, or equal.

W-32.16 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-32.17 Painting and Coating

Metal surfaces other than stainless steel shall receive a field coat as indicated for “Machinery and Equipment” in the Workmanship & Materials Section titled “Painting”.

City Standardization Letter for APCO check valve:

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Check Valve

Name of Company considered Single Source: APCO

Conditions and circumstances for the single source. Please be specific:

The City of Tampa Wastewater Department operates and maintains over 220 pumping stations. In most of the pump stations, check valves are required to prevent backflow into the stations.

Over the last 10 years, APCO check valves have proven to be the most reliable check valve the Wastewater Department has used. The Department has used a wide variety check valves over the last 25 years.

Standardizing on APCO check valves will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department Director's Signature:

Ralph L. Metcalf, P.E., Director of Wastewater Department

Date of Request: _____

Requisition Number: Generic **Buyer Name:** _____

Purchasing Department Action: _____

Signature: _____ **Date:** 4-12-2011

* * *

SECTION 35 - MAGNETIC FLOW METER

W-35.01 GENERAL

The flow meter system, including the flow elements and remote signal converter (transmitter) shall be manufactured by ABB Ltd., WaterMaster Series. A letter of standardization for the meter manufacturer has been included and can be found at the end of this section. No other manufacturer will be considered.

W-35.02 INSTRUMENT

Magnetic flow meter system shall be microprocessor-based, high impedance electromagnetic induction type and produce a DC pulsed signal directly proportional to and linear with the liquid flow rate. Complete zero stability shall be an inherent characteristic of the flow meter system. The magnetic flow meter system shall include a metering tube, signal cable (60 feet), and signal converter/transmitter. The metering tube shall be constructed of 304stainless steel with carbon steel flanged connections, have at least two diametrically opposed self-cleaning electrodes compatible with the process fluid, a nonconductive liner material rated for raw sewage service. For the intended service as described in this document, a meter housing rated for IP68/NEMA 6X continuous submergence conditions and an exterior coating consisting of a corrosion resistant finish. Output signal from the metering tube shall be fed through a continuous sixty-foot signal cable pre connected by the manufacturer to the metering tube and factory prepared ends that are prepared and ready to be terminated at the remote signal converter. 316 stainless steel grounding rings shall be provided. The flow meter shall have an operable measurement range of 1000:1, and shall have bi-directional measurement capability with forward, reverse and net totalization.

The signal converter/transmitter shall use a DC pulsed technique to drive bi-polar flux-producing coils and convert the DC pulse signal from the tube to a 4-20 MA DC signal. The signal converter/transmitter shall be microprocessor based, and have a LCD back-lit display with forward/reverse/net flow register, flow rate indication register, and alarm monitoring icon housed in an IP67/NEMA 4X enclosure. The transmitter shall provide empty pipe detection, have an integral self-test feature to verify proper operation of the electronics, provide high and low alarms, and an automatic zero adjustment.

The magnetic flow metering system shall be hydraulically calibrated by direct volumetric and weight standards at a facility which is traceable to National Institute of Standards Technology (NIST) or NAMAS. A real-time computer generated Calibration Test Report shall be provided containing the actual flow as measured by the standard, the flow as indicated by the magnetic flow meter system, and the percent of difference. The calibration facility shall be certified to 0.2% accuracy.

The magnetic flow metering system shall conform to the following technical specifications:

Flow Tube:	IP68/NEMA 6P Designed for continuous submergence
Transmitter:	IP67/NEMA 4X Remote signal converter
Accuracy:	0.20% of reading or +/- 0.003 ft/sec up to a maximum velocity of 49ft/sec

Repeatability:	0.05% or +/- 0.008ft/sec.
Rangeability:	1000:1
Temperature:	Up to 80°C.
Power:	90 to 260VAC. Power consumption <20VA with transmitter
Output:	4 to 20 MADC into 800ohms. Isolated and fully programmable Two pulse/frequency outputs

W-35.03 FLOW METERING TUBE

The magnetic flow elements shall operate by means of pulsed DC electromagnetic, volumetric flow rate measurement. The flow meter shall be insensitive to changes in the viscosity and density of the fluid that is being measured. The flow meter shall be inherently designed for continuous zero stability. The output signal shall be highly accurate and directly proportional to the fluid flow rate. The flow meter shall be designed and manufactured to international quality procedures (ISO 9001).

The flow meter tube shall be constructed of 304 stainless steel. The magnetic field generating coils shall be located within the metering tube. The coils shall be potted with an epoxy-base compound. An insulating interior liner of elastomer shall be inserted and turned out against the flange faces. The metering tube shall be capable of withstanding a test pressure of at least 75 PSI. The flow meter shall have 150 pound ANSI or AWWA Class D flanges and built in grounding electrodes. The flow meter shall be rated for continuous submergence to a depth of 30 feet in accordance with the requirements of IP68. The metering tube shall have an internal neoprene liner that is certified for use with raw sewage. The flow meter electrodes shall be of the protruding self-cleaning design made of type 316 stainless steel. Removable electrodes or ultrasonic cleaners are not acceptable. The input impedance of the electrodes shall be greater than ten million (10,000,000) mega ohms to achieve a meter accuracy that is completely unaffected by coatings. The laying length shall be the current standard for magnetic flow meters (60 feet). 316 stainless steel grounding rings shall be included with the flow metering system. The grounding rings shall insert between both flanges and shall not interfere with the internal flow profile. All gaskets for proper metering tube installation shall be included. The gaskets shall be made of a material suitable for raw sewage service and shall not be affected by any petroleum products or byproducts.

The flow meter shall be hydraulically calibrated in a laboratory that is internationally accredited by an agency such as NIST or NAMAS. The method of the initial calibration shall utilize volume and weight testing. All components of the device being provided as a result of these specifications shall be tested as a complete system. The results of this testing shall be certified by the agency and documentation of the test shall be provided with the equipment.

The flow meter accuracy shall be guaranteed with no more than five straight unobstructed pipe diameters upstream and three pipe diameter downstream of the flow meter. The accuracy of the flow meter as a system shall be three tenths (0.3) percent of the flow rate regardless of flow direction. The repeatability of the flow meter shall be a minimum of five one-hundredths (0.05) percent of the flow rate.

W-35.04 FLOW TRANSMITTER

The signal converter for the flow meter shall be housed in an IP67/NEMA 4X enclosure. This enclosure shall be suitable for pipe stand or wall mounting.

The signal converter shall be provided with a universal switching power supply. The range of this power supply shall be from 95 to 240 volts AC at 40 to 440 hertz. This power supply shall provide the necessary output to the signal converter and the flow meter's magnetic coils. The power supply shall have an inherent system to protect the electronics from lightning and/or power surges.

The signal converter electronics shall be microprocessor based. The converter shall provide an output of 4 to 20 milliamps at impedances of zero to 800 ohms. This output signal shall be directly proportional to the rate of flow through the meter. The signal converter shall have a second output for remote totalization. This output shall be a pulsed open collector capable of 800 HZ, at less than 35 VDC and 250 milliamps. The pulse width shall be software adjustable to match the input requirements of the totalizer. The range of the pulse width shall be from thirty-two one-thousandths (0.032) to two thousand (2000) milliseconds with a weighing factor range from one one-thousandths (0.001) to one thousand (1000).

The input impedance shall be greater than 10,000,000 megohms. The input span shall be continuously adjustable by means of a keypad with a velocity range from five tenths (0.5) to thirty (30) feet per second. The system supplied shall not require circuit or component changes to achieve calibration changes. The signal converter shall be designed for use with the flow meter. The system shall not require recalibration when signal converters are changed.

The signal converter shall have a local display. This display shall be calibrated in engineering units and provide instantaneous flow rates and totals. This display shall be a liquid crystal backlit screen with easily readable representations of the configuration and flow rate. The display shall offer the flow rate in either a percentage or in direct engineering units. This option shall be selectable at the local display. The display shall also provide a real time total flow indication. All configuration information, system adjustment entries and error messages shall be represented in clear, easy to understand terms. The internal program shall detect and reject incorrect entry values. The rejection of these incorrect entries shall be displayed as error messages on the screen. Failure of the signal converter shall be displayed as an error message. A failure of the converter shall trigger a contact that provides an output for a remote failure alarm. The display shall not require a book, manual or other documentation to translate diagnostic coded error messages.

The signal converter shall have integral zero return capability. This function shall be fixed at four milliamps. The zero return function shall be activated by an external contact being closed.

The range setting of the signal converter shall be adjustable through its entire range from zero to one hundred (100) percent of the flow meter's capacity. This range and other adjustable settings shall be represented on the local display screen.

The signal converters software shall include an integral self diagnostic program. This program shall continuously monitor operational modes and alarms, as well as, electrode reference voltage for indications of flow meter coil failures. Failure of the flow meter as detected by this software shall trigger the zero return function and the remote alarm contact. The software shall also include an algorithm for the reduction of noise that is generated by any other process equipment.

The signal converter shall have an operating temperature range from 30 to 150 degrees Fahrenheit. A one degree Fahrenheit change in the ambient temperature shall result in a change in the output reading of the flow meter that is less than one one-hundredths (0.01) percent of the flow reading. A 10% change in the supply voltage shall result in less than a two tenths (0.2) percent change in the output reading of the flow meter.

City Standardization Letter for ABB electromagnetic flow meter:

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

The purpose of this form is communicate the conditions and circumstances to standardize on a particular manufacturer of equipment.

Item/Equipment Required: Electromagnetic Flow meter

Name of Manufacturer: ABB

Conditions and circumstances for the single source, please be specific:
The Wastewater Department owns, operates and maintains several electromagnetic flow meters at pumping stations throughout our service area and at the treatment plant. Accurate and reliable flow information from these meters is critical for the proper monitoring and operation of our pumping stations and treatment plant.

After several years of using a variety of meter manufacturers for products and services, the Department has determined that ABB Electromagnetic flow meters are more reliable and easier to maintain than other brands. This is currently the only Electromagnetic flow meter that incorporates computer calibration traceability electronics. Standardizing to ABB Electromagnetic flow meters will provide reliability, manage and significantly reduce the required inventory of spare parts, Improve calibration efforts and enable the Department to consult with a local representative for technical assistance.

Requesting Department Director's Signature: [signature]

Date of Request: 3/1/11

Requisition Number: **Buyer Name:**

Purchasing Department Action:

Signature: [signature]

Date: 3-8-2011

* * *

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 noted on the color schedule.

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			K	K	
Electrical Conduit	A or N	C	K	K	
Steel Pipe, Valves, and Fittings	N	N	K	K	
Ductile Iron Pipe, Valves, and Fittings (Not Buried)		E	E	F	
Miscellaneous Steel and Ironwork	N	N	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	Porter International Alkyd Fast Dry Primer 297	2.0
E	Tnemec Series 135	3.0 – 5.0
F	Tnemec Series 1074U (Endurashield with factory added UV inhibitors)	2.5 – 3.5
G	Porter International Pigmented Bonding Coat 898 with Thinner	N/A
H	Porter International Acrylic Exterior Paint 520	2.0
I	Porter International I.A-24 Gloss Finish 241D	1.5
K	Porter International Intergard 475	5.0
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 wastewater pumping facility.

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 47B - HIGH SERVICE PUMPS AND DRIVERS

W-47B.1.0 GENERAL REQUIREMENTS

W-47B.1.1 Description

Work Specified Herein and Elsewhere:

A. Work under this section includes, but is not limited to the following:

a. Vertical turbine pump
b. Driver (electric motor)

B. Related Work Specified Elsewhere

1. Painting - Section 36
2. Ductile Iron Pipe and Fittings – Section 10
3. Electrical - Division 16.
4. Specific Provisions

W-47B.1.2 Scope

A. The STAR Replacement Pump equipment and appurtenances shall be furnished and installed by the Contractor in the position shown on the Drawings in accordance with recommendations of the Hydraulic Institute and the manufacturer's guarantee requirements for NPSH, lubrication, and other detailed operating requirements. All necessary piping, conduit, valves, wall sleeves, concrete foundation, foundation bolts, grouting, pumps, drivers, shafting, power supply, pipe connections, etc., shall be provided to insure a complete and satisfactory installation of pumping equipment.

B. One vertical turbine pump, with a rated capacity of 3,000 gpm @ 208 TDH, and one Nidec VHS 200-hp (inverter duty) with totally enclosed fan cooled (TEFC) motor shall be furnished and installed in accordance with the manufacturer's recommendations, as shown on the Drawings and specified herein. Pump and motor shall be purchased through Flowserve’s authorized rep Carter VerPlanck (see section 1.3 B. below). The pump shall be utilized for pumping reclaimed water from the Howard F. Curren Advanced Wastewater Treatment Plant into the City’s STAR reclaimed water distribution system.

C. These Specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment furnished. They are, however, intended to cover the furnishings, the shop testing, the delivery and complete installation and field testing, of all materials, equipment and appurtenances for the complete pumping system herein specified, whether specifically mentioned in these Specifications or not.

W-47B.1.3 Quality Assurance

A. The STAR Replacement Pump and equipment shall be new and unused.

B. The new pump shall be equivalent to the existing large pumps in the pump station, i.e., the same model and from the same manufacturer: Flowserve 14ENH-3.

C. A letter of standardization for the pump manufacturer has been included and can be found at the end of this section. No other manufacturer or pump will be considered.

Because it often takes a bit of time to get a quote for a specific vertical pump, the City has already obtained quote for a pump conforming with this specification from Flowserve's authorized sales rep (Dave Hartwig with Carter VerPlanck; ph. 813-287-0709), and copy is included for reference, at the end of this section. Bidders should contact Mr. Hartwig and confirm quote before submitting Bids.

On the quote, bidders are advised to note that Flowserve's estimated lead time to make and ship the required pump is approximately 18 weeks.

Submit certified factory tests in accordance with the standards of the Hydraulic Institute for pump. Certified pump performance curve shall be submitted including head/capacity, brake horsepower, pump efficiency and NPSHR for pump supplied. Test results shall be submitted to and approved by the ENGINEER prior to shipment of any components. Tests will be conducted at a minimum of five points along the pump performance curve on the actual pumping unit to be furnished. All equipment shall be tested as a complete unit by the pump manufacturer who shall certify to its compliance with the project requirements.

W-47B.1.4 Submittals

A. Certifications

Factory primers and/or finished painting shall be in accordance with Section 36 of these Specifications. Submit a letter certifying the manufacturer, product designation and specification data of all shop paints and primers to be used for equipment under this section.

B. Shop Drawings

Submit shop drawings of the pump and driver for approval in accordance with the Special Provisions and Plans. In addition the shop drawings shall include the following features:

1. Manufacturer's specification data and descriptive literature.

2. Performance curves showing capacity of gpm, NPSH, head and pump horsepower from 0 gpm to 125% of design capacity. Characteristics of pump furnished shall have a maximum tolerance of 1% in head or capacity above or below requirements specified herein. Indicate separately the head, capacity, horse power demand, overall efficiency, and minimum submergence required at the guarantee point.

3. Motor efficiencies and power factors at all design operating points.

4. The following data shall be submitted for the motor:

    a. Manufacturers designation.
    b. Horsepower output.
    c. Time rating.
    d. Temperature rise.
    e. RPM at full load.
    f. Frequency.
    g. Number of phases.
    h. Voltage.
    I. Full load amperes.
    j. Code.
    k. Service factor.

5. Drawings showing general dimensions, openings, connections, construction details of the equipment, wiring diagrams, piping drawings, and weights of major components.

6. Procedures for proper installation.

7. Manufacturer's guarantee.

8. Information about the nature and location of parts, service crews and repair facilities.

9. Factory certification that the pump bowl assembly meets the specified requirements.

10. Pump bearing loads and stresses.

11. Certified factory performance testing in accordance with the Hydraulic Institute Standards shall be performed on the pump to be furnished after fabrication and assembly, but prior to shipment to the project site.

12. Refer to the Electrical Drawings for typical control wiring diagrams.

C. Operation and Maintenance Manuals.

1. After approval of shop drawings, submit eight (8) complete bound sets of the following:

a. Operation and maintenance instruction bulletins for the pump and driver.
b. Complete parts list.
c. Wire lists and wiring diagrams for all panels

2. Manuals shall be prepared specifically for this installation (in accordance with the Specific Provisions) and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct Operation and Maintenance personnel unfamiliar with such equipment.

W-47B.1.5 Shop Painting

A. All exposed ferrous metal except machined bearing surfaces shall be shop primed in accordance with Section 36 of these Specifications.

B. All unexposed surfaces of the pumping equipment shall be finished with the manufacturer's standard finish or in accordance with Section 36 of these Specifications.

W-47B.1.6 Product Delivery, Storage and Handling

A. Deliver pumping equipment to the job site at the appropriate time for installation. Equipment items shall be crated or affixed to pallets with protective wrappings. Exercise care to prevent damage from handling. Contractor shall be responsible for receiving and handling pump and motor arriving on separate shipments.

B. Store mechanical and electrical components off the ground in weather-tight enclosures. Keep equipment dry at all times.

C. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

D. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

E. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

F. Each box or package shall be properly marked to show its net weight in addition to its contents.

W-47B.1.7 Manufacturer Services

A. The manufacturers of the STAR Replacement Pump (and Driver) shall provide the services of a factory-trained service representative for (2) two days in (2) two trips to supervise the installation, observe field tests, and to check and adjust the equipment and system when ready to be placed into operation. The manufacturer shall notify the ENGINEER when the service representative will be at the project site. The serviceman shall train the OWNER's operators in the operation and maintenance of the equipment, inspect thoroughly for damage and missing items, check integral equipment supplied by other manufacturers, and make any necessary adjustments. The OWNER may make an audio, or an audio-video recording of the training session as part of this Contract.

B. A written report covering the technician's findings and installation approval shall be submitted to the ENGINEER prior to system start-up. The installation and testing inspection report shall cover inspections performed, outline in detail any deficiencies noted, and outline in detail corrective measures taken. The technician shall remain on the job site until all deficiencies are corrected, or shall make as many additional trips as required to ensure that the installation is proper and acceptable to the OWNER and ENGINEER.

W-47B.1.8 Field Tests

A. Prior to acceptance, conduct an operational test in accordance with the Contract Documents and the plans, under the observation of the ENGINEER, to determine if the installed equipment meets the purpose and intent of the Specifications.

B. Tests shall demonstrate that the equipment and work is not defective electrically, mechanically, or otherwise, and is in a safe and satisfactory operating condition.

C. Prior to applying electrical power to any motor driven equipment, the drive train shall be rotated by hand to demonstrate free operation of all mechanical parts.

D. Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operation of control systems and equipment, and motor power input (kilowatts), voltage, speed, current, power factor, etc., in accordance with the latest standards of the Hydraulic Institute.

E. A written report covering the system start-up shall be submitted to the ENGINEER not more than two weeks after start-up procedures, outlining in detail any discrepancies, deficiencies, or failures occurring during start-up, and outlining in detail corrective measure taken or to be taken. The technician shall remain on the job site until the pumping system equipment is operating properly, or shall make as many additional trips as required until the system is operating properly.

W-47B.1.9 Guarantee

A. The pump and motor manufacturers shall guarantee all equipment to be free from defects in design, materials and workmanship for one year from the date of final acceptance by the OWNER. During the guarantee period, furnish and install replacement parts for any defective component at no additional cost, except for those items which are normally consumed in service such as oil, grease, packing, etc. Failure and replacement of any component within the one-year guarantee period shall serve to restart the one-year guarantee period for that component.

B. The manufacturer's warranty period shall run concurrently with the CONTRACTOR's warranty period. No exception to the provision shall be allowed.

C. For additional guarantee requirements, see the General Conditions.

W-47B.2.0 PRODUCTS

W-47B.2.1 Pumping System Components

A. STAR Replacement Pump (Vertical Turbine)

1. General

a. The pumping unit required under this Section shall be complete including proper alignment and balancing. Ample room for inspection, repairs and adjustment shall be provided.

b. The discharge head for the pump shall be rigidly and accurately anchored into position. All necessary anchor bolts, nuts and washers shall be Type 316 Stainless Steel and shall be furnished and installed by the CONTRACTOR.

c. Stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, and all other pertinent data shall be suitably secured to the pump and motor.

d. Ample means of lubrication shall be provided for all bearings and parts where required. Alenite industrial type fittings, or approved equal, shall be used for grease lubrication.

e. Pump and motor shall perform the work intended without undue wear and undue heating. The motor shall comply with the requirements of the Electrical Section (Division 16) of these Specifications.

f. The Pump will be exposed to high levels of chlorine residuals. Pump and seals shall not be adversely affected by a 10 mg/l chlorine residual.

g. The Pump shall have bronze bushings. Rubber bushings are not allowed due to possible chlorine damage by swelling.

2. Vertical Turbine Pump

a. Furnish and install one (1) close coupled vertical turbine, surface discharge, centrifugal pump as shown on the Drawings and specified herein.

b. The pumping unit shall consist of a pump, vertical drive, discharge assembly, separate sub base and shall be "water" lubricated vertical turbine pump complete with connectors, couplings and mountings, etc., as required for a complete operating installation.

c. Pump shall be Flowserve Model 14ENH-3.

3. Bowl Assembly

a. The pump bowls shall be of the best quality, close grained, enameled cast iron equivalent to ASTM A48 Class 30, having a minimum tensile strength of 30,000 psi, free of casting faults, accurately machined and fitted to close dimensions, and with bolt flanges of sufficient cross-section to prevent deflection. Reinforce flanges with at least four ribs which are one-half the flange metal thickness or greater. Use a casting with a diffuser of maximum cross-section to ensure long life. The interior of the bowls are to be lined with porcelain enamel to ensure consistency of output and optimum performance. Suction bowl to have flared opening for minimum vortex.

b. The bowl assembly is to be provided with a 316 stainless steel wear ring on each bowl. The bowls shall be capable of withstanding a hydrostatic pressure equal to twice the pressure at rated capacity or 1½ times shut-off head, whichever is greater.

c. The bowl shaft is to be of minimum 416 stainless steel sized to transmit the full power of the electrical motor driver with monel locking colletts.

d. The pump shaft is to be of minimum 416 stainless steel sized to transmit the full power of the electric motor driver.

e. The bowl assembly is to be provided with rubber or hi-lead bronze sleeve bearings and a permanently lubricated bottom bearing.

f. The impeller(s) shall be made of 316 stainless steel, correctly designed and accurately machined and polished to fit the castings. Impellers shall be firmly affixed to the shaft and mechanically balanced to provide perfect rotative parts on the shaft. The impellers shall be adjustable by means of a nut in the pump head. The impeller shaft shall be of 416 stainless steel and shall be

supported in the bowl by water lubricated bronze ASTM B144 bearings.

g. The suction bell shall be capable of connection to the 316 stainless steel suction strainer.

4. Column Assembly

a. The discharge column shall be cut to the proper setting length, be interchangeable for like sized pumps and of standard weight and conform to the AWWA Specifications for Vertical Turbine Pumps. The discharge column is to be of Schedule 40 (minimum) steel pipe. The ends of the column pipe shall be faced parallel flanged to such a degree that the ends will butt to ensure proper alignment when assembled. Coat columns in accordance with Section 36.

b. The line shaft shall be 416 stainless steel with Monel CPLGS of not less than 1-1/4" diameter and furnished in suitable length for the close coupled setting and be interchangeable for like size pumps. To ensure accurate alignment of the shafts, they shall be straight within 0.005" total indicator reading for a 10' section; the butting faces shall be machined square to the axis of the shaft; the maximum permissible error in the axial alignment of the thread axis with the axis of the shaft shall be 0.002" in 8". The line shaft shall be coupled with stainless steel couplings of a dissimilar alloy to prevent galling, which shall be designed with a safety factor of 1½ times the shaft safety factor and shall be threaded to tighten during pump operation.

c. The line shaft bearing guides shall be bronze meeting ASTM B145, ALLOY 836 or 844.

5. Discharge Head Assembly

a. A discharge head of cast iron ASTM A48, Class 30, shall be provided for mounting a vertical electric motor and supporting the pump column, bowls, and suction pipe.

b. The stuffing box shall be cast iron with Chesterton Type 442 split mechanical seals

c. The discharge head shall be provided with a compatible steel sub-base of the manufacturer's standard design.

d. Provisions shall be made, by means of a coupling above the packing box area, to allow for removal of the motor without removing the pumps or piping.

e. Hinged type coupling guards shall be provided.

f. The pump head shall be equipped with integral mounting plate and shall have a machined face to receive a vertical hollow shaft motor.

The outlet flange shall be fitted to receive 125 lb. ANSI Standard flange fittings. Each discharge flange shall also be equipped with a 1/4" NPT connection for a pressure gauge.

6. Strainer shall be 316 stainless-steel.

B. Driver

One (1) new 200 HP Vertical Hollow Shaft variable speed motor with steady bushing shall be furnished and installed with the pump. The following Specifications cover the new motor.

1. The no load current of the motor shall not exceed nameplate current at any system speed with voltage variations of plus or minus 10%.

2. Motor shall have a minimum service factor of 1.15, and shall be sized to operate the specified loads continuously without operating in the service factor overload range. The temperature rise under such conditions shall not exceed 80 degrees C above a 40 degree C ambient for totally-enclosed motors measured by thermometer. Insulation shall be Class F.

3. The motor shall be a premium efficiency TEFC electric motor designed for "Outdoor Installation." Pump shall be non-overloading along the entire curve.

4. Couplings shall be as recommended by the pump manufacturer, unless otherwise specified, and as approved by the motor manufacturer and the ENGINEER.

5. Pump (and motor) shall be mounted on a steel leveling plate.

6. The motor shall comply with requirements of the Electrical Specifications (Division 16)

7. Pump motor shall be provided with a minimum of one (1) lifting eye bolt.

8. A thrust bearing of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust shall be incorporated into the driver as an integral part of it. The bearing shall be of such size that the average life rating is no less than five years under continuous operation.

9. A top drive coupling shall be equipped with a non-reverse back-stop.

10. Motor shall include 6 ea 100 OHM winding RTDs, upper and lower bearing 100 OHM RTDs.

11. Motor shall be equipped with resistance-type 120v space heater to maintain the motor winding temperature 5 degrees above the ambient air temperature. Electrical power shall be connected and controlled as shown on the drawings. Space heater shall be wired by the Contractor.

10. Motor shall be manufactured by U.S. Motors/Nidec.

11. Pump Motor Grounding Shaft Protection:

a. New motors shall have the bearing protection installed by the motor manufacturer.

b. Existing motors shall have the bearing protection installed by an Authorized Service Shop with expertise in the proper installation of the devices per manufacturer's specifications.

c. Provide bearing protection for vertical mounted motors as follows:

1. Top Bearing (NDE): Motors rated over 100HP (75kW) must be equipped with an insulated bearing (or insulated bearing housing / mounts) to disrupt circulating currents.

2. Drive End (DE): Install one AEGIS™ SGR Bearing Protection Ring (or equivalent bearing protection ring) on drive end.

3. AEGIS™ SGR (or equivalent bearing protection ring) can be installed internally on the back of the bearing cap or externally on the motor end bracket.

4. Colloidal Silver Shaft Coating (PN CS015) is also a requirement when using an AEGIS™ SGR brand ground ring device. When equivalent ground ring designs are used, shaft preparation requirements specified by the alternate ground ring manufacturers will be followed.

d. Manufacturers' Certificate of compatibility: Submit certificate of compatibility signed by the motor manufacturer indicating the ground ring is installed per manufacturers' requirements without any detriment to proper motor operation.

W-47B.2.2 Performance Requirements

A. Performance requirements for the STAR Replacement Pump and Driver shall be as follows:

	Pump No. 1
Design Capacity (gpm)	3,000
Design Total Dynamic Head (ft)	208
Number of Stages	3
Minimum Guaranteed Pump Bowl Efficiency at Design Point	82%
Maximum Speed (rpm)	1800
Motor Horsepower (maximum)	200
Motor Voltage	460V
Motor Phasing	3 Ph

B. Overall System Efficiency

1. The minimum acceptable overall system efficiency shall be 77.9%.

2. Overall system efficiency is predicated on an assumption of 82% minimum pump bowl efficiency and 95% minimum motor efficiency within the range of pumping conditions specified. Other combinations of pump-motor efficiencies will be acceptable provided they meet the respective minimum efficiencies stated and are approved by the ENGINEER.

C. Manufacturer's Services will be required on two occasions for a total of two days in increments of one day per occasion.

D. In addition, after six and twelve months of operation make one day inspection trips to inspect and adjust the system.

E. There shall be no significant change in vibration and noise level over the entire listed range of flow for the pumping system.

W-47B.3.0 INSTALLATION

W-47B.3.1 General

A. The pumping equipment and all appurtenances shall be furnished and installed in the positions shown on the Drawings in accordance with the manufacturer's printed instructions, guarantee requirements for clearance, NPSH, lubrication and other detailed operating requirements. All necessary piping, conduit, valves, meters and gauges, concrete foundation, foundations bolts, grouting, pumps, drivers, shafting, power supply, pipe connections, equipment supports, vibration isolation, etc., shall be provided to insure a complete and satisfactory installation of pumping equipment.

B. The supplier of the pumping equipment shall also supply the driver and shall assume responsibility of the proper functioning of the pump and driver and all elements of the power train.

C. Check alignment, and where necessary, realign shafts of motor and pump within recommended tolerances by manufacturer, and in presence of manufacturer's service representative. Do not compensate for misalignment by use of flexible couplings.

D. Lubricate pump before start-up. Start-up in accordance with manufacturer's instructions.

E. Have manufacturer's representative on-site to inspect installation and provide the ENGINEER with a written report as to any installation or start-up problems. Should any problems be noted, the manufacturer's representative will describe procedures to resolve them.

F. Ensure that pump unit is wired properly, with rotation in correct direction, and that pump and motor grounding have been provided.

G. Install base-mounted pump and steel foundation plate on concrete base. Anchor bolts used to secure the pumps and plates to the concrete base shall be poured in place as indicated on the Drawings. Set and level pump, grout under pump base with non-shrink grout.

H. Install pump where indicated, in accordance with the manufacturer's installation instructions and with recommended clearances provided for service and maintenance.

I. The pump setting shall be at a depth to where the basket strainer can easily be removed for maintenance, and as recommended by the manufacturer.

J. The CONTRACTOR shall do all work required to give a complete and satisfactory installation, including setting of the turbine pump and driver, and initial operation of the pump after installation.

W-47B.3.2 Cleaning

Clean grease, oil, or any other debris from the exterior surfaces of the equipment and adjacent surfaces.

W-47B.3.3 Miscellaneous

A. All machine bolts, 316 stainless steel stud nuts, and cap screws shall be of the hex head type.

B. Parts Numbering

Parts shall be completely identified with a numerical system (no alphabet letters) to facilitate parts inventory control. Each part shall be properly identified by a separate number, and those parts which are identical shall have the same number to effect minimum spare parts inventory.

C. Pump, motor, and base shall be painted as described in Section 36 of these Specifications.

City standardization letter for Flowserve vertical pump:

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

The purpose of this form is to certify conditions and circumstances to standardize on a particular manufacturer or equipment.

Item or Services Required: Ingersoll-Dresser Vertical Turbine Pump

Name of Manufacturer: Flowserve

Conditions and special circumstances for the standardization:

The City owns, operates, and maintains 3 Ingersoll-Dresser vertical turbine pumps in the STAR Reclaimed Water Pumping Station, located inside of the Howard F. Curren Advanced Wastewater Treatment Plant. The 3 existing pumps discharge reclaimed water from the AWTP into the RCW distribution system, through a large single header pipe.

To increase RCW pumping capacity, the Water Department is adding a fourth pump to the pump station – that will discharge into the same header pipe as the 3 existing pumps. For equivalent operations and efficient maintenance, the proposed pump should be the same as the 3 original pumps.

Standardizing to Flowserve Ingersoll-Dresser VTPs for the RCW Pumping Station will provide reliable equivalent operations, and enable the Department to consult with one local representative for technical assistance (and service) for the pumps.

8/2/13

Requesting Department Director's Signature **Date of Request**

Requisition Number **Buyer Name**

Purchasing Department Action:
Standardize a project thru Contract Admin

Nels Smith 8/26/13

Signature **Date**

Flowserve Pump Quote (6 pages):

CARTER | VERPLANCK
POST OFFICE BOX 24169
TAMPA, FLORIDA 33623
www.carterverplanck.com
Phone: 813.287.0709
Fax: 813.282.8216

Quote Form

To: CPH Engineers **Date: 1/23/2014**

Attn: Wade Wood **Re: Tampa STAR Replacement Pump**

WE ARE PLEASED TO QUOTE YOU ON THE FOLLOWING MATERIAL FOR ACCEPTANCE WITHIN 30 DAYS

New Effluent Pump and Motor

Note: This proposal is limited to the supply of equipment for the detailed specification(s) listed below. No other commercial or technical specification, referenced or not, have been considered in the preparation of this proposal,
or costing of this equipment.

Ref: Tampa Star

I. Specification Sections Applicable to this Proposal:

*Section 11060 High Service Pumps and Drivers

II. Equipment and Accessories Included as Applicable:

ITEM #1

Qty.:	1
Customer:	CVP
End User:	Tampa Star
Date:	10/02/13
Item #:	1
Tag #:	------
Quote#:	TR13-617
Type of Pump	Wet Pit
(WP,Can,AFV,Deep, Barge)	-----
Flow: (gpm)	3000
Head: (feet)	208
RPM:	1800
Bowl Size-Model:	14ENH-3
HP:	200 HP
Total Length:	179"
Bowl Eff.:	82.20%

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Lead Time (Weeks):	18 Weeks

BOWL DESCRIPTION:
Model - 14ENH-3, 3-Stages
Bowl Construction – Flanged
Bowl - Cast Iron
Impeller - 316 SS
Bowl Shaft - 416SS
Impeller Fastening Description - Monel Drive Collets
Bowl Bearings – Bronze
Bowl Wear Rings - 316 SS
Impeller Wear Rings - None Quoted
Strainer - 316 SS
Other Description - 316SS Bolting

COLUMN DESCRIPTION:
Size - 10" Diameter (Schd. 40)

Carbon Steel Column – Flanged
Lineshaft Material - 416 SS LS
Lineshaft Lubrication - Prod Lube
Lineshaft Sleeves - 304SS

Bearing Retainer - Cast Iron
Bearings - Rubber
Other Description - 316SS Bolting

DISCHARGE HEAD DESCRIPTION:
Type / Size - 12W, 12"x125#
Material - Fabricated Steel Discharge Head
Head Shaft - 416 SS Head Shaft
Sealing Type - Chesterton 442 Split Mechanical Seal
Coupling Guard - Aluminum Non-Spark

MOTOR DESCRIPTION:

Size - 200 HP (Inverter Duty) Nidec/US Motor
Type - VHS w/ Lower Steady Bearing
Speed - 1,800 rpm
Electrical Rating - 460-3-60

Enclosure - TEFC
Efficiency - Premium Efficient
Pump Down Thrust - 3,721#
Other Description/s - 1.15 SF
Accessories – Winding RTDs (6ea 100 Ohm Platinum) Bearing RTDs (1 in each end, 100 Ohm Platinum dual element), Space Heater (120V), Shaft Grounding ring, Insulated Upper Bearing

COATING DESCRIPTION:
Flowserve standard grey enamel applied to Exteriors ONLY of Discharge Head.
Tnemec 140 Epoxy applied to exteriors of bowl Assembly, Interior and Exterior of Column, and Interior of Discharge Head.
Tnemec-140 is also NSF-61 potable water approved.

TESTING DESCRIPTION:
Hydro Testing - (Not Quoted)

Performance Testing -
Non-Witnessed Bowl Fully Assembled w/ Shop Calibrated Motor

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Quote Form

To: CPH Engineers **Date: 1/23/2014**

Attn: Wade Wood **Re: Tampa STAR Replacement Pump**

WE ARE PLEASED TO QUOTE YOU ON THE FOLLOWING MATERIAL FOR ACCEPTANCE WITHIN 30 DAYS

Coupling Guard
Other Description - 316 SS Bolting

SPARES DESCRIPTION:

(Not Quoted)

OTHER REQUIREMENTS OR FIELD SERVICES:

Startup service by factory authorized service technicians

III. Items Not Included:

1. Seismic Analysis, Anchor Bolts, Field Testing, Gauges, Valves, Appurtenances

IV. Clarifications & Comments To Specifications:

1. Flowserve cannot guarantee pump performance as measured by field testing due to uncontrolled conditions. Flowserve guarantees one (1) rated design point at full rated speed, within the performance tolerances established by the Hydraulic Institute. Pump acceptance shall be based upon factory performance testing.
   Also, please take note of attached pump curve for your evaluation of compliance with the specification.
2. Please note Flowserve standard warranty is quoted (1 year from start-up or 1 ½ year from Shipment – whichever occurs 1st)
3. Vibration limits are quoted to most current HI standards.
4. Bearing retainers are bronze and not cast iron.
5. The motor being quoted is VHS (vertical hollow shaft) This matches the existing pumps.
6. Lineshaft bearing spacing is quoted to keep the 1st critical above the max. operating speed.

$ 108,727.00
NET LOT PLUS TAX

Page 3

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Quote Form

To: CPH Engineers **Date: 1/23/2014**

Attn: Wade Wood **Re: Tampa STAR Replacement Pump**

WE ARE PLEASED TO QUOTE YOU ON THE FOLLOWING MATERIAL FOR ACCEPTANCE WITHIN 30 DAYS

Submittals within 2-3 weeks from receipt of purchase order
Shipping window of (18) weeks after approval and release
Price includes freight to the jobsite

Please Note:

1. We *do not include sales tax,* pressure gauges, anchor bolts, wire cable, conduit, piping, installation, hook-up, field testing, control panels or any other accessories or other ancillary items which are not specifically called out in this scope of supply.
2. Under no circumstances will Carter & VerPlanck, Inc. or its suppliers be liable for any incidental, consequential, liquidated, special or late delivery damages whatsoever.
3. Payment terms are 100% net 30 days from delivery with approved credit. Our prices based upon *no retainage.*
4. Pricing is based upon Carter & VerPlanck, Inc. and the manufacturer's Standard Terms and Conditions of Sales. Copies of these documents are attached herewith for your review and reference. *No other terms or conditions of sale will apply unless accepted in writing by an officer of the company.*

TERMS: 100% Net 30 days after invoice date

-WITH CREDIT APPROVAL

QUOTATION DOES NOT INCLUDE ANY SALES OR USE TAX PAYABLE UNDER ANY STATE OF FEDERAL STATUE

CARTER & VERPLANCK, INC.

BY Dave Hartwig

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Quote Form

To: CPH Engineers **Date: 1/23/2014**

Attn: Wade Wood **Re: Tampa STAR Replacement Pump**

WE ARE PLEASED TO QUOTE YOU ON THE FOLLOWING MATERIAL FOR ACCEPTANCE WITHIN 30 DAYS

TERMS & CONDITIONS OF SALE

1) Neither Carter & VerPlanck, Inc. nor the manufacturer(s) will be liable for damages of any kind, whether direct, consequential, incidental, special or liquidated.

2) Price does not include any gauges, gauge cocks, tools, lubricants, installation, anchor bolts, spare parts, start-up service or other items not specifically called out herein.

3) Price does not include any motor starters, controls, or power factor correction devices other than as specifically called out herein.

4) THE WARRANTY EXTENDED BY THE MANUFACTURER(S) IS IN LIEU OF ALL OTHER OBLIGATIONS, LIABILITIES OR WARRANTIES OF MERCHANTABILITY, FITNESS OR OTHERWISE, EITHER EXPRESS OR IMPLIED, BY FACT OR BY LAW, AND STATES OUR ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM OF DAMAGES IN CONNECTION WITH THE SALE OR FURNISHING OF GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATION. WE FURTHER SPECIFICALLY EXCLUDE ANY EXPRESS OR IMPLIED WARRANTIES REFERENCE UNDER FLORIDA STATUTE #718.203. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

5) **NOT INCLUDED:** Unless specifically set forth in the scope of the quotation, this offer **does not** include:
- start-up assistance or field services
- interconnecting wiring and/or conduit
- installation labor
- installation supervision
- motor control equipment
- motor starters or contactors
- power distribution equipment
- miscellaneous mechanical and mounting hardware

6) **FREIGHT:**
A) All prices are F.O.B. factory or suppliers' shipping point with freight prepaid and included to the jobsite.
B) Title and Risk of Loss passes to CONSIGNEE AT SHIPPING POINT.
SELLER prepays freight charges.
SELLER bears freight charges.
CONSIGNEE must file claims for loss or damage, (if any).
C) Seller will not consider any claim for damage or shortage unless it is noted on the bill of lading at time of receipt. It is the responsibility of the CONSIGNEE to verify that all items contained on the bill of lading are received prior to accepting shipment.

7) **TAXES:**
The prices quoted are exclusive of, and Purchaser shall pay and make all returns for, any Federal, State, or local sales, use, transfer, or similar taxes applicable to the equipment and material once the same have been delivered as provided herein.

8) **VALIDITY OF PRICING:**
The prices stated herein are contingent upon receipt of a firm order, or letter of intent, in an acceptable form from Purchaser within 30 days from the date of this offer, and Purchaser's willingness to accept delivery when the factory is prepared to ship. If a responsive firm order is not received by the above date, Seller shall have the right to withdraw this quotation and to revise the prices and shipping dates provided herein.

9) **PAYMENT TERMS:**
Seller's payment terms are that all invoices are due and payable within thirty (30) days of the date thereof with approved credit. Interest on the unpaid balance at the rate of 11/2% per month, or the maximum permitted by law, whichever is less will be added to all outstanding invoices which are not paid within 30 days. **Our price is based on no retainage.**

10) **DELIVERY:**

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Quote Form

To: CPH Engineers **Date: 1/23/2014**

Attn: Wade Wood **Re: Tampa STAR Replacement Pump**

WE ARE PLEASED TO QUOTE YOU ON THE FOLLOWING MATERIAL FOR ACCEPTANCE WITHIN 30 DAYS

The shipping dates provided herein are based on Seller's current information as to availability of material and components and our best estimate as to dates on which we will be able to ship. These dates are subject to revision or postponement because of unavailability of material and components or because of events beyond our control.

If Purchaser requests postponement of previously agreed to shipping date(s), Seller may invoice the Purchaser, or then require payment for all of such equipment and material as is then ready for shipment; and, from and after the date that such equipment and material or any portion thereof is ready for shipment, any expenses or other charges incurred by Seller in regards to the same shall be at Purchaser's expense and Purchaser shall promptly pay any invoice rendered by Seller in regard thereto.

11) **SERVICE:**
No start-up assistance or field services are included unless specifically called out in our offering. If so included, the Seller will furnish Field Service Engineer(s) as described in our proposal, at the time of start-up, to inspect the completed system, to advise in regard to placing the system in initial operation and to instruct operating personnel on the proper use of the equipment and material. The proper installation, start-up and operation of the system and any further changes to be made in the system, responsibility for servicing, and all labor costs thereof, shall be the responsibility, under the control and at the risk of the Purchaser. At the time start-up service is requested we ask you to be **completely** prepared, including where and as appropriate, the availability of power, water, flow, access, etc. so that start-up may proceed as anticipated. Any return trips to the site or additional time required as a result of failure to be so prepared, will be charged to the customer at the prevailing demand service rate.

If service additional to that provided for therein is required, Seller, if available, shall furnish at the expense of the Purchaser, competent service engineers at Seller's then prevailing rates, plus travel and living expenses, to assist in additional service in regard to the equipment and material or in regard to equipment furnished by Purchaser. All charges in connection with such service shall be billed by the Seller and shall be due and bear interest at the Company's normal payment terms unless Seller shall require other payment terms and conditions.

12) **GENERAL:**

The descriptions, terms and conditions contained in this Proposal and the terms and conditions contained in the Manufacturer's Standard Terms attached hereto, which are incorporated herein by reference, constitute the quotation of the Seller. To the extent that the descriptions, terms and conditions contained in the Proposal are inconsistent with the Manufacturer's Standard Terms, the Manufacturer's Standard Terms are modified by this Description.

13) No order shall be deemed accepted by the Manufacturer until the Purchaser is notified of its acceptance by the Manufacturer. Carter & VerPlanck, Inc., is not an agent or employee of the Manufacturer(s) and is not authorized to accept orders in its (their) behalf.

14) Any suit or proceeding brought by Purchaser to enforce this agreement, to resolve any dispute over its terms, or to sue for damages for its breach shall be brought only in a state or federal court of appropriate jurisdiction in Hillsborough County, Florida. Purchaser expressly waives any objection that venue in Hillsborough County is inconvenient or improper.

15) In any suit or proceeding brought to enforce this agreement, to resolve any dispute over its terms, or to sue for damages for its breach, the prevailing party shall recover a reasonable attorneys' fee in addition to costs of suit.

SECTION 73–RESTRAINING DEVICES

W-73.01 General

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:

Restraint devices for nominal pipe sizes 3 inch through 36 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

The devices shall have a working pressure rating equal to that of the pipe on which it is used but a minimum 100 psi. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.

W-73.02 Material

Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.

Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.

Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

W-73.03 Gaskets

Mechanical joint gasket shall be of a design that causes the gasket to deflect approximately 30% during assembly of the mechanical joint. The gasket material shall conform to the requirements of ANSI/AWWA C111/A21.11, section 11-6.4, of the latest revision.

W-73.04 Traceability

An identification number consisting of year, day, plant and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body.

All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.

Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.

W-73.05 Installation

Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly.

Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

W-73.06 Approvals

Mechanical Joint Restraints shall be listed by Underwriters Laboratories in the 4 inch through 12 inch sizes.

Mechanical Joint Restraints shall be Factory Mutual Approved in the 4 inch through 12 inch sizes.

Mechanical Joint Restraints, 4 inch through 24 inch, shall meet or exceed the requirements of ASTM F1674 of the latest revision.

Mechanical joint restraint shall be Series 2000PV for PVC pipe and Series 1000 for DIP pipe produced by EBAA Iron Inc. or approved equal.

W-73.07 Coating System – Manufacturer Applied

Contractor shall paint and coat restraint assemblies as required per W-36 Painting. Coating for restraint devices applied by the manufacturer shall consist of the following:

All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid Xylan® fluoropolymer coating with heat cure to follow each coat.

All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

The coating system shall be MEGA-BOND by EBAA Iron, Inc. or approved equal. Requests for approved equal must submit coating material and process details for review.

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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

Underground ducts for feeders, instrumentation wiring, control wiring, and communication wiring shall be plastic conduit and shall be encased in reinforced concrete as shown. In general, the plastic conduit shall be PVC Schedule 80, NEMA TC-2, as manufactured by Carlon, Triangle, Allied Tube, or equal. Ducts shall be installed as shown and shall be sloped uniformly between the elevations shown. Manufactured fitted plastic duct spacers shall be used for installation spacing.

Concrete for the encasement shall be Class B using aggregate not exceeding 3/4 inch and shall be reinforced as shown. Ducts shall drain to the manholes or end structures. End bell fittings shall be provided on the ducts in the manholes.

Appropriate expansion fittings or other approved methods shall be used in the installation of plastic ducts so as to avoid expansion and distortion prior to encasement in concrete. Spacers shall be located a maximum of 8 feet, 0 inches on centers and the duct spacings center to center shall not vary in excess of 1/16 inch from the specified spacings shown, prior to and after encasement.

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.

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SECTION 89 - PIPE RAILINGS

W-89.01 General

Pipe railings include all labor, materials, equipment, and services required to fabricate, furnish, and install pipe railing as shown, specified, and required to complete the work. Pipe railings shall include, but not be limited to, the following: aluminum welded railings and handrails, anchors, bolts, sleeves, and all accessories and appurtenances required for the work.

Before fabrication of all pipe railings and posts and handrails is permitted, field dimensions locating the pipe sleeves shall be taken and submitted to the pipe railing fabricator. Working drawings submitted for approval must include certification that all dimensions were taken in the field; otherwise, drawings will not be acceptable.

Three samples of handrail and post intersections, indicating welded connection and finish specified, shall be submitted for approval.

W-89.02 Aluminum Railings

Aluminum railings and posts shall be 1-1/4-inch Schedule 40 aluminum pipe conforming to ASTM B241, 6063-T6. End posts shall be 1-1/4-inch Schedule 80 aluminum pipe.

Sleeves for posts shall be of nominal sizes indicated and shall be Schedule 5 stainless steel pipe conforming to ASTM A554 - MT304.

Chains shall be 3/16-inch trade size of Type 316 stainless steel electrically welded. Open eye swivel snaps, eye bolts, and accessories for fastening shall be stainless steel and shall have a working load limit of 230 pounds.

W-89.03 Workmanship and Installation of Railings

Pipe railings for platforms, stairways, and other locations indicated shall be of heights and strengths as required by the OSHA Standards and shall consist of two horizontal rails and toe guard or bottom rail where required by the OSHA Standards.

The handrails along walls shall consist of a single rail turned 90 degrees to terminate 1/8 inch from the walls. Brackets for aluminum handrails shall be manufactured, standard brackets made of 1-1/4- inch aluminum pipe welded to an aluminum flange plate and secured to the wall with two stainless steel adhesive anchor bolts. The aluminum handrails shall be spliced and welded to the aluminum bracket. The brackets for the FRP handrails shall be a solid, formed surface mount post base as manufactured by IMCO Reinforced Plastic, Inc. The FRP handrails shall be secured to the post base by coating the splice with a manufacturer's supplied adhesive and plastic bolts. The brackets shall be secured to the concrete walls with adhesive anchor bolts. Hollow walls shall be grouted solid at attachment locations. Terminal brackets shall not be more than 12 inches from the end of the handrails.

Aluminum railing post shall be recessed and set with a quick setting grout compound. The grout compound shall be Quik-Rod as manufactured by Preld Industries; Pol-Rok as manufactured by the Hallemite Mfg. Co.; or equal. The aluminum railings shall be set into 2-inch Schedule 5 stainless steel pipe sleeves. Where aluminum railing posts are required to be anchored to vertical concrete surfaces, a 6- by 6- by 1/4-inch thick aluminum plate shall be provided and anchored with four (4) stainless steel adhesive anchor bolts, 5/8-inch in diameter, and the bottom of the post shall be closed with a welded cap. Where aluminum railing posts are to be anchored to the top flange of a stair stringer, a 3/8-inch thick aluminum plate shall be welded to the bottom of the post and fastened to the stringer with two (2) stainless steel 1/2-inch diameter bolts.

FRP railing posts are to be secured to the concrete with a surface mount post base. The FRP post shall be attached to the FRP post base by coating the splice with a manufacturer supplied adhesive and a plastic bolt. Where FRP railing posts are to be anchored to the top flange of stair stringers, a FRP bracket of sufficient strength to meet the strength requirements of the guard rails, a 1,000 pound vertical or horizontal load shall be used. The fastenings for the brackets and the post shall be 316 stainless steel bolts.

Anchoring and spacing of posts for railings and mounting of handrails shall meet or exceed OSHA requirements. Spacing of posts and mounts shall not exceed 6 feet on centers. End post for aluminum railings shall be reinforced with Type 6061-T6 aluminum bars. Corner post shall not be allowed. Posts shall be set back according to standards.

Bends in aluminum pipe railings shall be made without the use of fittings where practical. Railing sections between splices shall not exceed 20 feet. Railing and posts shall be in the same plane. Aluminum pipe railings shall have continuous 360 degree welds at all intersections. All joints in aluminum railings shall be welded and ground smooth. All joints on FRP railings shall be mitered for a close fit and ground smooth. The joints on FRP railings shall be bolted and bonded with adhesive to prevent pull-out. Provisions shall be made for removable sections where shown and for expansion and contraction.

Aluminum railings shall be delivered to the job protected by polyethylene tubing with a minimum wall thickness of 0.05 inches. Tubing shall remain during construction and shall be removed only when directed by the Engineer. FRP railings shall be delivered to the job free of any surface blemishes. Any sections damaged during construction shall be removed and replaced at the Contractor's expense.

W-89.04 Fiberglass Reinforced Plastic (FRP) Railings

FRP railings and posts shall comply with OSHA, pp 1910.23 entitled "Guarding Floor and Wall Openings" and shall be able to withstand a 1,000 pound vertical or horizontal load on any part of the top rail. The maximum allowable deflection under a 200 pound concentrated vertical load shall be 3/16 inch.

The guardrail system shall use internal fittings for all connections and be 3 feet in height with a top rail, intermediate rail, and toe guard. The toe guard shall be channel shaped to assure horizontal and vertical stiffness without sag and shall run true with the guardrail. All joints shall be bonded and mechanically fastened using non-metallic hardware to prevent pull-out or rotation.

The guardrails shall be supplied in prefabricated sections complete with all incidental items such as rivets, couplings, inserts, closed ends, brackets, flanges, sleeves, fittings, bends, and adhesives required to field assemble the system. The manufacturer shall also supply a compatible resin system to field coat the edges cut in the field. Each piece, part, or unit shall be tagged with the manufacturer's drawing and part number to aid field assembly.

The FRP railing shall have a U.L. classification of 94 V-O, Class "I" flame spread, a flammability rating of 25 or less, and shall be a type suitable for continuous exposure to hydrogen sulfide.

The FRP railings shall meet or exceed the following minimum mechanical and physical properties:

Property (Coupon Value)	Unit	Longitudinal	Transverse
Ten. Strength	psi	30,000	7,000
Ten. Modulus	psi	2,500,000	800,000
Flex. Strength	psi	30,000	10,000
Flex Modulus	psi	1,000,000	800,000
Comp. Strength	psi	30,000	15,000
Comp. Modulus	psi	2,500,000	1,000,000
Shear Strength	psi	5,500	5,500
Barcol Hardness		50	
Density	#1 cu.in.		0.058-0.062
Spec. Gravity	1.61-1.75		
Coefficient of Thermal Expansion	in/in/deg C	0.0000052	

Full Section Deflection Tests

Mod of Elasticity	psi	2,500,000
Ten. Strength	psi	20,000
Comp. Strength	psi	20,000

W-89.05 Finishes

Exterior aluminum pipe railings shall have a National Association of Architectural Metal Manufacturers (NAAMM) Architectural Class 1 AA-A41 clear coating.

Interior aluminum pipe railings shall have a NAAMM Architectural Class 2 AA-A31 clear coating.

The FRP items shall have an integral colored gelcoat. No secondary painting on FRP items shall be allowed.

W-89.06 Manufacturer's Representative

The services of a qualified representative of the manufacturer of the railings shall be provided to supervise and inspect the installation of the handrails.

W-89.07 Certification

The manufacturer of the FRP railings shall give the Engineer a Certificate of Manufacturer stating that the FRP railings supplied for this project meet or exceed these Specifications and the manufacturer shall have the working drawings signed by a Structural Engineer registered in the State of Florida.

* * *

SECTION 16010

GENERAL PROVISIONS

1.0 GENERAL

1.01 Scope of Division:

A. Work shall include all materials, equipment and labor necessary for a complete and properly functioning electrical installation in accordance with local and state codes, and contract drawings and specifications. Work shall be understood to include all work specified in Division 16, electrical section numbers 16000 through 16999, inclusive, of the specifications.

B. It is the intent of the specifications that all materials and equipment shall be installed by the CONTRACTOR in accordance with the good practice of the several trades involved, ready to operate in the manner indicated or manifestly implied, irrespective of whether or not such completeness, workmanship or practices are detailed herein. Any item not specifically required by the specifications, drawings and plans but which is necessary for a complete, working installation shall be provided by the CONTRACTOR at no additional cost to OWNER.

C. Motors specified in Division 16 shall be furnished and installed as specified in other divisions, unless otherwise noted.

D. The term "CONTRACTOR" as used in these Division 16 sections refers to the Contractor that is responsible for the work in accordance with the agreement with the OWNER. Any reference to the "electrical subcontractor" or to other subcontractors is intended only to provide technical requirements for the electrical work to be performed within the CONTRACTOR's scope of work.

1.02 Examination of Site:

A. Bidders shall visit the site and familiarize themselves with existing conditions and satisfy themselves as to the nature and scope of the work and the difficulties that attend its execution. The submission of a bid will be construed as evidence that such an examination has been made, and that existing conditions have been allowed for in his bid.

B. CONTRACTOR shall be responsible for field verification of scale dimensions, exact equipment locations, cable lengths, bills of materials and other construction data.

C. All fees and permits in connection with electrical services shall be included in this contract.

1.03 Codes and Standards:

A. Materials and installation, as a minimum, shall conform with local and state codes and ordinances. Equipment, where applicable, shall be Underwriters Laboratories, Inc. listed and shall conform to National Electrical Manufacturers Association (NEMA) Standards. Do not reduce standards of quality and workmanship established by Drawings and Specifications by any of these codes and ordinances.

B. The following codes set minimum requirements for work specified in Division 16:

1. National Fire Protection (NFPA) 70-2011.
2. Occupational and Safety Hazard Act (OSHA).
3. State and local ordinances.
4. Others as specified.

1.04 Drawings and Specifications:

A. Drawings and specifications are intended to agree and be mutually explanatory. Specific notes on drawings take precedence over general terminology of the specifications.

B. Electrical drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit.

C. Because of the small scale of the drawings, it is not possible to indicate all of the offsets, fittings and accessories required. CONTRACTOR shall investigate the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels and accessories required to meet such conditions.

D. Field coordinate with other trades in ample time to build all chases and openings, set all sleeves, inserts and concealed materials, and provide clearances that may be required to accommodate materials and equipment. Electrical work shall be laid out so that in case of interference with other items, the layout may be altered to suit conditions encountered.

E. The Engineer reserves the right to make any reasonable changes (approximately 6 feet) in the location of outlets, fixtures, switches, receptacles or equipment, prior to the rough-in of such, without additional cost to the OWNER.

F. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Engineer. Should the CONTRACTOR find, at any time during the progress of the work, that, in his judgment, a modification of the requirements of any particular item is necessary, he shall report such item promptly to the Engineer for his decision and instruction.

G. CONTRACTOR shall notify all other Contractors of any deviations or special conditions necessary for the installation of his work. Interferences between the work of various Contractors shall be resolved prior to installation. Work installed not in compliance with the drawings and specifications and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled by the CONTRACTOR without additional cost to the OWNER. The Engineer or his Representative shall be the mediating authority in all deviations and conflicting disputes arising on the project.

H. Insofar as it is possible to determine in advance, the CONTRACTOR shall consult with the masonry contractor and others so as to leave the proper chases and openings for his work; and he shall place all of his outlets, anchors, sleeves and supports prior to pouring concrete or installing masonry work. Should the CONTRACTOR neglect doing this, any cutting and/or patching shall be done at the CONTRACTOR's expense.

1.05 Cutting and Patching:

A. Any routine damage caused by cutting or in any other way caused by the electrical contractor in the performance of his contract shall be repaired or replaced under the separate heading for the type material included and in a manner satisfactory to the Engineer.

B. Any unnecessary damage caused by the CONTRACTOR, due to installation of the electrical work, brought about through carelessness or lack of coordination, shall be corrected under the separate heading for the type of materials involved and paid for by the CONTRACTOR.

1.06 Access Panels: The CONTRACTOR's attention is called to access panels. It is a requirement of these specifications that all access panels required in architectural finishes or surfaces to provide access to junction boxes, smoke detectors, strip heaters, ballasts or other devices be provided and located by the trade requiring access. The access panel shall be installed by the trade constructing the base to which the access panel will be anchored.

1.07 Structural Support:

A. Provide shop drawings for fabrication and erection of structure framing required for attachment of hangers or other devices to support electrical equipment.

B. Framing members shall be standard rolled steel shapes, ASTM 36 steel, except those members welded to main structural member. Framing shall be "simple beam" type with end connections welded or bolted for shear loads. Cantilevers may be used only when detailed or specifically approved. Location of supplementary framing shall be subject to approval. Welding shall be done by certified welders.

C. Framing members shall be designed for their actual loads, with allowable stresses set forth in the AISC code, without excessive deflection and with consideration for rigidity under vibration, in accordance with standard structural practices.

D. Supplementary framing, including design loads, member size and location, shall be clearly shown on shop drawings.

E. When supplementary framing is indicated, the CONTRACTOR shall verify that dimensions are suitable and that framing is structurally adequate for the equipment furnished.

F. No cutting or drilling of holes in structural members will be permitted, except where written permission has been obtained from the Engineer.

1.08 Operations and Maintenance:

A. Furnish required copies of manufacturer's operating and maintenance manuals. Include for each piece of equipment; product data sheets, wiring diagrams, maintenance recommendations, parts lists, and instruction sheets. Prepare manuals to include all systems and equipment shown and/or specified.

B. Instruct representatives of OWNER in operation and maintenance of installed systems. Furnish letter naming OWNER's personnel receiving instruction. Have maintenance manual available, and acquaint OWNER's representatives with its contents during instruction.

C. Operating and maintenance manuals shall be prepared and submitted in accordance with the requirements of the section entitled "Submittal Data".

1.09 Record Drawings:

A. Maintain one extra set of black-line or black-line print drawings for use as Record Drawings. Records shall be kept daily, using colored pencil. As the work is completed, relevant information shall be transferred to a reproducible set, and copies made to be given to the Engineer.

B. Comply with the following for all work specified in Division 16. As-built information shall be shown to scale, using standard symbols listed in the legend. As a minimum, show the following:

1. Location of stub-outs, dimensioned from permanent building lines.
2. Location and depth of under-slab and in-slab raceways.
3. All routing of raceways.
4. Corrected panelboard and equipment schedules.
5. Corrected circuit numbers as they appear on panelboard directories.
6. Corrected motor horsepower and full load amperages.
7. Number, size, type of insulation and number of wires in each conduit or multi-conductor cable whether in conduit or exposed.
8. Location of junction boxes, pullboxes and splices.
9. Location of access panels.

C. Each "as-built" drawing provided by the CONTRACTOR shall be signed and dated with changes clearly noted in red. Additionally, the printed name of the individual signing the "as-built" drawings along with that person's company affiliation shall be included. If no change was made during construction, a note designating "no changes" shall be included on the drawing, as well as, the previously stated information and signature.

1.10 Electrical Service:

A. Electrical service characteristics shall be as indicated on drawings. Furnish metering and service entrance arrangement in accordance with requirements of the utility. Consult with representatives of the utility immediately after award of construction contract, and reach agreement with its representatives as to details of service for this project. See drawings for additional requirements.

B. CONTRACTOR shall leave the required length of free cable in the transformer's secondary compartment of the utility transformer(s) or in the utility company connection pedestal at the base of the utility power pole, as applicable. Furnish suitable connectors for attaching cables to the secondary bushings in the utility transformer(s) or secondary conductors from pole-mounted transformers in accordance with utility company requirements. See drawings for additional requirements.

1.11 Interface With Work Specified In Other Divisions: Note that work specified under other divisions requires coordination and cooperation of the subcontractor performing work under Division 16. Attend necessary coordination and scheduling meetings and be informed so interfacing is accomplished to result in complete and operating systems.

1.12 Temporary Lights and Power:

A. CONTRACTOR shall provide a temporary electrical distribution system of 120/240 volt, 3-phase, 200 amp minimum. All temporary work shall be installed in a neat and safe manner.

B. The CONTRACTOR shall furnish and install power outlets and lighting necessary for construction. Power outlets shall be 30-amp, 1-phase; fused disconnect switches shall be for 120/240 volts as necessary for construction activities.

C. The service and panelboards required for the above light and power outlets shall be furnished and installed by CONTRACTOR, and power consumption shall be paid for by the CONTRACTOR.

D. Temporary electrical power distribution and wiring shall be removed when no longer required.

1.13 Applicable Documents: The listed publications form a part of this specification and, where referred to by basic designation only, are applicable to the extent indicated.

A. American Society for Testing and Materials (ASTM).

1. (A 36-75) Specification for Structural Steel.
2. (A 153-73) Specification for Zinc Coating (Hot dip) on iron and steel hardware.

B. American Institute of Steel Construction (AISC).

1. "Specification for the design, fabrication and erection of structural steel for the buildings", with commentary, herein, designated as the AISC Specification.

2.0 PRODUCTS

2.01 Uniform Products:

A. Equipment and materials of the same type or classification and used for the same purpose, shall be products of the same manufacturer.

B. Materials and equipment shall conform in all respects to the requirements set forth in these specifications and the accompanying drawings. However, wherever a product is identified by name, equal products which meet the Engineer's written approval may be used – **except AFD shall only be as specified - Yaskawa**.

C. Except as otherwise specified, materials and equipment shall be new and bear the approval label of Underwriters Laboratories, Incorporated.

2.02 Shipping Dates for Major Items of Equipment: Not later than six weeks after the Notice to Proceed is issued to the CONTRACTOR, the CONTRACTOR shall furnish to the Engineer a complete list of all major items of electrical equipment including pad mounted transformers, primary switchgear, unit substation, low voltage switchboards, panelboards, bus duct, dry type transformers, lighting fixtures, etc., along with vendors, dates orders were placed and scheduled delivery dates.

2.03 Shop Drawings:

A. As soon as practical, after the notice to proceed is issued, in order that work under this contract will not be delayed, submit to the Engineer, for review, complete descriptive and dimensional data on:

1. Wire (600 volts and below).
2. Conduit.
3. Outlet cover plates.
4. Wiring devices.
5. Wiring.
6. Adjustable frequency drives (AFD's).
7. Circuit breakers.
8. Motor control centers (MCC's).

B. Corrections or comments made on shop drawings during the review do not relieve CONTRACTOR from compliance with requirements of contract documents, plans and specifications. Shop drawings will be checked for general conformance with the design concept of the project and general compliance with information given in the contract documents. Review of the shop drawings shall not relieve the CONTRACTOR from responsibility for confirming and correlating all quantities and dimensions, coordinating his work with that of all other trades, and performing his work in a safe and satisfactory manner. Review of shop drawings shall not permit any deviation from plans and specifications.

C. See Division 1 - General Requirements for number of copies of shop drawings to be submitted.

2.04 Equipment Manuals:

A. Before the project is finally accepted, the CONTRACTOR shall furnish to the Engineer three bound sets of descriptive, dimensional parts data on:

1. Wire (600 volts or below).
2. Conduit.
3. Outlet cover plates.
4. Wiring devices.

5. Wiring.
6. Adjustable frequency drives (AFD's).
7. Circuit breakers.
8. Motor control centers (MCC's).

B. Each set of this literature shall be bound in a permanent type hard cover ring binder and shall be suitably indexed.

C. Equipment manuals shall include complete details of equipment such as primary switchgear, switchboards and unit substations, complete with wiring diagrams and bus ratings, and trip curves for power air circuit breakers, fuses and molded case circuit breakers (600 amp and larger).

D. Equipment manuals shall also include warranties, guarantees, and manufacturer's instructions shipped with equipment.

3.0 EXECUTION

3.01 General:

A. The CONTRACTOR shall, at his own cost, obtain all necessary permits, pay all legal fees and charges, and comply with all state and local building and safety laws, ordinances, and regulations relating to building and public health and safety. A final inspection certification from the local inspection authorities shall be furnished to the Engineer.

B. The CONTRACTOR shall keep the work installed by him in perfect working order for one year from date of final written acceptance of the project, said guarantee to be based upon defective materials and/or workmanship. CONTRACTOR shall furnish to the OWNER materials and labor necessary to comply with this guarantee.

C. All defects with the equipment which develop during the testing or during the initial installation shall be repaired and corrected by the CONTRACTOR at no cost to the OWNER. After each/any repair or correction, the CONTRACTOR must retest the equipment. The CONTRACTOR shall bear the expense of any repair or retest necessitated by his faulty workmanship or material. The OWNER shall not bear the expense of repairs, readjustment and retest resulting from the use of faulty materials supplied by the CONTRACTOR.

D. All work shall be neat and installed in a craftsmanlike manner. Return calls (second or later trips) or installation revisions which are necessary to repair equipment/correct installation obviously made necessary as a result of incorrect work by the CONTRACTOR will be the responsibility of and at the expense of the CONTRACTOR.

E. The CONTRACTOR shall inspect all electrical equipment upon receipt. Any damaged or missing items shall be reported by the CONTRACTOR to the Engineer.

F. Erection of all equipment and materials shall be done in a neat and workmanlike manner, aligned, leveled and adjusted for satisfactory operation. Equipment shall be installed so that all functional parts are easily accessible with adequate clearance for inspection, operation, maintenance, repair and replacement. Coordinate layout with all trades.

G. Work required to pierce any waterproofing shall be done with care and after the part piercing the waterproofing has been set in place, the opening made for this purpose shall be sealed and made absolutely watertight in accordance with recommendations of waterproofing manufacturer.

3.02 Fire Rating:

A. Installation under this division shall be so made that the fire-protective rating of fire walls and fire-resistant or fire-stopped walls, partitions, ceilings and floors will be substantially equivalent to its original rating.

B. CONTRACTOR shall review architectural plans and specifications for approved fire rating materials and installation methods.

3.03 Protection and Finish:

A. Where marring or disfigurement has occurred, replace or refinish the damaged surfaces as directed.

B. Equipment or components exposed to the weather shall be sealed weather-tight. All equipment outlets and conduit openings shall be protected with temporary plugs or caps at all times that work is not in progress.

C. Prepare all exposed raceways, fittings, boxes, supports and panelboards for painting by removing all oil, grease and dirt. Employ the necessary precautionary methods to prevent painting over or obscuring any nameplates or designations on all electrical apparatus and devices.

D. All surfaces of ferrous metal on equipment exposed to the weather and all ferrous metal not otherwise specified shall be given a rust inhibiting treatment, consisting of hot-dipped galvanizing after fabrication followed by the application of rust inhibiting primer and finish paint. Weight of the coating shall be in accordance with ASTM A153.

3.04 Storage of Materials: Prior to and during installation, store materials to protect them from damage, ingress of dust, moisture or deterioration. Material shall not be stored in contact with ground or floor. In determining required protection for stored materials, consider use for which the equipment was designed. If suitable storage areas are not available at the job site, provide temporary construction or store materials off-site in suitable warehouses. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced.

3.05 Tests and Inspections: Prior to acceptance inspection, clean and where required, paint all equipment installed under Division 16. Factory applied finishes that have been scratched or otherwise damaged shall be touched up with color matched paint furnished by the manufacturer.

(End of Section 16010)

SECTION 16050

BASIC MATERIALS AND METHODS

1.0 GENERAL

1.01 Applicable Sections:

A. Drawings and general provisions of the contract, including general and supplementary conditions and all division specification sections, apply to work of these Division 16 sections.

B. Excavation and backfill for work under this Section shall conform to the requirements specified in the division entitled “Sitework”.

1.02 Wiring Methods:

All wiring for power, control and signal systems shall be installed in raceway systems specified herein, unless specifically exempted.

1.03 Equipment Connections:

A. In general, provide electrical power and control system connections to all equipment shown on the drawings. Included are wiring, raceways, disconnects and other devices shown. Excluded are devices furnished integrally with the manufacturer’s package and work specified in other sections of these specifications.

B. Control wiring and temperature control wiring shall be installed under the supervision of the mechanical subcontractor.

C. All electrical work required for the installation of the temperature control system shall be provided as shown on the electrical drawings or called for in the electrical specifications.

1.04 Applicable Publications:

NFPA No. 70 - National Electrical Code.

(End of Section 16050)

SECTION 16095

SUBMITTAL DATA

1.0 GENERAL

1.01 Drawings and general provisions of the contract, including general and supplementary conditions and all division specification sections, apply to work of this Section.

1.02 Standard for Materials: It is the intention of these specifications to indicate a standard of performance and quality for all materials incorporated in this work. Manufacturer's names and catalog numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only those named manufacturers' products will be considered and the CONTRACTOR's bid shall be on their products. The first named of several manufacturers is the manufacturer whose product was used in engineering the project. Manufacturers of products other than those specified, although acceptable as manufacturers, shall guarantee that their product will perform as specified and will meet space requirements. Where performance characteristics of such equipment differs from the equipment scheduled on the drawings, the Engineer shall reserve the right to reject it. Where use of such equipment requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit and any other equipment, the CONTRACTOR shall furnish said changes and additions and pay all costs for all changes to the work and the work of others affected by using such equipment.

1.03 Submittal Data:

A. Materials List:

1. Disconnect switches.
2. Rigid metal conduit and fittings.
3. Rigid nonmetallic conduit and fittings.
4. Specialty conduit fittings.
5. Outlet boxes.
6. Conductors.
7. Wiring devices.
8. Materials specified on drawings.
9. Enclosures.

B. Product Data:

1. Fuses and time-current curves.
2. Circuit breakers and time-current curves.
3. Motor control centers (MCC's).
4. Adjustable frequency drives (AFD's).

(End of Section 16095)

SECTION 16110

ELECTRICAL CONDUIT

1.0 GENERAL

1.01 Scope: This section includes requirements for conduit and fittings.

1.02 Submittals: Submit manufacturer's catalog data for all conduit and fittings proposed for use.

2.0 PRODUCTS

2.01 Conduit:

A. Rigid steel conduit, elbows, couplings and nipples shall be hot dipped galvanized after fabrication. Galvanizing shall include uniform zinc coating both inside and outside, including all threads on conduit and fittings. Compliance: ANSI C80.1, UL 6.

Acceptable: Triangle-PWC, Robroy, Republic Steel, Wheatland and Allied.

B. Electrical Metallic Tubing (EMT) and Elbows: Steel tubing, zinc coated. Compliance: ANSI-C80.3, UL 797.

C. Flexible Steel Conduit: Continuous length, spiral wound steel strip, zinc coated inside and outside, each convolution interlocked with the following convolution. Compliance: UL 1.

D. Liquid Tight Flexible Steel Conduit: As specified for flexible steel conduit with continuous length copper bonding strip and extruded polyvinyl chloride (PVC) jacket. Compliance: UL 360. Flexible non-metallic conduit is not acceptable.

Acceptable: American Hose Type UA Sealtite hose.

E. Liquid Tight Flexible Nonmetallic Conduit:

1. Size 2 Inch or Less: All flexible conduits size 2 inch or less in non-classified areas shall be nonmetallic, liquid tight, 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 liquid tight nonmetallic fittings shall be used for conduit installation.

2. Acceptable: Carlon, Kellems, K-Flex, or equal.

3. Greater Than 2 Inch: All flexible conduits greater than 2 inch in non-classified areas shall be metallic, liquid tight, 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 liquid tight metallic fittings shall be used for conduit installation.

   Acceptable: Thomas & Betts or equal.

F. Electrical Plastic Conduit: Polyvinyl chloride, Schedule 80, heavy wall, UL listed for application. NEMA designation EPC-80-PVC. Compliance: NEMA TC-2, UL 651. Use only below grade unless specifically indicated otherwise.

G. Rigid Aluminum Conduit: Rigid aluminum conduit shall be 6063 aluminum alloy, T-1 temper. Compliance: ANSI C80.5, UL 6.

   Acceptable: Wheatland, Robroy, and Allied.

H. PVC Coated Conduit: Polyvinyl chloride (PVC) coated conduit shall be rigid aluminum coated with a 40 mil (0.040") PVC coating on the exterior and a 2 mil (0.002") urethane coating on the interior. The conduit shall meet the requirements of ANSI C80.5 and UL Standard #6. The PVC coating shall be UL listed for UV resistance.

   Acceptable: Robroy Industries Plasti-Bond Red, Thomas & Betts Ocal-Blue.

2.02 Conduit Fittings:

A. Rigid Steel Conduit Fittings: Zinc coated steel or cadmium coated, malleable iron for steel conduit. Compliance: ANSI-C80.4, UL 514.

1. Ells, Tees and Entrance Fittings: Malleable iron with tapered threads with neoprene gasket and screw on metal cover.

   Acceptable: Appleton series L, T, and X.

2. Offsets and Reducers: Tapered threads.

   Acceptable: Appleton series OFN, RB, and ME.

3. Expansion Couplings: Tapered thread, weatherproof with neoprene gland and copper bonding jumper, 4 inch movement.

   Acceptable: Appleton series XJ; Crouse-Hinds, OZ.

4. Union Couplings: Tapered thread.

   Acceptable: Appleton series UN.

5. Lock Nuts: Steel, 2 inches smaller. Malleable iron, larger than 2 inches.

   Acceptable: Appleton series BL.

6. Bushings: Malleable iron, insulated throat. Provide grounding type where necessary. Plastic bushings are not acceptable.

   Acceptable: Appleton series BU and G1B.

7. Clamps: Malleable iron.

   Acceptable: Appleton series CL and CLB.

B. EMT Fittings: Zinc coated steel, inside/outside including threads. Rain-tight, compression gland type or concrete tight, set screw type fittings. Compliance: ANSI-C80.4.

1. Ells: Compression coupling with neoprene gasket and screw fastened steel cover.

   Acceptable: T&B series.

2. Connectors and Couplings: Compression or set screw type. Connectors shall have insulated throat.

   Acceptable: T&B series.

3. Rigid Conduit Adapters: Tapered threads and compression coupling.

   Acceptable: Appleton series TWR.

4. Clamps: Steel alloy, 1 inch and smaller. Malleable iron, larger than 1 inch.

   Acceptable: Appleton series TWCL.

C. Flexible Steel Conduit Fittings: Steel alloy, zinc coated, with insulated throat. Slip-proof, positive grip type with screw tightened, double gripping steel wedge set at an angle to grip tighter under strain. Set screw type, squeeze type and clamp type fittings shall not be used. Rigid conduit adapters shall have beveled threads at one end.

   Acceptable: T&B “Tite-Bite” series.

D. Liquid Tight Flexible Conduit Fittings: Steel alloy, zinc coated with molded nylon compression ring and insulated throat. Liquid tight beveled thread, gland nut design with ground cone and sealing ring.

Acceptable: T&B series 5300.

E. Plastic Conduit Fittings: Polyvinyl chloride, UL approved for application. Manufacturer's standard solvent cement. Compliance: NEMA TC-3, UL 514B.

F. Expansion Fittings: Designed for use across structural expansion joints and meeting NEC code requirements for electrical continuity.

Acceptable: O-Z/Gedney.

G. Aluminum Conduit Fittings: Couplings and fittings for use with the rigid aluminum conduit shall be 6063 alloy, T-1 temper.

Acceptable: Appleton Electric, Thomas & Betts, Crouse-Hinds and O-Z/Gedney.

H. PVC Coated Conduit Fittings: Couplings and fittings for use with PVC coated conduit shall be of the same manufacturer as the conduit. The couplings and fittings shall be aluminum with a 40 mil (0.040") PVC coating bonded to the exterior and a 2 mil (0.002") urethane coating bonded to the interior. Flexible, overlapping, pressure-sealing sleeves shall be on each coupling and fitting to protect the connections. Fastening hardware for fittings shall be stainless steel and shall be encapsulated for maximum corrosion protection.

Acceptable: Robroy Industries Plasti-Bond Red, Thomas & Betts Ocal-Blue.

2.03 Acceptable: Manufacturer's names and series numbers listed for conduit fittings are for reference to type, materials, and finish intended for use. Equivalent fittings manufactured by Appleton, Crouse-Hinds, T&B, Raco, Efcor, O.Z. and Steel City will be acceptable provided such fittings meet the express requirements of this specification.

2.04 Concrete for encasing conduits shall be steel reinforced cement, lime, aggregate and all other concrete components with aggregate size not exceeding 3/8-inch. Concrete shall have a minimum compressive strength at 28 days of 3,000 psi.

There shall be not less than 3-inches of concrete between the outside of a duct and the earth. There shall be not less than 2-inches of concrete between adjacent ducts. All duct line concrete pours shall be continuous between manholes or hand holes and between manholes or hand holes and structures. Where duct lines pass through concrete walls, the concrete envelopes shall be extended through and finished flush

with inside surfaces. Water-tight construction joints of an approved type shall be provided.

Duct banks shall be reinforced with steel as shown in the drawings. Install No. 4 steel reinforcing bars on 6" centers each way, extending the length of the concrete encasement. Additionally, No. 4 steel hoops surrounding the ducts shall be placed on 24" centers along the length of the duct bank.

Duct bank lines shall be laid in trenches on mats of gravel not less than 6 inches thick and well graded. The minimum cover for duct lines shall be 24-inches unless otherwise permitted by the Engineer.

Concrete for duct bank encasement shall be dyed red for easy identification.

3.0 EXECUTION

3.01 General: Conduits concealed below finish level of floors which have water barriers shall be located within slab, where practicable, to avoid penetrating water barriers. Where electrical conduits are completely concealed in concrete slab, conduits shall be secured to the upper side of the bottom reinforcing steel or to the lower side of the top reinforcing steel. Conduit shall not interfere with the functioning of the concrete or the reinforcing steel.

Install exposed conduits plumb where vertical and parallel to floors and walls where horizontal. Group parallel conduits where possible with spaces between adjacent conduits kept to a minimum. Support individual conduits with standard conduit straps.

Where conduits are not adjacent to structure, support by adjustable galvanized steel pipe hangers or trapeze hangers. Perforated strap hangers or tie wire will not be permitted. Install conduit to clear all piping, ductwork, structural members and equipment. Independently support conduit from the structure and not from ductwork, piping, ceiling framing members or equipment without written permission from Engineer. All conduit fittings shall be properly installed and made up mechanically and electrically tight. Provide grounding type bushings where necessary. Branch circuit conduits for recessed lighting in suspended ceilings may be supported from the ceiling suspension system if the suspension system is not compromised, and provided suitable fasteners, intended for the purpose, are used.

Conduits shall be supported at maximum intervals of 10 feet. Additional supports shall be provided at bends, fittings, and fixtures as necessary to keep the conduit system rigid and vibration free. Supports shall be adequate for the loads imposed.

Pull-points shall be installed so that no conduit run has more than four 90-degree bends.

If conduit runs exceed the equivalent of a 150-foot straight run or contain more than the equivalent of three 90-degree bends, pull fittings shall be provided. One 90-degree bend shall be considered equivalent to 50 feet of straight run.

Underground conduit bends shall be "long radius" bends. Radius of bends for special cases shall be calculated.

Where bends or offsets are required, they shall be made with suitable conduit bending equipment. Uniform circular cross section of the conduit shall be maintained at such bends. No single bend shall be greater than 90 degrees.

Couplings or other fitting shall not be installed in the curved portion of bends. Where unions are required because of a bend, they shall be installed at least one joint from bends.

All conduits (including those installed underground) shall be installed at right angles to or parallel to equipment and building base lines unless otherwise noted on the drawings.

Underground conduits shall be installed a minimum of twenty-four (24) inches below grade. The backfill shall be free from refuse, scrap and boulders. The backfill shall be tamped about the conduit and in successive six-inch (6") layers. Whenever conduit is stubbed vertically out of the ground, provision shall be made to ensure that the conduit is rigidly fixed.

All underground conduits for feeders, instrumentation wiring, control wiring, and communication wiring shall be PVC conduits and shall be encased in reinforced concrete as shown, unless otherwise noted. Conduits shall be installed as shown and shall be sloped approximately 3-inches per 100 feet uniformly between the elevations shown. Manufactured fitted plastic duct spacers shall be used for installation spacing of conduits.

Concrete for the encasement shall be Class B using aggregate not exceeding 3/8-inch and shall be reinforced as shown. Ducts shall drain to the manholes or end structures. End bell fittings shall be provided on the ducts in manholes.

Appropriate expansion fittings or other approved methods shall be used in the installation of plastic ducts so as to avoid expansion and distortion prior to encasement in concrete. Spacers shall be located a maximum of 8 feet on centers and the duct spacings center-to-center shall not vary in excess of 1/16 inch from the specified spacings shown, prior to and after encasement.

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 metallic conduits (rigid aluminum or rigid steel as designated in the drawings) shall be made. Where it is not otherwise shown, all ducts entering buildings and structures,

exclusive of manholes, shall have transitions to metallic 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.

Transition from above-grade metallic conduit to nonmetallic conduit shall be accomplished with a threaded adapter. Metallic conduit installed above grade and extending below grade shall include the first 90° elbow. All metallic conduit 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.

Install a warning ribbon approximately 12-inches below finished grade and a minimum of 12-inches above all underground duct banks. The identifying ribbon shall be a PVC tape, 3-inches wide, yellow color, permanently imprinted with, "CAUTION BURIED ELECTRIC LINE BELOW" in black letters. Cut tape every 15 feet.

Use of Electrical Metallic Tubing (EMT) shall be limited to areas where specifically noted on the drawings as an acceptable wiring method. Use of EMT shall not extend beyond an interior space which is not conditioned.

All metallic conduit shall be terminated with insulated bushings to prevent damage to wire during pulling operations, except in enclosures where hub design is adequate to prevent insulation damage.

PVC coated conduit and fittings shall be installed with tools specifically designated for the installation of coated conduit systems. All damages to the PVC coating, including nicks and abrasions, shall be repaired with touch-up coating compounds recommended by the manufacturer of the PVC coated conduit.

(End of Section 16110)

SECTION 16120

LOW VOLTAGE ELECTRICAL WIRE AND CABLE

1.0 GENERAL

1.01 Scope: The work of this Section includes wiring for systems operating at 600 volts or less.

1.02 Cooperation with Other Trades: It shall be the responsibility of the CONTRACTOR to coordinate all electrical power, control and interlock wiring and installation between the various trades involved so that all equipment and devices furnished under other Sections are properly wired and installed to perform their intended functions. All necessary materials, equipment and labor to perform this work shall be provided without change in the contract amount.

1.03 Submittals: Submit list of material proposed for use.

1.04 Applicable Standards: Provide only UL listed or labeled products.

2.0 PRODUCTS

2.01 600 Volt Power and Control Wiring:

A. General: New, copper, soft drawn, annealed, wiring free of kinks, cuts and abrasions, single conductor type. All conductors shall be stranded unless otherwise designated or approved in writing. All wiring insulation shall be color coded.

B. Insulation:

1. Building Wires: The following types are acceptable: Type THHN/THWN polyvinyl chloride insulation, nylon jacket, 600 volt listed by UL for 75°C operation in wet locations. Type THHW, cross link polyethylene insulation, 600 volt, listed by UL for 75°C operation in wet locations. Minimum size building wires, No. 12 AWG conductor.

2. Direct Current Carrying Wires: For circuits operating at 50 volts or more in direct current (DC) applications, Type RHH/RHW hypalon insulation, 600 volt listed by UL for 75°C operation in wet locations. Minimum size conductor, No. 12 AWG.

3. Fixture Wires: In accordance with Article 402 of the NEC. Minimum size, #16 AWG.

4. Ground Wires: Bare or Type TW, green, thermoplastic, 600 volt, listed by UL for 60°C operation, wet or dry locations.

5. Control Wires: Except for specialized multi-conductor control systems, type TW thermoplastic, 600 volt, listed by UL for 60°C operation, wet or dry locations. Minimum size, #14 AWG except where permitted otherwise.

2.02 600-Volt Instrumentation Cables: Wiring for instrumentation signals (e.g. 1-5 VDC, 4-20 mA DC) shall be shielded two-conductor no. 16 AWG cables. Instrumentation cables shall have stranded copper conductors with 600-volt insulation. Cable pairs shall be twisted and shielded. 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 as manufactured by Belden, Dekoron, or equal.

2.03 Wire Connectors:

A. Compression Type: Solderless, UL approved compression type.

B. Twist Type: Insulated shell, helical spring steel twist-on type connector for connection only in dry locations. No. 10 AWG maximum conductor size.

3.0 EXECUTION

3.01 General: Install all wire and cable in conduit. Size as indicated on drawings. Identify feeders and branch circuit building wires as follows:

Wire	120/208 Volt	120/240 Volt	277/480 Volt
Phase A	Black	Black	Black
Phase B	Red	Orange	Orange
Phase C	Blue	Blue	Yellow
Neutral	White	White	Gray
Switch Leg	Purple	Purple	Purple
Ground	Green	Green	Green

Motor control circuits shall be identified as follows:

Wire	Color
Stop	Red
Start	Blue
Common	Yellow
Pilot Light	Orange *

* Use white when connected to control circuit neutral.

3.02 Identification of Conductors: Identification shall be by colored insulation on conductors or by use of colored, non-aging plastic tape. Tape shall be permitted only for #8 AWG and larger conductor sizes. Where tape is used to identify conductors, apply at all terminations, junction boxes, pull boxes and wireways. Apply tape, butt lapped, for a minimum distance of 2 inches and, where applied to

ends of conductors, start at cut end of the conductor insulation. Signal and control conductors shall be color coded or labeled as necessary for clear identification. Use terminal strips for terminating control wiring in all control equipment and terminal cabinets. The conductivity and insulation of all joints in wire and cables shall not be less than that of the original conductors. Use solderless lugs and compression type connectors only.

When pulling wires, use appropriate wire pulling lubricants recommended by conductor manufacturer. Do not pull wire or cable through any box, fitting or enclosure where change of raceway alignment or direction occurs; do not cut strands from conductors to fit lugs or terminals; and do not bend conductors to less than recommended radius.

3.03 Wiring in Enclosures: Train in a neat and orderly manner all conductors in panelboards, cabinets, control panels, motor controllers, motor control centers, wireways and wiring troughs. Where conductors cannot be properly trained otherwise, secure with "Ty-Raps" or other suitable lacing. Identify all control, instrumentation and alarm wiring at cabinets and boxes using suitable conductors tags.

3.04 Terminations: Lugs shall be required for stranded wire #10 AWG and larger and where so designated in the drawings.

(End of Section 16120)

SECTION 16190

SUPPORTING DEVICES

1.0 GENERAL

1.01 Scope: This Section includes the requirements for channel strut used for miscellaneous framing and supports.

1.02 Submittals: Submit manufacturer's catalog data for proposed channel strut, including fittings and clearly showing finish and load ratings.

2.0 PRODUCTS

2.01 General: Channel strut shall be aluminum or stainless steel with continuous opening along one side designed to receive nuts and other devices for hangers. Provide nominal 9/16 inch holes or slots at top surface for securing to structure as necessary.

2.02 Load Rating: Minimum channel size and gauge shall be such that a uniformly distributed load of 150 pounds will not cause a deflection greater than 1/360 of span length over a beam span of 72 inches. The same beam shall support a concentrated load of 130 pounds minimum at center of span without exceeding the above deflection. Load rating of channel for all applications shall be increased as necessary so that imposed load, whether concentrated or distributed, does not cause a greater deflection than given above.

2.03 Finish:

A. After fabrication, channel strut shall be chemically cleaned and degreased.

B. Accessories: All fasteners, brackets, clips, bolts, rods, nuts and other related items for use with channel strut (including aluminum unistrut) shall be stainless steel. Conduit clamps for use with aluminum channel shall be aluminum.

2.04 Acceptable: B-Line, Unistrut and Kindorf.

3.0 EXECUTION

3.01 General: Secure to structural elements by welding, bolting or by other means acceptable to the Engineer. Provide all necessary accessories to safely support imposed loads.

3.02 Touch-Up: After installation, touch-up all tool marks, cut ends, and other areas where finish has been damaged.

3.03 Finish Cuts: File all ends smooth on channel strut which has been cut, removing burrs and sharp edges.

3.04 Insulation: Provide 1/8" neoprene insulation between aluminum channel unistrut and steel shapes or concrete to protect against galvanic actions and corrosion.

(End of Section 16190)

SECTION 16195

ELECTRICAL EQUIPMENT IDENTIFICATIONS

1.0 GENERAL

1.01 Nameplates:

A. Engraved phenolic nameplates shall be installed on each panel, disconnect (safety) switch, motor starter, dry transformer, equipment cabinet, terminal cabinet, and circuit breaker in main switchboard hereinafter specified.

B. Nameplates for 120/208 volt (or 120/240 volt) shall be white letters on a black background.

C. Nameplates for 277/480 volt shall be black letters on a white background.

D. Nameplates for equipment on emergency equipment shall be similar to those specified in 1.01 B and 1.01 C, except that background shall be red.

E. Nameplates shall include equipment designation as indicated on drawings, branch of service, and voltage.

1. Typical panelboard nameplate (example):

Panel A
120/208 volt - 3Ø, 4W.
LIFE SAFETY

2. Nameplates for disconnect (safety) switches and motor starters shall be similar to those indicated in E. 1 above.

F. Nameplates shall be three-ply phenolic - black-white-black, white-black-white or red-white-red, as required - engraved through the first layer. Lettering shall be 0.5 cm (3/16”) minimum. Edges of all nameplates shall be beveled at 45 degrees.

2.0 EXECUTION

2.01 Nameplates shall be secured by screws to the equipment. Use of glue is not permitted.

(End of Section 16195)

SECTION 16427

LOW VOLTAGE POWER CIRCUIT BREAKERS AND SWITCHGEAR MODIFICATIONS

1.0 GENERAL

1.01 Scope of Work: Modify the existing low voltage switchgear as shown in the drawings and as specified herein as required to accept one (1) circuit breaker. The circuit breaker and its associated equipment and accessories required shall be provided and installed by the CONTRACTOR.

1.02 Submittals: Submit shop drawings and product data for the circuit breaker, bus modifications for the low voltage switchgear, indicating all materials, ratings, construction and finishes furnished for this project.

1.03 Reference Standards:

A. The existing low voltage switchgear shall be modified and tested in accordance with the latest NEMA and Underwriters' Laboratories Standards. Equipment shall conform to ANSI test standards and the requirements of the National Electrical Code.

B. Circuit breakers shall be in accordance with:

1. ANSI C37.13 - Low Voltage AC Power Circuit Breakers Used in Enclosures.
2. ANSI C37.16 - Preferred Ratings, Related Requirements, and Application for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors.
3. ANSI C37.17 - Trip Devices for AC and General Purpose DC Low-Voltage Power Circuit Breakers.
4. UL 1066 - Low Voltage AC and DC Power Circuit Breakers Used in Enclosures.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 Quality Assurance:

A. Modifications shall maintain existing listings and ratings of the equipment.

B. Modifications shall be made by a Contractor specializing in this type of work. Qualifications and experience on past similar projects shall be submitted for approval.

C. Modifications to the existing switchgear and installation of the new circuit breakers shall be done by Eaton Corporation or any agent authorized by Eaton to perform such work.

2.0 PRODUCTS

2.01 General:

A. The existing low voltage switchgear shall be modified and additions shall be provided as necessary and specified to accommodate the installation of the circuit breaker shown in the drawings. Modifications and installation shall be complete with all the necessary framing, barriers, steel enclosures, phase buses and ground bus.

B. Provide suitable entry and connectors for the phase and grounding conductors indicated on the drawings.

C. The existing switchgear is rated at 480 VAC, 3-phase, 4-wire, 2000 amperes and is manufactured by Westinghouse.

D. All additions, modifications, parts and circuit breakers shall be manufactured by Eaton.

2.02 Bus Modifications (as required):

A. Bus ampacities and short circuit withstand bracing shall not be less than shown on the drawings. The overall short circuit rating and ampacity of the existing switchboard shall be maintained. Components shall be rated 600 volts.

B. The integrity of the existing installed devices and hardware shall be maintained.

C. Phase buses added or modified as necessary to accept the new circuit breaker shall be tin-plated copper. The bussing shall be of sufficient cross sectional area to meet ANSI C37.20.1 for temperature rise. The buses and splice connections shall be 100% rated.

2.03 Removable Element:

A. Draw-out type circuit breakers shall be provided as shown in the drawings, complete with operating mechanism, removable portion of breaker, mechanical interlocks, and control wiring.

B. Each circuit breaker shall be isolated from all other equipment, and arranged so that it may be completely disconnected from the line and bus for test and inspection. The circuit breaker unit shall be equipped with mechanical interlocks which prevent moving the circuit breaker to or from the connected position without tripping open the circuit breaker. It shall not be possible to close the circuit breaker unit when it is at any point between the operating and test positions, or when the interlock is engaged. Insulated (glass polyester) barrier shutters and associated mechanisms shall be provided to isolate the bus from the breaker compartment when the breaker is moved to the disconnected position. It shall be possible then

to remove it from the structure. All removable elements of like rating and having similar features shall be interchangeable. Means shall be provided for padlocking the circuit breaker in the disconnect position.

C. Each circuit breaker shall be mounted in a withdrawal-type unit carried on suitable rollers at the sides of the unit. A levering-in device shall be provided for moving the unit between the operating and test positions. A rail extension shall be provided for use in withdrawing the unit out of the housing beyond the test position. Mechanical interlocks shall be provided to prevent movement of a breaker unless it is in the tripped position, and also to prevent closing the breaker unless it is in the operating or test position.

D. Withdrawal type units and stationary sections for these units shall be assembled in jigs which accurately locate the contacts, holding devices and interlocks. One removable unit of each type and rating shall be tried in each stationary compartment of the same type and rating, and each stationary compartment shall be checked with its own removable unit to ensure interchangeability.

E. Primary circuits between the removable units and stationary structures shall be made by means of solid contacts mounted on an insulating base in the housing which engage finger contacts on the circuit breaker studs of the removable units. Springs shall ensure ample and positive contact pressure. The current-carrying surfaces of the primary contacts shall be silver plated

F. Secondary circuit between the removable units and stationary structure shall be made by means of automatic, self-aligning, multi-contact devices. Springs shall be provided to ensure ample and positive contact pressure. The current-carrying surfaces of the secondary contacts shall be silver plated. Contact engagement shall be maintained in both the connected and test positions.

G. All controls and secondary connections shall be made with minimum size AWG 14 stranded switchboard wire having thermoplastic insulation, fire resistant. Approved terminal blocks with marking strips shall be provided for all secondary and control circuits leaving the switchgear or for interconnecting separate compartments. All control and instrumentation wiring shall be stranded copper conductors with numbered markers at devices and terminal strips.

2.04 Low Voltage Power Circuit Breaker:

A. The low voltage power circuit breaker shall be electrically operated, stored-energy type, trip-free, complete with solid state digital RMS sensing trip devices, position indicators, trip alarm contact, necessary auxiliary contacts, and disconnecting devices, all mounted on a removable

drawout carriage. The solid state trip device shall not be susceptible to harmonics caused by adjustable speed drives. Each solid state trip device shall be equipped with a communication option that allows the circuit breaker status to be indicated at a single monitoring point.

B. Circuit breakers shall have an interrupting rating of 65,000 RMS symmetrical amperes. The stored-energy mechanism of circuit breakers shall be electrically charged.

Circuit breaker trip functions shall be provided as follows:

1. Instantaneous
2. Long time delay
3. Short time delay
4. Ground fault

C. Each circuit breaker shall have at minimum the following features and shall be rated as follows:

1. Electrically operated close and trip - 120 volts AC.
2. Position indication.
3. Auxiliary contacts as shown with a minimum of four (4) spares.
4. Control selector switch operation.
5. Overcurrent Trip Switch (OTS).
6. Operation counter.

D. The electric operator shall come complete with cam mechanism, opening solenoid, closing solenoid and check switches to monitor the positions of the mechanical components. The controller of the electric operator shall be a microprocessor-based controller, providing voltage independent charging time, charging status indication and software-controlled closing logic for the electric close function.

Manual charging of the stored energy mechanism and operation of devices shall be accomplished with the compartment door closed and latched. The charging mechanism shall be so designed that any circuit breaker, when closed, has inherently the necessary stored energy for tripping.

E. The circuit breaker trip unit shall be set to ensure maximum protection of the circuits and shall be properly coordinated to provide a selective protective system. The trip unit shall also provide indication as to current in each phase with overload, short circuit and ground fault tripping.

F. The cubicles for the feeder circuit breakers for MCC-RW Bus 1 shall contain the following:

1 - Removable, 1200 ampere power circuit breaker complete with accessories; sensor ratings as designated in the drawings, ANSI 50/51/51G features, interrupting ratings minimum 65,000 RMS amperes symmetrical.

1 - Set of 1200 ampere, 3-phase line side bus bars.

1 - Set of 1200 ampere, insulated, 3-phase load side bus bars with feeder cable lugs.

1 - Uninsulated ground bus.

1 - 120 volts AC control power.

Hinged front doors, one for each breaker serving as breaker fronts, instrument and control panels each containing:

1. One (1) circuit breaker control switch “Close-Trip”.
2. One (1) set of red and green indicating lights.
3. One (1) set of engraved nameplates.

Door shall be painted to match existing switchgear color.

G. Key interlocks shall be provided where shown on each circuit breaker.

H. The circuit breakers shall be Eaton Magnum Air Circuit Breaker or equal.

2.05 Transformers:

A. Current transformers shall have proper polarity markings and sufficient thermal and mechanical rating to withstand the maximum momentary current rating of the circuit breaker.

B. Control voltage transformers shall be indoor dry type, single-phase, 60 Hertz, 480-120 volts, rated as required to operate the circuit breaker controls as shown in the drawings.

2.06 Wiring: The circuit breaker shall be completely assembled, wired, and tested, including buses, connection, insulators, cleats, terminals, and terminal blocks. No current carrying parts shall be left uninsulated. Terminal blocks shall have approved covers and shall be mounted so that the wires to them can be grouped and laced together in a neat and workmanlike manner. Cup washers shall be furnished for wires AWG 12 and smaller and solderless lugs for larger sizes. A sufficient number of terminal connections, including 15 percent of spare terminals, shall be provided for all control wiring. All wiring shall be AWG 14 stranded copper or larger, insulated for 600 volts.

2.07 Cable Terminals: Solderless, clamp type connectors and terminals, suitable for copper conductors, shall be provided for terminating feeder cables.

2.08 Identification: The front of each compartment shall have a nameplate identifying the circuit controlled. All switches, instruments, and other items shall have identifying metal escutcheons or nameplates, fastened with corrosion-resistant screws. Mounting cement is not acceptable. Inside each compartment, all terminals and equipment shall be identified by nameplates or other acceptable markings.

All nameplates shall be made of laminated plastic with a blacked top layer over a white underlayer that will display white characters when engraved. Lettering shall be 3/16" high. On the key interlocked circuit breakers, an additional nameplate shall be installed on the compartment doors to indicate the device interlocked with the respective breaker.

3.0 EXECUTION

3.01 Installation:

A. Modifications to the existing switchboards shall be made in accordance with the manufacturer's instructions and recommendations. Provide all hardware for installation.

B. Touch-up damaged paint finishes.

C. Cable connections to bus bars shall be made with two-hole NEMA lugs. Remove bus bar sections for shop drilling and re-install, as required. Re-torque all connections. Fabricate and install any custom bus extensions or custom fit bus sections.

D. Make up all bus joints to recommended torque and install and connect all protective devices and circuit wiring.

3.02 Field Testing:

A. After the circuit breaker has been completely installed, it shall be tested to determine general operating condition and circuit continuity, high potential tests and other standard tests for that particular class of equipment.

B. The completely installed, wired and adjusted circuit breaker shall be tested in accordance with IEEE and NEMA Standards for this class of equipment.

C. Make the following minimum tests and checks before energizing the modified equipment.

1. Megger buses, phase-to-phase and phase-to-ground after disconnecting devices sensitive to megger voltage. All circuits and equipment shall be given a dielectric test of 1,500 volts for one minute.
2. Check mechanical interlocks for proper operation.
3. Test ground connections for continuity and resistance.
4. Adjust circuit breaker enclosure door.

D. In the event of an equipment fault, notify the OWNER immediately. After the cause of the fault has been identified and corrected, a joint inspection of the equipment shall be conducted by the CONTRACTOR, the Engineer

and the equipment manufacturer's factory service technician. Repair or replace the equipment as directed by the Engineer prior to placing the equipment back into service.

E. All circuit breaker trip functions and protective relay trip points shall be set by CONTRACTOR to ensure maximum protection of the circuits and shall be properly coordinated to provide a selective protective system. Circuit breaker and protective relay set points shall be submitted in writing by CONTRACTOR and approved by the Engineer prior to energizing the equipment.

F. Four (4) certified copies of test records shall be furnished for the Engineer's approval.

3.03 Adjustment:

A. Test all operational features of the installed equipment to the satisfaction of the OWNER. Submit a certified copy of the field inspection to the Engineer. No equipment shall be energized without the approval of the Engineer.

B. Inspect the installation for compliance with the manufacturer's recommended installation practices and report all deviations to the Engineer.

3.04 Cleaning: Remove all rubbish and debris from inside and around the switchgear. Remove dirt and dust from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.

3.05 Services of Manufacturer's Representatives: The services of qualified representatives of the manufacturer of the switchgear equipment shall be provided to supervise the installation of the equipment, make any necessary adjustments, and place it in trouble-free operation and instruct the operating personnel in its operation and maintenance. This shall include all testing, trip determination and setting, and adjustment necessary to secure proper operation of the equipment. The CONTRACTOR or any of his employees will not be accepted as bona fide manufacturer's representatives.

3.06 Accessories: Provide one (1) circuit breaker test kit for testing all circuit breaker trip functions on the circuit breakers provided.

3.07 Instructions and Parts Lists: Six (6) 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.

3.08 Spare Parts: The CONTRACTOR shall furnish the following spare parts:

Six (6) of each type fuse

All parts shall be delivered securely wrapped or boxed, indexed and tagged with complete information for use and reordering.

(End of Section 16427)

SECTION 16450

ELECTRICAL SYSTEM GROUNDING

1.0 GENERAL

1.01 Scope: All grounding shall be in accordance with Article 250 of the NEC, except where specifically indicated otherwise. In no case shall a grounding conductor be smaller than #12 AWG.

1.02 Submittals: Submit to Engineer a list of all materials plus manufacturer's catalog data for all connection devices.

2.0 PRODUCTS

2.01 General: Use copper and copper alloy materials specifically intended for electrical grounding.

2.02 Conductors: Grounding conductors shall be copper only, solid or stranded, and sized as indicated or as necessary. Conductors may be bare or have type TW insulation unless otherwise indicated. Insulated conductors shall have green color insulation.

2.03 Connections: Copper and copper alloy only.

A. Mechanical Type:

1. Connection to water pipe shall be copper alloy body, single conductor, "U" bolt clamp.

2. Connection to bus or other flat surfaces shall be copper body, compression type, two bolt lug.

3. Acceptable: O.Z. C.G. series, Thomas and Betts and Burndy.

B. Welded Type: All grounding connections made below grade (or which are made in inaccessible locations) shall be made by exothermic welds (such as Cadweld).

3.0 EXECUTION

3.01 General: All grounding shall be electrically continuous to grounding electrodes. Provide grounding type bushings and copper jumpers at switchboard and elsewhere to provide suitable raceway grounding where conduits cannot be properly terminated with lock nuts at sheet metal enclosures.

3.02 Ground the Following: All non-current carrying metal parts of all electrical apparatus, conduits and cabinets for power, lighting and communications shall be grounded. Provide additional grounding where indicated or specified and as required by code.

3.03 Equipment Grounds: All circuits, including feeders and 3-phase motors, shall have a separate green colored insulated grounding wire pulled in same conduit with power wires. Ground wires shall be solidly grounded at all termination points, panelboards, and other equipment as necessary and shall be solidly grounded to system ground.

3.04 Conduit Bonding:

A. The conduit shall not serve as the sole ground connection. However, the conduit shall be provided with proper fittings to bond the conduit to the associated power equipment.

B. Conduits that enter switchgear, motor control center and similar open-bottom or top entry enclosures shall be terminated in the insulated ground-type bushings that are bonded together by a minimum AWG size of number 6 bare copper conductor and connected to the equipment ground bar or to the enclosure.

3.05 Receptacles: Receptacles shall be grounded with a self-grounding clip on the receptacle except where separate green ground is indicated on drawings.

3.06 Separately Derived Systems: The neutral of all separately derived systems shall be solidly grounded at the points designated only. These shall be the only points in the entire electrical distribution system where the neutral is grounded. The neutral at all other points shall be fully insulated from ground.

(End of Section 16450)

SECTION 16475

MOLDED CASE CIRCUIT BREAKERS

1.0 GENERAL

1.01 Scope: This Section includes provisions for molded case circuit breakers rated up to 1200 amperes.

1.02 Submittals: Submit manufacturer's catalog data for each frame size circuit breaker proposed for installation.

1.03 Tests: Each circuit breaker used as main service entrance equipment, and each circuit breaker 225 ampere frame size and larger shall be tested for proper operation.

2.0 PRODUCTS

2.01 General: Molded case circuit breakers shall have a molded insulated case and shall be bolt-on or plug-in style of the frame size and trip rating indicated on the drawings. Circuit breakers shall be listed by UL and shall conform to the applicable standards of NEMA publication AB 1-1993 and Federal Specification W-C-375b. Circuit breakers used as main service entrance equipment shall be so listed by UL. Operating handles shall be toggle style, operable at the front of the circuit breaker.

2.02 Contacts: Circuit breaker contacts shall be silver plated and rated for the continuous current indicated by the circuit breaker frame size.

2.03 Operator: Mechanism for operation shall be quick-make, quick-break and of trip free design so that contacts cannot be held closed against a short circuit or overload. Units shall be designed for common tripping of all poles.

2.04 Trip Mechanism: The trip mechanism shall be a combination thermal-magnetic type. Thermal elements shall have inverse time characteristics for overload conditions and magnetic element shall protect against short circuits by providing instantaneous trip. Magnetic trip shall be adjustable for all circuit breakers of 225 amperes or larger frame size.

2.05 Voltage Ratings: Circuit breaker shall be rated for use at the voltages indicated on the drawings.

2.06 Interrupting Ratings: Circuit breakers shall be rated for short circuit duty at not less than the RMS symmetrical current values indicated on the drawings, but in no case less than the following ratings:

		Interrupting Rating in RMS Symmetrical Amperes			
Frame Size	Poles	120 Volts	240 Volts	277 Volts	480 Volts
100 amp.	1-P	10,000	----	14,000	----
100 amp.	2,3-P	----	10,000	----	14,000
225 amp.	2,3-P	----	25,000	----	22,000
400 amp.	2,3-P	----	42,000	----	30,000
600 amp.	2,3-P	----	42,000	----	30,000
800 amp.	2,3-P	----	42,000	----	30,000
1200 amp.	2,3-P	----	42,000	----	30,000

2.07 Enclosures: Circuit breakers shall be suitable for and rated for use in panelboards, switchboards and other enclosures.

2.08 Individual Enclosures: Where indicated, circuit breakers shall be installed in separate steel enclosures. Enclosures shall be NEMA 1 for general indoor use, NEMA 3R for general outdoor use, and NEMA 4X stainless steel, where indicated on the drawings.

2.09 Acceptable: Siemens, Eaton, GE and Square D.

3.0 EXECUTION

3.01 Panelboards and Switchboards: Circuit breakers shall be factory installed in panelboard or switchboard assemblies as indicated on the drawings. Devices shall be bolted in place. Make up all conductor terminations.

3.02 Individual Enclosures: Circuit breaker enclosures shall be suitably supported on structures using framing channel as necessary. Where practical, locate the top of the enclosure 6 feet above the floor. The circuit breaker operating handle shall not be less than 4 feet above the floor. Make up all conductor terminations and conduit.

3.03 Trip Adjustment: Magnetic trip adjustments on all adjustable trip breakers shall be set in accordance with the manufacturer's directives and in accordance with the drawings.

(End of Section 16475)

SECTION 16476

LOW VOLTAGE ENCASED POWER CIRCUIT BREAKERS

1.0 GENERAL

1.01 Scope: This Section includes requirements for low voltage power circuit breakers encased in insulated housings and suitable for switchboard application.

The motor control center (MCC-RW) shall be equipped with three (3) insulated case circuit breakers. Insulated case circuit breakers shall be provided for main circuit breakers and main bus tie circuit breakers and shall be fixed position mounted with electrical operation.

1.02 Quality Assurance:

A. Reference standards. Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:

1. NEC Article 408, Switchboards and Panelboards.
2. NEMA 250, Enclosures for Electrical Equipment (1,000 volts maximum).
3. UL Standard 489, Molded Case Circuit Breakers.

1.03 Submittals:

A. Submit complete manufacturer's data for each frame size circuit breaker including time current characteristic curves.

B. Shop Drawings: Submit for approval the following:

1. Manufacturer's technical information for circuit breaker proposed for use.
2. Listing of the accessories.
3. Construction details of enclosure.

1.04 Tests:

A. Each circuit breaker shall be tested in the field before acceptance.

B. Retain the services of the circuit breaker manufacturer for field inspection and testing.

2.0 PRODUCTS

2.01 General:

A. Circuit breakers shall be UL listed for 100% current carrying duty, and where used for main service entrance equipment shall be so listed by UL. Breakers shall be either manually or electrically operated (E.O.) as indicated on the drawings. Breakers shall be totally enclosed within molded style, insulated case. Voltage rating shall be 600 volts, 60 Hertz. Breakers shall be provided with the number of poles indicated on the drawings at the applied system voltage and have an interrupting rating of not less than 65,000 RMS symmetrical amperes. Units shall be designed for reliable operation at full rated current over the minimum ambient temperature range of 0°F to 120°F. Circuit breakers shall be quick-make, quick-break, employing stored mechanical energy for both closing and opening. Units shall provide for common tripping of all poles and shall be of trip free design so that the breaker cannot be held closed against a condition causing a trip. Breakers shall have provisions for padlocking the breaker in the "open" position. Where required for drawout applications, the circuit breaker shall readily adapt to drawout carriage mounting in switchboards.

B. The circuit breaker shall be provided complete and ready for installation in the motor control center, including, but not limited to, all controls, indicators, fusing, transformers, wiring and terminals.

C. Insulated case circuit breakers, as described herein, are distinguished from molded case circuit breakers by the stored energy mechanism employed to open and close the circuit breaker, and the inclusion of an internal motor operator when electrical operation is required.

2.02 Manual Operator: The circuit breaker shall be equipped with a front mounted means for manually opening and closing the breaker. Manual charging of the stored energy mechanism and operation of devices shall be accomplished with the compartment door closed and latched.

All breakers shall include a push button on the front of the breaker for tripping open and shall have a position indicator to indicate "open", "closed", "charged", "discharged" state. The charging mechanism shall be so designed that any circuit breaker, when closed, has inherently the necessary stored energy for tripping.

2.03 Keyed Interlocking: Keyed interlocking capabilities shall be provided and keyed as designated on the drawings.

2.04 Trip Units: Trip units shall be self-contained, integral type, all solid state, static trip device including current sensors and self-contained power supply so that automatic tripping of breakers is independent of external source of power. The static trip device and controls shall be constructed of industrial grade components designed for long life within an ambient temperature range of -20°C to 55°C. Trip level shall be factory set at indicated ampere trip level and shall be adjustable in the field (without special tools or disassembly of breaker). Each circuit breaker shall have mechanical or electrical devices to indicate nature of trip from (1) Long Time, (2) Short Time/Instantaneous, or (3) Ground Fault.

2.05 Trip Unit Adjustment Ranges: Trip units shall have fully field adjustable settings over the minimum ranges listed below:

A. Long Time Pick-Up: 6 steps, nominally 50% to 100% of current sensor rating.

B. Long Time Delay: 3 bands, adjustable over the minimum nominal range of 20 to 80 seconds at 300% of long time pick-up.

C. Short Time Pick-Up: 5 steps, nominally 200% to 800% of long time trip setting, minimum range.

D. Short Time Delay: 3 bands, nominally 0.1 to 0.3 seconds.

E. Ground Fault Pick-Up: 5 steps.

F. Ground Fault Delay: 3 bands.

G. Instantaneous: 5 steps, nominally 300% to 1000% minimum range.

2.06 Circuit Breaker Adjustment Features: Unless otherwise indicated on the drawings, circuit breakers shall have adjustment features as indicated below:

A. Main and Tie Circuit Breakers: Long time pick-up and delay, short time pick-up and delay, instantaneous pick-up.

B. Feeder Circuit Breakers: Long time pick-up and delay, short time pick-up and delay, instantaneous pick-up.

C. All Circuit Breakers: Provide ground fault pick-up and delay as shown on the drawings.

2.07 Transformers: Provide all control voltage transformers and current transformers (CT's) as required for proper operation, including all necessary ground fault sensing CT's.

2.08 Auxiliary Contacts: Provide N.O. and N.C. contacts as indicated or necessary for control and signal function.

2.09 Acceptable Breakers: Circuit breakers shall be Square D Masterpact, Siemens type SB, or Eaton Magnum DS.

3.0 EXECUTION

3.01 Circuit breakers shall be properly installed in appropriate compartments of factory assembled switchboards or motor control centers (MCC's).

(End of Section 16476)

SECTION 16482

LOW VOLTAGE MOTOR CONTROL

1.0 GENERAL

1.01 Description: This section includes requirements for a 600 volt motor control center (MCC) and all required control devices as shown on the drawing and specified to be part of the MCC equipment. The MCC shall be connected to two (2) 480 volt, 3-phase, 3-wire, 60 Hertz feeders as shown on the drawings.

1.02 Related Work:

A. Section 16010; General Provisions.
B. Section 16475; Molded Case Circuit Breakers.
C. Section 16476; Low Voltage Encased Power Circuit Breakers.

1.03 Submittals:

A. Submit shop drawings in accordance with the General Provisions and the following.

B. Shop drawings shall include ratings, one-line diagrams, circuit diagrams (including remote devices and connection points), dimensional data, weights, conduit entry restrictions, anchor bolt locations, protective relaying and Bill of Material. Product data sheets, installation and maintenance manuals and catalog cut sheets shall be included with the shop drawings submitted.

C. Drawings are subject to approval. Construction shall not commence until all shop drawings are approved.

D. After completion of installation, CONTRACTOR shall furnish reproducible tracings of final certified drawings and drawings and data sheets or manuals, as required in Section SP-72 - O&M Manual, and include the following:

1. Plan, elevation and location of equipment.
2. Dimension outlines including weights.
3. Terminal arrangements, type and location of accessories.
4. Assembly details.
5. Complete bill of material.
6. Any and all other drawings required for erection and installation of the equipment.
7. Complete power and control wiring diagrams including all accessories.
8. Operations, maintenance and installation instruction books.
9. Spare parts list.

1.04 Standards:

A. The design, fabrication and performance of the equipment shall conform to the applicable requirements of the following standards and codes:

1. American National Standards Institute (ANSI).
2. National Electrical Manufacturer's Association (NEMA).
3. National Electrical Code (NEC).
4. Underwriters Laboratories (UL) 845, current edition.

B. Any conflict between the above mentioned documents and this specification shall be referred to the Engineer for clarification before proceeding with the fabrication of the affected parts.

1.05 Tests: Standard design and production tests shall be performed in accordance with the requirements of NEMA, ANSI and IEEE Standards.

1.06 Packing/Shipping: The MCC shall be separated into shipping blocks of no more than three vertical sections each. Each shipping block shall include a removable "lifting angle" which will allow an easy means of attaching an overhead crane or other suitable lifting equipment.

1.07 Storage: If the motor control center cannot be placed into service reasonably soon after its receipt, it shall be stored in a clean, dry and ventilated building free from temperature extremes. Acceptable storage temperatures are from 0°C (32°F) to 40°C (104°F).

1.08 Warranty: The MCC shall be free from defects in materials and workmanship for a period of one (1) year from the date of substantial completion.

2.0 PRODUCT

2.01 Manufacturers: Shall be Square D Company Class 8998 Model 6 MCC or approved equal manufactured by Siemens, Eaton or Allen-Bradley.

2.02 Materials:

A. Steel material shall comply with UL845.

B. Each motor control center shall consist of vertical sections of heavy gauge steel bolted together to form a rigid, free-standing assembly. A removable 7 gauge structural steel lifting angle shall be mounted the full width of each of the motor control center shipping blocks at the top. Removable 7 gauge bottom channel sills shall be mounted on the front and rear of the vertical sections, extending the full width of each of the shipping blocks. Vertical sections shall have structural support members formed from a minimum of 12 gauge hot rolled steel. Internal reinforcement structural parts shall be of 12 gauge steel to provide a strong, rigid assembly. The entire assembly shall

be constructed and packaged to withstand all stresses included in transit and during installation.

2.03 MCC Finish:

A. All steel parts shall be provided with UL listed acrylic baked enamel paint finish, except plated parts used for ground connections. All painted parts shall undergo a multi-stage treatment process, followed by the finishing paint coat.

B. Pre-treatment shall include:

1. Hot alkaline cleaner to remove grease and oil.
2. Iron phosphate treatment to improve adhesion and corrosion resistance.
3. Non-chrome sealer to enhance corrosion resistance.

C. The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.

D. The standard paint finish shall be able to pass at least 300 hours of salt spray per ASTM B117 with less than 1/8" loss of paint from a scribed line.

E. Paint color shall be #49 medium light gray per ANSI standard Z55.1-1967.

F. All unit interior surfaces shall be painted white for improved visibility inside the unit enclosure.

2.04 Structures:

A. Structures shall be 20 inches deep, totally enclosed, dead-front, free standing assemblies. Structures shall be bolted together to form a single assembly.

B. The overall height of the MCC shall not exceed 90".

C. Structures shall be NEMA 1A gasketed.

D. Each 20 inch wide standard section shall have all the necessary hardware and bussing for modular plug-in units to be added and moved around. All unused spaces shall be covered by hinged blank doors and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters. Larger section widths may be provided for larger equipment.

E. Each section shall include a top plate (single piece or two-piece). Plates shall be removable to ease the cutting of conduit entry openings.

2.05 Wireways:

A. Structures shall contain a minimum 12" high horizontal wireway at the top of each section and a minimum 6" high horizontal wireway at the bottom of each section. These wireways shall extend the full length of motor control center to allow room for power and control cables to connect between units in different sections.

B. A vertical wireway shall be provided in each motor control center section that accepts modular plug-in units. The vertical wireway shall connect with both the top and bottom horizontal wireway. The vertical wireway shall be 4" wide minimum with a separate hinged door. Access to the wireways shall not require opening control unit doors. Structures that house a single, full section control unit are not required to have vertical wireways. Those control units must open directly into the motor control center horizontal wireways.

2.06 Barriers:

A. All power bussing and splice connections shall be isolated from the unit compartments and the wireways. The horizontal bus shall be mounted onto a molded-glass filled polyester support assembly that braces the bus against the forces generated during a short circuit. The horizontal bus shall be isolated from the top horizontal wireway by a grounded steel barrier. This barrier shall be removable to allow access to the bus and connections for maintenance.

B. The vertical bus shall be housed in a molded glass-filled polyester support that provides bus insulation and braces the bus against the forces generated during a short circuit. These supports shall have openings every 3" for unit stab-on connections. Each opening shall be provided with a manual shutter to close off the stab opening. These shutters shall be attached to the structure so that when they are removed (to allow a stab connection) they are retained in the structure and are readily accessible for use should a plug-in unit be removed from the motor control center.

C. Barriers shall be provided in the vertical structure and unit design to prevent the contact of any energized bus or terminal from the conduit or wireway areas.

2.07 Bussing:

A. All bussing and connectors shall be tin-plated copper.

B. The main horizontal bus shall be rated at 1200 amperes continuous and shall extend the full length of the motor control center. Bus ratings shall be based on 65°C maximum temperature rise in a 40°C ambient. Provisions shall be provided for splicing additional sections onto either end of the motor control center.

C. The horizontal bus splice bars shall be pre-assembled into a captive bus stack which can be easily installed into the end of the motor control center power bus to allow the installation of additional sections. The main bus splice shall utilize four bolts, two on each side of the bus split, for each phase. Additional bolts shall not be required when splicing higher amperage bus. The splice bolts shall secure to self clenching nuts installed in the bus assembly. It shall be possible to maintain any bus connection with a single tool. "Nut and bolt" bus connections to the power bus will not be permitted.

D. Each section that accepts plug-in units shall be provided with a vertical bus for distributing power from the main bus to the individual plug-in starter units. This bus shall be of the same material and plating as the main bus and shall be rated at 600 amperes continuous. The vertical bus shall be connected directly to the horizontal bus stack without the use of risers or other intervening connectors. It shall be possible to maintain the vertical to horizontal bus connection with a single tool. "Nut and bolt" bus connections to the power bus shall not be permitted.

E. A tin-plated copper ground bus shall be provided that extends the entire length of the motor control center. The ground bus shall be 0.25" x 1.0" and be rated for 300 amperes. A compression lug shall be provided in the motor control center for an AWG 4/0-250 KCMIL grounding conductor. The ground bus shall be provided with (6) 0.38" holes for each vertical section to accept ground lugs for any loads requiring a ground conductor.

F. Each vertical section shall have a vertical ground bus that is connected to the horizontal ground bus. This vertical ground bus shall be installed so 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.

G. The power bus system shall be braced for a short circuit capacity of 42,000 RMS amperes minimum.

H. No neutral bus or neutral termination lug is necessary for the motor control center (MCC).

2.08 Unit Connections:

A. Units with circuit breaker disconnects through 400 amperes frame and fusible switch disconnects through 400 amperes shall connect to the vertical bus through a spring reinforced, tin-plated, stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus.

Stabs on all plug-in units shall be solidly bussed to the unit disconnect. Cabled stab assemblies are not permitted.

B. All conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material to prevent accidental contact with those parts.

C. All plug-on units shall utilize a two stage ADVANCE/RETRACT type operating mechanism which will allow the unit to disengage from the power bus without withdrawing the unit from the motor control center.

In the ADVANCED position, the unit stabs shall engage the vertical phase bus. When the unit door is closed, the mechanism will allow complete "on/off" control of the unit disconnect with clear indication of the disconnect's status.

In the RETRACT position, the unit stabs shall be disengaged from the vertical phase bus. A non-defeatable mechanical interlock shall prevent the disconnect from being placed in the "on" position. A single standard padlock shall be able to lock the unit in the RETRACT position, and simultaneously lock the disconnect in the "off" position. When in this RETRACT position, it shall be possible to close the unit door in order to maintain the enclosure's integrity.

A non-defeatable mechanical interlock shall prevent installing or removing a plug-in unit from the structure unless the mechanism is first placed in the RETRACT position.

The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.

D. All non-plug-on units shall utilize a fixed position type operating mechanism which allows complete "on/off" control of the unit disconnect with the clear indication of the disconnect's status. All circuit breaker operators shall include a separate "tripped" position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door. A mechanical interlock shall prevent an operator from opening the unit door when the disconnect is in the "on" position. Another mechanical interlock shall prevent an operator from placing the disconnect in the "on" position while the unit door is open.

E. Provisions shall be provided for locking all disconnects in the "off" position with up to three padlocks.

2.09 Feeder Disconnects:

A. Feeder disconnects shall be molded case, thermal magnetic circuit breakers. Feeder disconnects shall be dual mounted, where possible.

B. Circuit breakers shall be in accordance with Specification Section 16475 - Molded Case Circuit Breakers.

C. Feeder disconnect units shall be as indicated on the drawings.

2.10 Main Circuit Breaker(s):

A. The Bus 1 main circuit breaker and Bus 2 circuit breaker shall be a 1200 ampere frame, 3-phase, 600 volt, 60 Hertz, UL listed, insulated case, solid state trip, circuit breaker with a 42,000 amperes symmetrical interrupting capacity. The circuit breaker shall be equipped with an electrically operated stored mechanical energy device for both closing and opening the circuit breaker.

1. The long time trip point of said breaker shall be set as indicated on the drawings.

2. The circuit breaker shall be U.L. listed for 100% continuous current operation.

3. Ground fault sensing shall be included with the circuit breaker. This device shall be factory set to trip the circuit breaker at 200 amperes of ground fault with a time delay of 0.3 seconds.

4. Circuit breaker adjustable trip functions shall include:

   a. long time current and delay
   b. short time pickup and delay
   c. instantaneous pickup
   d. ground fault pickup and delay

B. The electric operator shall come complete with cam mechanism, opening solenoid, closing solenoid and check switches to monitor the positions of the mechanical components. The controller of the electric operator shall be a microprocessor-based controller, providing voltage independent charging time, charging status indication and software-controlled closing logic for the electric close function.

Manual charging of the stored energy mechanism and operation of devices shall be accomplished with the compartment door closed and latched. The charging mechanism shall be so designed that any circuit breaker, when closed, has inherently the necessary stored energy for tripping.

C. The circuit breaker shall be fixed mounted in the motor control center and shall be provided in accordance with the drawings. The main circuit breaker shall be in accordance with Specification Section 16476 - Low Voltage Power Encased Circuit Breakers.

D. A phase failure relay with an adjustable time delay shall be provided to trip the main circuit breaker in the event of a phase failure of the incoming power. This device shall be factory set to trip the circuit breaker on a phase imbalance of 15% with a 5 second delay.

E. One (1) set of normally open ("A") and one (1) set of normally closed ("B") contacts shall be furnished to indicate the open/closed status of the circuit breaker. Wiring for these contacts shall be brought to terminals in the main circuit breaker section.

2.11 Main Tie Circuit Breaker:

A. The main tie circuit breaker shall be a 1200 ampere frame, 3-phase, 600 volt, 60 Hertz, UL listed, insulated case, solid state trip, circuit breaker with a 42,000 amperes symmetrical interrupting capacity. The circuit breaker shall be equipped with an electrically operated stored mechanical energy device for both closing and opening the circuit breaker.

1. The long time trip point of said breaker shall be set as indicated on the drawings.

2. The circuit breaker shall be U.L. listed for 100% continuous current operation.

3. Circuit breaker adjustable trip functions shall include:

a. long time current and delay
b. short time pickup and delay
c. instantaneous pickup

B. The circuit breaker shall be fixed mounted in the motor control center and shall be provided in accordance with the drawings. The main circuit breaker shall be in accordance with Specification Section 16476 - Low Voltage Power Encased Circuit Breakers.

C. The electric operator shall come complete with cam mechanism, opening solenoid, closing solenoid and check switches to monitor the positions of the mechanical components. The controller of the electric operator shall be a microprocessor-based controller, providing voltage independent charging time, charging status indication and software-controlled closing logic for the electric close function.

Manual charging of the stored energy mechanism and operation of devices shall be accomplished with the compartment door closed and latched. The charging mechanism shall be so designed that any circuit breaker, when closed, has inherently the necessary stored energy for tripping.

2.12 Metering:

A. Electronic metering, equivalent to a Schneider Electric PM 820, shall be provided where shown on the drawings. Electronic metering shall be mounted in the door and supplied with the designated protective relaying functions, appropriate transformer(s) displays and selector switch(es) as required.

B. Where metering is indicated on the drawings, provide a separate customer metering compartment with front hinged door and include the following:

1. Current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.

2. Potential transformers, including primary and secondary fuses with disconnecting means, shall be provided for the metering shown on the drawings.

2.13 Components:

A. The motor control center shall consist of 20" deep, rigid, free standing sections which are joined together to form a complete assembly as shown on the Drawings. Provisions shall be made for top or bottom cable entry as designated in the drawings and shall consist of the number of sections designated in the drawings. All controls, feeder circuit breaker units, starter units and controllers shown in the drawings shall be included in the motor control center.

B. Control Power Transformer:

1. Each starter unit shall be provided with an encapsulated control transformer of sufficient size to accommodate the control circuit loads, including contactor coil burden, cooling fans, specified auxiliary devices, etc. One leg of the 120 volt secondary circuits shall be fused using a standard 250 volt fuse. The other secondary leg shall be solidly grounded. The primary side of the transformer shall be fused with two (2) 600 volt, current limiting fuses with an interrupting capacity not less than the interrupting capacity of the circuit breaker.

2. The control power transformer shall be rated for 100 VA minimum capacity.

3. Where designed on the drawings and the control power is provided from a source remote from the motor control center, a control transformer will not be required in that starter unit. The disconnect for that starter shall include an interlock for disconnecting the externally powered control circuit(s).

C. Terminal Blocks:

1. All starter units shall be provided with unit control terminal blocks.

2. Terminal blocks shall be the pull-apart type rated at 600 volts, 25 amperes. All current carrying parts shall be tin-plated. Terminals shall be accessible from inside the enclosure with the enclosure door is opened. Terminal blocks shall be DIN rail mounted with the stationary portion of the block secured to the unit divider located below each unit. The stationary portion shall be used for field connections and shall remain attached to the unit when the unit is removed. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components. The unit shall be constructed so the unit can be removed without disturbing any of the field control wiring. The portion of the terminal blocks used for the unit wiring (factory connections) shall be removable with the unit.

D. Wiring:

1. The motor control center shall be wired using standard copper conductors with 90°C rated thermoplastic insulation. Control wiring shall be #14 AWG. Power wiring shall be minimum #12 AWG. Wires and terminal block shall be marked as indicated on as-built drawing schematics.

2. Wiring shall be NEMA Class I, Type B. Additional wiring details are shown on the drawings.

E. Line and Bus Connection:

1. The line and load terminals on the main circuit breaker shall be sized to accommodate the conductors designated in the drawings. Terminals shall be suitable for termination of copper conductors. Line and load conductors connected to the main circuit breaker will enter the motor control center as designated in the drawings.

2. Main lug connections to the horizontal bus of the motor control center, where applicable, shall be sized to accommodate the conductors designated in the drawings. Lugs shall be suitable for termination of copper conductors. Conductors shall connect to the horizontal bus from above or below as designated in the drawings.

F. Nameplates: Shall be engraved phenolic nameplates for each motor control center and each unit compartment. Nameplates shall be black background with white letters, measuring a minimum of 1.5” H x 6” W total outside dimensions. Nameplates shall be secured in place with stainless steel screws.

G. Pilot Devices: Each starter shall be provided with the pilot devices indicated on the drawings. Pushbuttons, selector switches and indicating lights shall be the 30 mm, heavy-duty, oil-tight type and shall mount on a removable panel located on the starter unit, not on the compartment door. Pilot lights shall be LED type.

H. Control Components: Where shown in the drawings, auxiliary contacts, control relays and timers shall be provided, as required. Relays shall be heavy-duty, general purpose type, having 120 volt, 60 Hertz operating coils and 120 volt, 10 ampere rated contacts.

I. An arc flash hazard warning label shall be affixed to the front and back of each motor control center section, each hinged door or compartment in the motor control center and each removable panel on the motor control center. Reference NFPA 70E and ANSI Z535 for appropriate warning label guidelines.

2.14 Quality Control: The entire motor control center shall go through a quality inspection before shipment. This inspection shall include:

A. Physical Inspection of:

1. The structure,
2. The electrical conductors, including:

a. Bussing,
b. General wiring,
c. Units.

B. Electrical Tests:

1. General Electrical Tests including:

a. Power circuit phasing,
b. Control circuit wiring,
c. Instrument transformers,
d. Meters,
e. Ground fault system, and
f. Device electrical operation.

2. AC dielectric tests of the power circuits.

C. Markings/Labels, including:

1. Instructional type,
2. Underwriters Laboratories (U.L.),
3. Inspector’s stamps.

The manufacturer will use integral quality control checks throughout the manufacturing process to maintain the correctness of the MCC.

3.0 EXECUTION

3.01 Location: The motor control center shall be located with a minimum of 6" of space between the back of the motor control center and the wall.

The motor control center shall be assembled on a smooth level surface so that all sections are properly aligned.

The motor control center shall be installed on a 4" concrete equipment pad. Isolation pads shall be installed between the motor control center and the concrete pad.

(End of Section 16482)

SECTION 16483

ADJUSTABLE FREQUENCY DRIVES

1.0 GENERAL

1.01 Scope of Work:

A. This Section describes the requirements for adjustable frequency drives and variable speed drives, herein identified as an AFD for use with AC motors.

B. The manufacturer shall furnish, field test, adjust and place in satisfactory operation all AFD equipment.

C. Any exceptions/deviations to this specification shall be indicated in writing and submitted with the quotation.

1.02 References:

A. ANSI/NFPA 70 - National Electrical Code
B. ANSI C84.1 - Voltages Tolerances for North America
C. CSA C22.2 No. 14-M91 - Industrial Control Equipment
D. IEC 68 Part 2-3 - Basic Environmental Testing Procedures Part 2: tests - Test Ca: Damp Heat
E. IEC 146.1 - Semiconductor Converters-General Requirements and Line Commutated Converters Part 1-1: Specifications of Basic Requirements
F. IEC 664 - Insulation Coordination for Equipment Within Low-Voltage Systems
G. IEC 447 - Man-Machine Interface Actuating Principles
H. IEC 439 Part 1 - Low Voltage Switchgear and Controlgear Assemblies
I. IEC 947 - Low Voltage Switchgear and Controlgear Components
J. IEC 364 - Electrical Installation of Buildings
K. IEC 204/NFPA 79 - Electrical Equipment of Industrial Machines/ Industrial Machinery
L. IEC 106 - Guide for Specifying Environmental Conditions for Equipment Performance Rating
M. IEC 529 - Degrees of Protection Provided by Enclosure
N. IEC 1000 - Electromagnetic Compatibility
O. IEC 721 - Classification of Environmental Conditions
P. IEC 255-8 Overload Relays
Q. IEC 801-2,-3,-4,-5 - Immunity Tests
R. NEMA ICS 6 - Industrial Control and Systems Enclosures
S. NEMA ICS, Part 4 Overload Relays
T. NEMA 250 Enclosures for Electrical Equipment
U. NEMA ICS 2-321 - Electrical Interlocks
V. NEMA ICS7 - Industrial Control and Systems Adjustable Speed Drives
W. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection Installation and Operation of Adjustable Speed Drives
X. UL 50 - UL Standard for Safety Enclosures for Electrical Equipment

Y. UL 98 - UL Standard for Disconnect Switches
Z. UL 507 - UL Standard for Safety Electric Fans
AA. UL 508 - UL Standard for Safety Industrial Control Equipment
BB. UL 508C - UL Standard for Safety Power Conversion Equipment
CC. UL 991 - UL Standard for Safety Tests for Safety Related Controls employing Solid State Devices
DD. OSHA 1910.95 - AC Drive Controller Acoustical Noise
EE. Conforming to National Safe Transmit Association and International Safe Transmit Association Test for Packages Weighing 100 lbs. or Over

1.03 Related Work:

A. Section 16482; Low Voltage Motor Control.

1.04 Submittals:

A. Complete wiring diagrams and enclosure outline drawings shall be furnished for review and approval before assembly of the AFD commences. The enclosure drawings shall include front and side views of the enclosures with overall dimensions and weights shown, conduit entrance locations and nameplate legends.

B. Standard catalog sheets showing voltage, horsepower, maximum current ratings and recommended replacement parts with part numbers shall be furnished for each different horsepower rated AFD unit provided.

C. Standard operation and maintenance instruction manuals shall be furnished for each different horsepower rated AFD unit.

1.05 Warranty: A 1-year warranty shall be provided on materials and workmanship from the date of substantial completion.

1.06 Quality Assurance:

A. The manufacturer of the AFD shall be a certified ISO 9001 facility.

B. The AFD and all associated optional equipment shall be UL listed according to Power Conversation Equipment UL 508C. A UL label shall be attached inside each enclosure as verification of its listing.

C. The AFD shall be designed, constructed and tested in accordance with NEMA, NEC, and IEC standards.

D. The power converter for each AFD shall be tested with an actual AC Induction Motor 100% loaded and temperature cycled within an environment chamber at 104°F (40°C). Documentation shall be furnished to verify successful completion of the test.

E. All AFD door mounted pilot devices shall be tested to verify successful operation.

F. The AFD shall be Hi-Pot tested, with all enclosed devices mounted and wired, prior to shipment.

2.0 PRODUCT

2.01 Manufacturers:

A. The AFD shall be a Yaskawa Model iQ1000 provided by ICON Technologies. No equal. Reference Standardization Certificate of Conditions and Circumstances included at the end of this specification.

B. Alternate control techniques other than pulse width modulated (PWM) are not acceptable.

2.02 General Description:

A. The AFD shall convert the input AC power to an adjustable frequency and voltage as defined in the following sections.

B. The AFD shall be of the pulse width modulated type with a bridge converter to convert incoming fixed voltage/frequency to a fixed DC voltage. All components shall be integral to the AFD enclosure and require no additional installation costs. The pulse width modulation strategy shall be implemented in a microprocessor that generates a sine-coded output voltage.

C. The AFD shall be designed with a rectifier input designed for 18-pulse minimum operation. Phase shifting transformers shall be housed in the AFD enclosure. Active harmonic filters and inductor-capacitor filters are not acceptable.

2.03 Construction:

A. The AFD shall be mounted in a NEMA Type 1 gasketed enclosure with an externally operated disconnect device.

B. A mechanical interlock shall prevent an operator from opening the AFD unit door when the disconnect is in the “on” position. Another mechanical interlock shall prevent an operator from placing the disconnect in the “on” position while the AFD unit door is open. It shall be possible for authorized personnel to defeat these interlocks.

C. Provisions shall be provided for locking all disconnects in the “off” position with up to three (3) padlocks.

D. Current limiting fuses shall be installed and wired to the AFD input.

E. Provisions shall be made for accepting a padlock to lock the enclosure door.

2.04 Motor Load:

A. The AFD shall be sized to operate the motor(s) and connected loads shown in the drawings.

B. The manufacturer of the AFD shall coordinate the installation of the filters or reactors on the output of the AFD to ensure overshoot voltage at the motor terminals does not exceed the maximum withstand voltage of the connected motor load. The overshoot voltage shall take into account pulse rise time, cable length, minimum time between pulses and phase-to-phase transition time.

2.05 Application Data:

A. The AFD shall be sized to operate the connected motor with all driven loads attached.

B. The speed range shall be 40:1.

2.06 Environmental Ratings:

A. The AFD shall be of construction that allows operation in a pollution Degree 3 environment. AFD units that are only rated for Pollution Degree 2 environment will not be allowed.

B. The AFD shall be designed to operate in an ambient temperature from -10 to +40°C (+14 to 104°F).

C. The storage temperature range shall be -20 to +60°C.

D. The maximum relative humidity shall be 95% at 40°C, non-condensing.

E. The AFD shall be rated to operate at altitudes less than or equal to 3,300 ft (1000m).

F. The AFD shall meet the IEC 68-2 operational vibration specification.

2.07 Ratings:

A. The AFD shall be designed to operate from an input voltage of 460± 15% VAC.

B. The AFD shall operate from an input voltage frequency range from 47.5 to 63 Hertz.

C. The displacement power factor shall not be less than 0.95 lagging at any speed or load condition.

D. The efficiency of the AFD at 100% speed and load shall not be less than 96%.

E. The variable torque rated AFD overcurrent capacity shall be 110% for 1 minute.

F. The output carrier frequency of the AFD shall be randomly modulated and selectable at 2, 4, or 10 kHz depending on the AFD rating for low noise operation. No AFD with an operable carrier frequency above 10 kHz will be allowed.

G. The output frequency shall be from 0.1 to 400 Hertz for AFD units up to 75 HP. At ratings above 75 HP, the maximum output frequency shall be 200 Hertz.

2.08 Protection:

A. Upon power-up the AFD shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, dynamic brake failure, DC to DC power supply, control power and the pre-charge circuit.

B. The AFD shall be UL 508C listed for use on distribution systems with the available fault current shown on the drawings. The power converter section of the AFD shall meet short circuit withstand-ability of 65,000 RMS symmetrical amperes as defined by NEMA ICS 7.1.09 and have the value listed on the AFD nameplate.

C. The power converter section of the AFD shall be protected against short circuits, between output phases and ground; and the logic and analog outputs.

D. The AFD shall have a minimum AC undervoltage power loss ride-through of 200 msec. The AFD shall have the user defined option of frequency fold-back to allow motor torque production to continue to increase the duration of the power loss ride-through.

E. The AFD shall have a selectable ride-through function which will allow the logic to maintain control for a minimum of one second without faulting in the event of a loss of power.

F. For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function will provide up to five (5) programmable restart attempts. The programmable time delay before restart attempts will range from 1 second to 600 seconds.

G. The deceleration mode of the AFD shall be programmable for normal and fault conditions. The stop modes shall include free-wheel stop, fast stop and DC injection braking.

H. Upon loss of the analog process follower reference signal, the AFD shall fault and/or operate at a user defined speed set between software programmed low speed and high speed settings.

I. The AFD shall have solid state I^2t protection that is UL listed and meets UL 508 C as a Class 10 overload protection and meets IEC 947. The minimum adjustment range shall be from 0.45 to 1.05 percent of the current output of the AFD.

J. The AFD shall have a thermal switch with a user selectable pre-alarm that will provide a minimum of 60 seconds delay before overtemperature fault.

K. The AFD shall utilize bonded fin heatsink construction for maximum heat transfer.

L. The AFD shall have a programmable fold-back function that will anticipate a controller overload condition and fold back the frequency to avoid a fault condition.

M. The output frequency shall be software enabled to fold back when the motor is overloaded.

N. There shall be three (3) skip frequency ranges that can each be programmed with a selectable bandwidth of 2 or 5 Hertz. The skip frequencies shall be programmed independently, back-to-back or overlapping.

O. The AFD shall be equipped with Metal Oxide Varistors (MOV's) wired to the input line terminals.

2.09 Adjustments and Configurations:

A. The AFD shall self-configure to the main operating supply voltage and frequency. No operator adjustments will be required.

B. Upon power-up, the AFD shall automatically send a signal to the connected motor and store the resulting resistance data into memory. The inductance data will be measured during no-load operation when operating at a frequency between 20-60 Hertz. The AFD will automatically optimize the operating characteristics according to the stored data.

C. The AFD will be factory pre-set to operate most common applications.

D. A choice of three types of acceleration and deceleration ramps shall be available in the AFD software; linear, S curve and U curve.

E. The acceleration and deceleration ramp times shall be adjustable from 0.1 to 999.9 seconds.

F. The volts per frequency ratios shall be user selectable to meet variable torque loads, normal and high torque machine applications.

G. The memory shall retain and record run status and fault type of the past eight (8) faults.

H. Slip compensation shall be a software enabled function.

I. The software shall have a NOLD (no load) function that will reduce the voltage to the motor when selected for variable torque loads. A constant volts/Hertz ratio will be maintained during acceleration. The output voltage will then automatically adjust to meet the torque requirement of the load.

J. The AFD shall offer programmable DC injection braking that will brake the AC motor by injecting DC current and creating a stationary magnetic pole in the stator. The level of current shall be adjustable between 50-150% of rated current and available from 0.0 - 30 seconds continuously. For continuous operation after 30 seconds, the current shall be automatically reduced to 50% of the nameplate current of the motor.

K. Sequencing logic shall coordinate the engage and release thresholds and time delays for the sequencing of the AFD output, mechanical actuation and DC injection braking in order to accomplish smooth starting and stopping of a mechanical process.

2.10 Operator Interface:

A. The operator interface terminal shall allow the modification of AFD adjustments through a touch keypad. All electrical values, configuration parameters, I/O assignments, application and activity function access, faults, local control, adjustment storage, self-test and diagnostics shall be in English.

B. The display shall be a high resolution, LCD backlighted screen capable of displaying graphics such as bar graphs as well as six (6) lines of twenty-one alphanumeric characters.

C. The AFD model number, torque type, software revision number, horsepower, output current, motor frequency and motor voltage shall all be listed on the drive identification display as viewed on the LCD display.

D. A single keystroke scrolling function shall allow dynamic switching between display variables.

E. The terminal keypad shall consist of programmable function keys. The functions shall allow both operating commands and programming options to be preset by the operator. A hardware selector switch shall allow the terminal keypad to be locked out from unauthorized personnel.

F. The operator terminal shall offer a general menu consisting of parameter setting, I/O map, fault history, and drive configuration. A software lock shall limit access to the main menu. The main menu shall consist of keypad configuration, drive configuration, general configuration, diagnostic mode and drive initialization screens.

G. There shall be arrow keys that shall provide the ability to scroll through menus and screens, select or activate functions or increase the value of a selected parameter.

H. A data entry key shall allow the user to confirm a selected menu, numeric value or allow selection between multiple choices.

I. An escape key shall allow a parameter to return the existing value if adjustment is not required and the value is displayed. The escape function shall also return to a previous menu display.

J. A RUN key and a STOP key shall command a normal starting and stopping as programmed when the AFD is in keypad control mode. The STOP key shall be active in all control modes.

K. The AFD shall have LED's mounted on the front panel to indicate functional status. An LED shall verify that the AFD power supply is on. An LED indicator shall indicate an AFD fault. An LED indicator shall designate a pending fault condition.

L. The status LED's shall be able to be remotely mounted up to 3 meters from the AFD.

M. A user interface shall be available that is a Windows-based personal computer, serial communication link or detachable operator interface.

N. The keypad and all door mounted controls shall be NEMA Type 1 rated.

O. The AFD shall include an RS-485/Modbus port for communication with the existing programmable logic controller (PLC).

2.11 Control:

A. External pilot devices shall be able to be connected to a terminal strip for starting/stopping the AFD, speed control and displaying operating status. All control inputs and outputs shall be software assignable.

B. 2-wire or 3-wire control strategy shall be defined within the software. External relays or logic devices will not be allowed.

C. The control power for the digital inputs and outputs shall be as designated in the drawings. Appropriate interface modules shall be provided as required.

D. The internal power supply shall incorporate an automatic current fold-back that protects the internal power supply if incorrectly connected or shorted. The transistor logic outputs shall be current limited and not be damaged if shorted or excess current is pulled.

E. All logic connections shall be furnished on pull apart terminal strips.

F. There shall be two (2) software assignable, analog inputs. The analog inputs shall be software selectable and consist of the following configurations: 0-20 mA, 4-20 mA, 20-4 mA, x-20 mA (where x is user defined) 0-5 v, 1-5 v or 0-10 v.

G. There shall be four (4) software assignable, isolated logic inputs that can be selected and assigned in the software. The selection of assignments shall consist of run/reverse, jog, plus/minus speed (2 inputs required), setpoint memory, preset speeds (up to 2 inputs), auto/manual control, controlled stop, terminal or keypad control, bypass (2 inputs required), motor switching and fault reset.

H. There shall be two (2) software assignable analog outputs that can be selected and assigned in the software. The analog output assignments shall be proportional to the following motor characteristics: frequency, current, power torque, voltage and thermal state. The output signal shall be selectable from 0-20 mA or 4-20 mA.

I. Two (2) voltage-free Form C relay output contacts shall be provided. One of the contacts shall indicate AFD fault status. The other contact shall be user assignable.

J. There shall be a hardware input/output extension module which also provides interlocking and sequencing capabilities. The module shall be fully isolated and housed in a finger safe enclosure with pull apart terminal strips. The module shall provide four (4) logic inputs, two (2) analog inputs, two (2) relay outputs and one (1) analog output. All of the I/O shall be user assignable in the software as previously defined.

K. The AFD door mounted controls shall include a power ON, Drive RUN, Drive Fault Light and Hand-Off-Auto selector switch with Manual Speed Potentiometer.

3.0 EXECUTION

3.01 Inspection:

A. Verify that the location is ready to receive work and the dimensions are as indicated.

B. Do not install the AFD until the building environment can be maintained within the service conditions required by the manufacturer.

3.02 Protection: Before and during the installation, the AFD equipment shall be protected from site contaminants and weather elements.

3.03 Installation:

A. Installation shall be in compliance with manufacturer's instructions, drawings and recommendations.

B. The AFD manufacturer shall provide for two (2) days a factory certified technical representative to supervise the contractor's installation, testing and start-up of the AFD equipment. The start-up services shall be included in the cost of the equipment.

3.04 Harmonic Testing: No harmonic testing is required.

3.05 Training: An on-site training course of one (1) training day shall be provided by a representative of the AFD manufacturer to OWNER's operations and maintenance personnel. The cost of training shall be included in the total bid price.

City standardization letter for variable frequency drive:

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Low Voltage Variable Frequency Drives

Name of Company considered Single Source: Yaskawa

Conditions and circumstances for the single source. Please be specific:

The City of Tampa Wastewater Department operates and maintains over 220 pumping stations and the Howard F. Curren Advanced Wastewater Treatment plant. In many of the pump stations and at many locations in the treatment plant, low voltage variable frequency drives (VFDs) are required to control electrical motors. These motors operate pumps, fans and blowers that are critical to pumping and treating wastewater.

Over the last 10 years, Yaskawa VFDs have proven to be the most reliable VFDs the Wastewater Department has used. The Department has used a wide variety of VFDs over the last 25 years. Yaskawa VFDs have required little or no maintenance.

Standardizing on Yaskawa VFDs will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department Director's Signature: Ralph L. Metcalf

Ralph L. Metcalf, P.E., Director of Wastewater Department

Date of Request: 4/6/10

Requisition Number: Generic **Buyer Name:**

Purchasing Department Action: Approved

Signature: **Date:** 4-7-10

(End of Section 16483)