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 14-C-00052

CHLORINE PIPING AND CHEMICAL BUILDING IMPROVEMENTS - D. L. Tippin WTF

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

AUGUST 2014

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

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BID NOTICE MEMO

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

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CONTRACT NO.: 14-C-00052; Chlorine Piping and Chemical Building Improvements – D. L. Tippin WTF
BID DATE: September 9, 2014 ESTIMATE: $700,000 SCOPE: The project comprises replacing the carbon steel gas and liquid chlorine piping, valves, and appurtenances; removing and replacing one roll-up door, in-kind; removing and replacing one roll-up door with a new masonry wall and foundation; pressure washing and painting the interior of the Rail Car Room; replacing lighting fixtures in the Rail Car Room and Chlorine Room and all associated work required for a complete project in accordance with the Contract Documents. PRE-BID CONFERENCE: Tuesday, August 26, 2014, 10:00 a.m. at the David L. Tippin Water Treatment Facility located at 7125 N. 30th Street, Tampa, FL 33610, Main Building 1st Floor Conference Room. Please send an email referring to this pre-bid conference and listing the names and companies represented for all attendees a minimum of 24 hours in advance to Israel.Vigier@ci.tampa.fl.us 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 14-C-00052; Chlorine Piping and Chemical Building Improvements - D.L. Tippin WTF

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., September 9, 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, replacing the carbon steel gas and liquid chlorine piping, valves, and appurtenances; removing and replacing one roll-up door, in-kind; removing and replacing one roll-up door with a new masonry wall and foundation; pressure washing and painting the interior of the Rail Car Room; and replacing lighting fixtures in the Rail Car Room and Chlorine Room and 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 a Public Construction Bond 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 Chlorine Piping and Chemical Building Improvements - D.L. Tippin WTF 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 150 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 16.4% has been established for subcontracting with Small Local Business Enterprises, (SLBEs), certified by the City. The goal is based upon the availability of the firms listed on the Goal Worksheet and as posted in the "SLBEs" link under this Contract's notice on the Department's Construction Project Bidding web page.

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

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

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

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

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

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

I-1.11 BID SECURITY:

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

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.12 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 issued and executed by (a) surety company(ies) acceptable to the City of Tampa and licensed to underwrite contracts in the State of Florida. After execution of the Agreement and before commencing work, the Contractor must provide the City a certified copy of the officially recorded Bond.

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

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

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

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

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

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

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

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

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

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

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

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

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

I-1.17 PAYMENT DISPUTE RESOLUTION

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

I-1.18 SCRUTINIZED COMPANIES.

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

I-1.19 FLORIDA'S PUBLIC RECORDS LAW

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

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

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

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

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

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

SECTION 2
GENERAL INSTRUCTIONS

I-2.01 BIDDER'S RESPONSIBILITY

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

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

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

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

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

I-2.02 FORM, PREPARATION AND PRESENTATION OF PROPOSALS

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

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

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

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

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

I-2.03 ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Plans, Specifications, or other Contract Documents will be made to any Bidder orally.

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

I-2.04 BID SECURITY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT
FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

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

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

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

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

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

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

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

CITY OF TAMPA INSURANCE REQUIREMENTS

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

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

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

The following coverages are required:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

City of Tampa MBD Office

U-WMBE Goal Setting Firms Report

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CONCRETE, BRICK, MASONARY

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

Horus Construction Services **Federal Number** 59-3675651
P.O. Box 10667 **Phone** (727) 898-6877 **Minority** African American
St. Petersburg, FL 33733 **Fax** (727) 898-6896 **Contact** James Graham, Jr.
E-mail horuscons1@juno.com

Excel 4, LLC **Federal Number** 45-4149326
P.O. Box 4475 **Phone** (407) 480-8976 **Minority** African American
Winter Park, FL 32793 **Fax** **Contact** Cleo Davis
E-mail excel4llc@yahoo.com

ELECTRICAL SERVICES

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

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

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

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

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

City of Tampa MBD Office

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PAINTING AND OTHER SERVICES, INTERIOR & EXTERIOR

USAMA Specialty Finishes, Inc. **Federal Number** 59-2877558

P.O. Box 1748
Safety Harbor, FL 34695-1748

Phone (727) 725-9005
Fax (727) 726-7363

Minority African American
Contact Muqit Usama

E-mail usama57@verizon.net

Fletcher Painting, Inc. d/b/a/ Fletcher Enterprise **Federal Number** 59-3587717

4355 Fairmont Street #8
Orlando, FL 32808

Phone (407) 290-1188
Fax (407) 290-9309

Minority African American
Contact Junior Fletcher

E-mail fletcherent-stacy@cfl.rr.com

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CONCRETE, BRICK, MASONARY

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

9001 126th Ave. North
Largo, FL 33773

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

Minority Small Business
Contact Israel Castro

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

P.O. Box 11005
Tampa, FL 33680

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

Minority Small Business
Contact Fernando Llop

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

10503 Palm Cove Ave
Tampa, FL 33647

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

Minority Small Business
Contact Ahmad Erchid

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

246 W Canal Drive
Palm Harbor, FL 34684

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

Minority Small Business
Contact Chet Netherly

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

3926 E. Eden Roc Circle
Tampa, FL 33634

Phone (813) 493-4762
Fax (813) 882-3455
E-mail velezconcrete99@gmail.com

Minority Small Business
Contact John Velez

JNandlal Maintenance Services of Brandon, LLC **Federal Number** 76-0821164

3008 King Phillip Way
Sefner, FL 33584

Phone (813) 679-7769
Fax (813) 654-7675
E-mail JamesNandlal@msn.com

Minority Small Business
Contact James Nandlal

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

2053 Mountain Ash Way
New Port Richey, FL 34655

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

Minority Small Business
Contact Manuel Kavouklis

City of Tampa MBD Office

SLBE Goal Setting Firms Report

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CONCRETE, BRICK, MASONARY

Andras Construction Service, LLC — **Federal Number** 20-4468935

18449 Lake Iola Rd
Dade City, FL 33523

Phone (813) 482-2581
Fax (352) 588-2073
E-mail jeffandras@gmail.com

Minority Small Business
Contact Jeffrey Andras

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

1320 E. 137th Ave
Tampa, FL 33613

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

Minority Small Business
Contact William Connor

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

11697 Walsingham Rd.
Largo, FL 33778

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

Minority Small Business
Contact Harold Kilgore

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

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

Phone (813) 402-8827
Fax (813) 388-4554
E-mail get-it-done@mytbcgroup.com

Minority Small Business
Contact Joy Iurato

Acclaim Service Group, Inc. — **Federal Number** 36-4668231

1324 Seven Springs Blvd., #325
New Port Richey, FL 34655

Phone (727) 848-3200
Fax (727) 848-3211
E-mail jamie@acclaimservicegroup.com

Minority Small Business
Contact Jamie Jones

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

City of Tampa MBD Office

SLBE Goal Setting Firms Report

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ELECTRICAL SERVICES

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

1201 W Waters Ave.
Tampa, FL 33604

Phone (813) 849-6331 **Minority** Small Business
Fax (813) 514-0473 **Contact** Rodney Jones
E-mail allinoneelectric@msn.com

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

6600 N. Florida Avenue
Tampa, FL 33604

Phone (813) 234-4004 **Minority** Small Business
Fax (813) 236-0394 **Contact** Jeffrey Priede
E-mail jdpinc@tampabay.rr.com

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

9353 E. Fowler Ave.
Thonotosassa, FL 33592

Phone (813) 264-9234 **Minority** Small Business
Fax (813) 333-9701 **Contact** Armando Hernandez
E-mail lhernandez@mandyselectric.com

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

3316 Bainbridge Dr.
Holiday, FL 34691

Phone (727) 847-3766 **Minority** Small Business
Fax (727) 845-3567 **Contact** Ralph Philbrook III
E-mail philbrook3llc@aol.com

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

3305 N. Stanley Rd.
Plant City, FL 33565

Phone (813) 986-6106 **Minority** Small Business
Fax (813) 986-9633 **Contact** Bill Crevello
E-mail crevelloelectric@gmail.com

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

7046-B West Hillsborough Ave
Tampa, FL 33634

Phone (813) 901-8185 **Minority** Small Business
Fax (813) 884-5060 **Contact** Jose Cruz
E-mail ehs915@aol.com

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

333 North Falkenburg Rd, Suite B201
Tampa, FL 33619

Phone (813) 684-7459 **Minority** Small Business
Fax (813) 654-0420 **Contact** Scott Mroczkowski
E-mail scott@sjmelectric.com

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ELECTRICAL SERVICES

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

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

845 Thompson Road
Lithia, FL Fl

Phone (813) 645-7000
Fax (813) 654-7568
E-mail john@reliableelectricusa.com

Minority Small Business
Contact John Babuka

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

1202 Gary Ave
Ellenton, FL 34222

Phone (941) 722-9227
Fax (941) 722-3318
E-mail georgeperry2@gmail.com

Minority Small Business
Contact George Perry

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

9170 126th Avenue N
Largo, FL 33773

Phone (727) 588-0126
Fax (727) 588-9170
E-mail mark.aaec@yahoo.com

Minority Small Business
Contact Mark Comerford

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

433 37th Ave NE
St. Petersburg, FL 33704

Phone (727) 460-8779
Fax
E-mail rhythmselectric@me.com

Minority Small Business
Contact Mathew Krchmar

City of Tampa MBD Office

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ELECTRICAL SERVICES

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

P.O. Box 579
Tampa, FL 33614

Phone (813) 986-3472
Fax (813) 986-5979
E-mail atrujill@tampabay.rr.com

Minority Small Business
Contact Steven Moates

PAINTING AND OTHER SERVICES, INTERIOR & EXTERIOR

USAMA Specialty Finishes, Inc. **Federal Number** 59-2877558

P.O. Box 1748
Safety Harbor, FL 34695-1748

Phone (727) 725-9005
Fax (727) 726-7363
E-mail usama57@verizon.net

Minority Small Business
Contact Muqit Usama

Harry's Painting & Enterprises, Inc. **Federal Number** 59-2820441

5250 Avery Road
New Port Richey, FL 34652

Phone (727) 848-1950
Fax (727) 847-3474
E-mail hp@harryspainting.com

Minority Small Business
Contact Sherrie Satterfield

Diversified Coatings & Finishes, Inc. **Federal Number** 59-3460053

12540 Green Oak Lane
Dade City, FL 33525

Phone (813) 494-5543
Fax (352) 567-1718
E-mail bobcookdcf@gmail.com

Minority Small Business
Contact Bob Cook

Federico's Painting Corp **Federal Number** 20-3279278

6615 Winding Oak Dr.
Tampa, FL 33625

Phone (813) 908-1404
Fax (813) 908-1404
E-mail federico_de_la_pava@hotmail.com

Minority Small Business
Contact Federico De La Pava

Gulf Coast Contracting, LLC **Federal Number** 20-1424580

P.O. Box 2178
Tarpon Springs, FL 34688-2178

Phone (727) 938-6081
Fax (727) 937-0967
E-mail gulfcoastoffL@aol.com

Minority Small Business
Contact Manuel Gialousis

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 8/5/2014

PAINTING AND OTHER SERVICES, INTERIOR & EXTERIOR

C&C Painting Contractors Inc. **Federal Number** 59-3617521

8372 Standish Bend Dr.
Tampa, FL 33615

Phone (813) 886-7100 **Minority** Small Business
Fax (813) 886-7102 **Contact** Carlos Cubas
E-mail carlos@ccpainting.com

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

2053 Mountain Ash Way
New Port Richey, FL 34655

Phone (727) 243-9234 **Minority** Small Business
Fax (727) 848-2026 **Contact** Manuel Kavouklis
E-mail manny@cmkconstructioninc.com

Kimszal Contracting Inc. **Federal Number** 20-3450022

3435 Chessington Drive
Land O' Lakes, FL 34638

Phone (813) 949-1750 **Minority** Small Business
Fax (813) 948-0451 **Contact** Edward Kimszal
E-mail edkimszal@msn.com

Leo's Construction, Inc. **Federal Number** 51-0456226

1320 Illinois Ave.
Palm Harbor, FL 34683

Phone (727) 858-0266 **Minority** Small Business
Fax **Contact** Travis Smudde
E-mail LeosConstructionInc@yahoo.com

Elite Industrial Painting, Inc. **Federal Number** 90-0658000

55 Dodecanese Blvd
Tarpon Springs, FL 34689

Phone (727) 487-3636 **Minority** Small Business
Fax (727) 940-5224 **Contact** Theofilos Manglis
E-mail Thmanglis@yahoo.com

Universal Contracting Services, Inc. **Federal Number** 20-1452205

11311 Hollyglen Drive
Tampa, FL 33624

Phone (813) 966-1508 **Minority** Small Business
Fax **Contact** Hadeel Eishesbaiy
E-mail ucs@email.com

West Star Painting, Inc. **Federal Number** 59-3295920

1717 Virginia Ave
Palm Harbor, FL 34683

Phone (727) 253-4637 **Minority** Small Business
Fax (727) 772-7417 **Contact** Flora Giannas
E-mail weststarpainting@aol.com

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 8/5/2014

SLBE Contract Goal

Goal
16.4%

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)

Contract 14-C-00052; Chlorine Piping and Chemical Building Improvements - D.L. Tippin WTF

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 replacing the carbon steel gas and liquid chlorine piping, valves, and appurtenances; removing and replacing one roll-up door, in-kind; removing and replacing one roll-up door with a new masonry wall and foundation; pressure washing and painting the interior of the Rail Car Room; and replacing lighting fixtures in the Rail Car Room and Chlorine Room, any allowances that may be listed in Section 01020, and with all associated work required for a complete project in accordance with the Contract Documents. _____ _____ dollars and _____ cents (BASE BID) LS	$_____

Computed Total Price In Words:

_____

_____ dollars and _____ cents.

Computed Total Price in Figures: $_____

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

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

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

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

Total Cost $_____

Signed _____

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

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

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

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

Dated _____, 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 14-C-00052; Chlorine Piping and Chemical Building Improvements - D.L. Tippin WTF

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 14-C-00052, Chlorine Piping and Chemical Building Improvements - D.L. Tippin WTF.

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 14-C-00052 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 14-C-00052; Chlorine Piping and Chemical Building Improvements - D.L. Tippin WTF, shall include, but not be limited to, replacing carbon steel gas and liquid chlorine piping, valves, and appurtenances; replacing chlorination equipment; removing and replacing one roll-up door, in-kind; removing and replacing one roll-up door with a new masonry wall and foundation; reinforcing the north wall of the Rail Car Room; pressure washing and painting the interior of the Rail Car Room; and replacing lighting fixtures in the Rail Car Room and Chlorine Room 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:

_____

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.

* * * * * * *

SUPPLEMENTARY GENERAL PROVISIONS

1.0 GENERAL:

1.1 This Section sets forth modifications to the "General Provisions" of the Contract Documents which are referred to as Specifications, General Provisions.

1.2 Paragraph numbers and titles used herein refer to similarly numbered and titled articles in the General Provisions.

1.3 Only those paragraphs contained herein shall be assumed to be modified. Paragraphs not appearing herein shall apply as written in the General Provisions.

1.4 Any portion of the General Provisions, whether or not modified herein, may be further modified in Special Conditions and in the Instructions to Bidders of these Specifications.

1.5 Where the Supplementary General Provisions, Special Conditions and Instructions to Bidders conflict with the General Provisions, the Supplementary General Provisions, Special Conditions and the Instructions to Bidders shall take precedence.

2.0 MODIFICATIONS TO THE GENERAL PROVISIONS AS FOLLOWS:

2.1 SECTION 1 SCOPE AND INTENT

G-1.02 WORK INCLUDED

The first paragraph shall be deleted in its entirety and replaced by the following paragraph:

"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 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 incidental thereto. He shall repair or restore all during performance of the work."

2.2 SECTION 3 WORKING DRAWINGS

a. Change to read as follows:

SECTION 3 SHOP DRAWINGS

b. Replace the existing paragraphs in their entirety with the following paragraphs:

G-3.01 SCOPE

Shop drawings, schedules, etc., shall be submitted to the Engineer and/or Architect in quadruplet, accompanied by a letter of transmittal. Subcontractors and suppliers shall submit shop drawings and make requests for approvals through their respective prime Contractors.

The drawings shall be numbered consecutively and shall accurately and distinctly present the following:

(1) Names of equipment or materials, and the locations at which the equipment or materials are to be installed in the work.

(2) All working and erection dimensions.

(3) Arrangement and sectional views.

(4) Necessary details, including complete information for making connections between work under this contract and work under other contracts.

(5) Kinds of materials and finishes.

(6) Parts list and description thereof.

The Engineer and/or Architect may decline to consider any shop drawing that does not contain complete data on the work and full information of related matters.

Fax submittals will not be reviewed.

G-3.02 APPROVAL:

Shop drawings shall be examined by the Contractor prior to his transmitting them to the Engineer and/or Architect. Shop drawings submitted to the Engineer and/or Architect shall bear the Contractor's stamp of approval evidencing that he has examined and checked each drawing and that he has found said drawings to be in accordance with the Contract requirements. Any drawings submitted without this stamp will not be considered by the Engineer and/or Architect and will be returned to the Contractor for re- submission.

If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of submittal and the following shall be submitted:

(1) Each request shall include a complete description of the proposed substitute and the name of the material or equipment for which it is to be substituted.

(2) Furnish drawings, cut, manufacturer's printed specifications, performance and test data and any other data or information necessary for a complete evaluation of both the item specified and the proposed substitute item.

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.

Approval of the drawings shall be general and shall not relieve the Contractor of responsibility for the accuracy of such drawings, nor for the quantities of materials and equipment, nor for the proper fitting and construction of the work, nor for the furnishing of materials, tools, equipment, etc., required by this contract and not indicated on the drawings.

No work called for by Shop Drawings shall be done until the said drawings have been approved by the Engineer and/or Architect.

The Contractor shall revise and resubmit the shop drawings as required by the Engineer and/or Architect until approval thereof is obtained.

The City shall retain four (4) copies of all submittals unless the Engineers and/or Architect makes a specific request for additional copies.

Items	Submittals	*Approval
All trade	Fourteen (14) Days	Fourteen (14) Days

*From date of receipt of submittal.

Delays on account of tardy or untimely submittals will not be considered as causes of extension of time of the Contract or increases to the Contract Sum.

G-3.03 JOB SITE:

One (1) copy of all approved submittals SHALL BE available at the Contractor's Office at the job site.

2.3 SECTION 4 MATERIALS AND EQUIPMENT

G-4.01 GENERAL REQUIREMENTS

In the first paragraph, second line, delete the word "specifications" and substitute the words "Contract Documents".

G4.03 REFERENCE TO STANDARDS

The following paragraph shall be added in its entirety:

"Compliance with the Standard Building Code, latest edition, and all local electrical and plumbing codes shall be required. In the event of a conflict in code requirements, the most stringent code or standard shall apply."

G-4.05 EQUIVALENT QUALITY

Add the following sentence to paragraph two: "Any professional fees associated with shop drawing review of materials or equipment submitted for approval as equivalent to that specified shall be borne by the Contractor.

2.4 SECTION 5 INSPECTION AND TESTING

G-5.06 PRELIMINARY FIELD TESTS

G-5.07 FINAL FIELD TEST

A. Add the following sentence to BOTH of the above paragraphs:

The Contractor shall provide, at NO EXTRA COST to the City, ALL labor, tools, equipment, materials, etc., for the Engineer and/or Architect to make any field test that may be required in the judgment of the Engineer and/or Architect.

2.5 SECTION 6 TEMPORARY STRUCTURES

G-6.03 CONTRACTOR'S FIELD OFFICE

a. In the last sentence of this paragraph, add the following words: "...and Shop Drawings".

G-6.03 CONTRACTOR'S FIELD OFFICE

A. Delete this paragraph G-6.03 in its entirety.

2.6 SECTION 7 TEMPORARY SERVICES

G-7.01 WATER, G-7.02 LIGHT AND POWER, AND G-7.03 SANITARY REGULATIONS

The City will provide potable water service from existing connection or fixtures. The quantity of water available is limited to that which might be available from a hose connection. Any other water required by the Contractor for the Work shall be the responsibility of the Contractor and shall be supplied from his own source of supply (tanker trucks or the like). Construction and removal of piping from existing connections and/or use of a separate construction water service shall be the responsibility of the Contractor, and such cost shall be included in the Lump Sum Price and no separate payment will be made therefore.

Any electrical service required during construction shall be responsibility of the Contractor and such cost shall be included in the Lump Sum Price and no separate payment will be made therefore.

G-7.07 TELEPHONE

The Contractor shall furnish the Engineer with a telephone number(s) by which the Engineer may contract the site.

2.7 SECTION 14 MISCELLANEOUS

G-14.04 USE OF EXPLOSIVES:

Explosives will not be used on the work except when authorized by the Engineer and/or Architect. The use of same, if authorized, shall conform to laws or ordinances which may pertain to the use of same and the utmost care will be exercised by the Contractor so as not to endanger life or property. The Contractor will assume full responsibility in connection with use of any explosives even though authorized. Explosives will not be stored within the City limits.

G-14.05 OWNERSHIP OF MATERIALS:

The removal of any underground and surface structures, equipment, and materials, as required shall become the property of the Contractor and shall be disposed of in a safe and legal manner.

G-14.06 NOTICE OR SERVICE THEREOF:

All notices, which shall include demands, instructions, requests, approvals and claims, shall be in writing.

Any notice to or demand upon the Contractor shall be sufficiently given if delivered to the office of the Contractor specified in the bid (or to such other office as the Contractor may, from time to time, designate to the City in writing), or if deposited in the United States mail in a sealed, postage-prepaid envelope, or delivered, with charges case addressed to such office.

All notices required to be delivered to the City shall, unless otherwise specified in writing to the Contractor, be delivered to Contract Administration Department – Construction Management Division, 3808 East 26th Avenue, Tampa, Florida 33605, and any notice to or demand upon the City shall be sufficiently given if delivered to the office of the said Engineer and/or Architect, or if deposited in the United States mail in a sealed, postage- prepaid envelope, or delivered with charges prepaid to any telegraph company for transmission, in each case addressed to said Engineer and/or Architect or to such other representative of the City or to such other address as the City may subsequently specify in writing to the Contractor or to its representative at the construction site for such purposes.

Any such notice or demand shall be deemed to have been given or made as of the time of actual delivery or (in the case of mailing) when the same should have been received in due course of post or (in the case of telegram) at the time of actual receipt, as the case may be.

G-14.07 REQUIREMENTS FOR CONTROL OF THE WORK:

Prior to the start of the work included in this contract, a Preconstruction Conference will be held by the Engineer and/or Architect to be attended by the Contractor and representatives of the various utilities and others for the purpose of establishing a schedule of operations which will coordinate the work to be done under this contract with all related work to be done by others within the limits of the project. The Contractor shall be prepared for this meeting and shall present a comprehensive construction schedule for all items of work to be accomplished by him, which will be used as the basis for the development of an overall operational schedule and a list of subcontractors to be used on this work.

All items of work on this contract shall be coordinated so that progress on each related work item will be continuous from week to week. The progress of the work will be reviewed by the Engineer and/or Architect at the end of each week, and if the progress on any item of work during that week is found to be unsatisfactory, the Contractor shall be required to adjust the rate of progress on that item or other items as directed by the Engineer and/or Architect.

The Contractor shall conduct his operations in such a manner as will result in a minimum of inconvenience to occupants of adjacent homes and business establishments and shall provide temporary access as directed or as conditions in any particular location may require.

G-14.08 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 a Work Directive Change 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."

G-14.09 RESERVED PARKING SIGNS IN PARKING METER AREAS

Not Applicable.

G-14.10 EROSION AND SEDIMENT CONTROL:

Not Applicable.

G-14.11 ENGINEER'S FIELD OFFICE:

Not applicable.

G-14.12 PROJECT SIGNS:

The Contractor shall furnish and install, as directed by the Engineer and/or Architect, a project sign of design, size, color, etc., as per drawing page SIGN-1.

G-15.0 NOTIFICATION TO CONTRACTORS:

All Contractors working in City of Tampa buildings and facilities that contain Asbestos Containing Materials (ACM) will be provided with a written notice, including contract custodial firms. The notice when applicable will advise Contractors about the possibility of encountering ACM while working for the City and will require Contractors to become familiar with locations of ACM within their work areas. The Contractor Notice shall include the name and phone number of the designated Building Asbestos Contact Person assigned to that building/facility. This notice is provided in Appendix C.

Appendix C

Contractor Notification Requirements

Asbestos-Containing Material (ACM) may be present in the facility. The presence of ACM does not necessarily mean that a hazard exists; however, a hazard may be created when ACM is disturbed and asbestos fibers become airborne. The best way to maintain a safe environment is to avoid the disturbance of ACM.

It is possible that you may encounter ACM while working in the facility. On the bulletin board, there is a summary of known locations of ACM in that building. The summary may or may not be all inclusive. Therefore, workers must exercise caution and be watchful for materials that might contain asbestos. Avoid disturbing ACM or suspected ACM as you carry out your work.

If your work necessitates the disturbance of ACM you shall take whatever precautions that are necessary to protect human health and the environment from asbestos fibers. At minimum, you will comply with all Federal, State, and Local responsible for assuring that you are medically certified, trained, and equipped with the proper personal protective devices for safe handling of ACM. You must notify the designated Building Asbestos Contact Person before disturbing any asbestos-containing materials in City-Owned buildings. The designated Building Asbestos Contract Person is listed on the bulletin board with the asbestos location summary.

If you need additional information regarding ACM in a particular building or would like to see a copy of the Operations and Maintenance Plan, contact the Building Asbestos Contact Person responsible for the building for which you will be working.

Comply with all regulatory requirements for removal and disposal

SPECIAL CONDITIONS

1.0 PRECONSTRUCTION BRIEFING:

The Contractor, upon receiving notice that he has been awarded the contract for the construction of the project, shall make an appointment with the Engineer and/or Architect for said briefing. The Contractor shall bring to this meeting the following:

1. Contract Documents not yet submitted.
2. A detailed Job Progress Schedule.
3. Samples, questions, etc., he feels necessary.
4. List of subcontractors.

Failure to bring the above items to the meeting will result in cancellation of meeting. Once items have been submitted, meeting will be rescheduled by the City. Site access and commencement of work will not be allowed during period between meetings.

Contractor shall have representatives present at meeting that are familiar with and conversant on, the scope of the work and Contract Document requirements. Failure to have such persons present will also result in cancellation and rescheduling of meeting until such a time when condition is corrected.

Elapsed time as a result of the Contractor's failure to comply with above will not result in an extension of contract time.

2.0 SITE REVIEW:

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 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.

The Contractor shall immediately, upon entering project site for the purpose of beginning work, review project site with the Engineer and/or Architect for the purpose of selecting area(s) to place materials for storage.

The Contractor must exercise proper precaution to verify all figures shown or indicated on the drawings, all existing trees, paved areas; utilities, etc., shall be located before beginning any work, and he shall be held responsible for any error resulting from his failure to exercise such precaution.

2.1 LAYING OUT WORK:

The Contractor shall locate all general reference points and take necessary action to prevent their destruction; lay out his own work and be responsible for all lines, elevations, measurements, grading, trenching, backfilling, utilities and other work to be executed by him for a complete project under this contract.

The Contractor shall lay out all work and have final approval by the Engineer and/or Architect before installation begins. Contractor shall be held responsible for any error resulting from his failure to exercise such approval. Said errors shall be corrected by the Contractor at NO EXTRA COST to the City.

The final location of all work to be performed shall be made jointly by the Engineer and/or Architect and the Contractor at the project site.

3.0 SAFETY AND HEALTH STANDARDS:

The performance of all construction under this contract shall conform to ALL Local, State, Federal Occupation Safety and Health Act Standards.

At the end of each work day, all work areas shall be left in a safe condition. Barricades and/or warning devices shall be provided for at any open excavations or barriers on the project site.

The Contractor's attention is directed to paragraphs Article 3.07 (page A-10) and Article 12.03 (page A-31) of the Agreement, and paragraph G-7.04 (page G-18) of the General Provisions.

4.0 INFORMATION FOR COLOR SCHEDULES:

Not later than thirty (30) calendar days after authorization to proceed with contract work, the Contractor shall submit to the Engineer and/or Architect the names of all manufacturers and trade names for all materials involving selection based upon color or texture or other design appearance features which are to be used in this project. Where samples are necessary for such selection, furnish same.

If such information is not furnished by Contractor within thirty (30) day period, the Engineer and/or Architect will select colors and textures from products named in the Contract Documents.

5.0 RESPONSIBILITY OF CONTRACTOR:

The Contractor shall take all necessary precautions to protect all project surfaces and adjoining areas from mechanical damage from tools, equipment, materials, supports, etc., and shall provide adequate protection from leaking lubricants or fluids from his equipment.

Damage to said project surfaces and adjoining areas caused by a lack of protection or negligence by the Contractor shall be repaired and/or replaced at NO EXTRA COST to the City and to the full satisfaction of the Engineer and/or Architect.

The Contractor and all subcontractors are charged with the protection of the work and property, but the final responsibility for these provisions rests with the Contractor who shall take complete charge of the project site from start to finish of work.

6.0 COORDINATION WITH N.I.C. ITEMS:

The Contractor shall give to the Engineer and/or Architect, in writing, a time schedule for the installation or removal of all N.I.C. items at the beginning of the project. Failure of the Contractor to supply the Engineer and/or Architect with said schedule shall not be used for reason of time extension by the Contractor.

7.0 ELECTRICAL SERVICE LOCATION:

Any electrical service required during construction shall be the responsibility of the Contractor and such cost shall be included in the Lump Sum Price and no separate payment will be made therefore.

8.0 SCHEDULING:

The Contractor shall provide the City with a detailed schedule prior to start of work.

The schedule shall be a fully developed, horizontal bar-chart type Contractor's construction schedule. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".

Unless otherwise directed or approved, prepare schedule on a single 8-1/2" X 14" sheet of plain bond white paper.

Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.

Contractor shall also prepare schedule in accordance with applicable portions of Section 4.02 of the Agreement.

9.0 ASSIGNMENT OF CONTRACT: Not applicable.

10.0 WORKMANSHIP AND MATERIALS:

Workmanship and materials shall be installed in accordance with accepted standards of the specific trade, as defined by the applicable recognized trade association(s). In the event of a conflict between these trade standards and the Contract Documents, the conflict shall be brought to the Engineer's and/or Architect's attention writing and the final decision shall be made by the Engineer and/or Architect.

11.0 RECORD DRAWINGS:

During the course of the work, Contractor shall maintain, at the site, a clean undamaged set of the Contract Documents. Contractor shall mark set, on a daily basis, with location and progress of all contract work.

Drawings shall be on site at all times and available for review by the City. Failure of Contractor to have drawings on site and/or up to date may result in suspension of work until situation is corrected. Extension of contract will not be granted for such condition.

At conclusion of work, the Contractor shall provide the City with one complete set of Electronic Record Drawings incorporating changes described above, and four marked hard copy sets of as-built record drawings clean and damaged free shall also be submitted to the City at the same time. Electronic files will be issued to the Contractor by the City of Tampa. These files will be AutoCAD DWG, AutoCAD DWF or Adobe PDF latest versions.

12.0 ON SITE RECYCLABLE CRITERIA:

Contractor shall make reasonable attempts to recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Contractor shall develop and implement a Construction Waste Management Plan that identifies the materials that are to be diverted from disposal by weight or volume and be directed to a recycling facility. Specific area(s) on the construction site shall be designated for collection and tracking of the designated materials as needed. Location of the recycling area on site shall be coordinated with the project owner's representative on site prior to construction start. The intent of this section is to encourage recycling where practical in the context of the scope of work.

Contractor shall submit the following but not limited to items related to this section:

1. Provide a submittal of the contractor's plan of action to recycle

2. Contractor is required to document all activities with above requirements and provide to the city upon request items that are recyclable, documentation of the quantity of material disposed at a recycling facility.

City of Tampa – DMI Sub-(Contractors/Consultants/Suppliers) Payments

(FORM MBD-30)

[ ] Partial [ ] Final

Contract No.: _____ WO#,(if any):_____ Contract Name:_____

Contractor Name:_____ Address:_____

Federal ID:_____ Phone:_____ Fax:_____ Email:_____

GC Pay Period:_____ Payment Request/Invoice Number:_____ City Department:_____

Total Amount Requested for pay period: $_____ Total Contract Amount(including change orders):$_____

-Type of Ownership - (F=Female M=Male), BF BM = African Am., HF HM = Hispanic Am., AF AM = Asian Am., NF NM = Native Am., CF CM = Caucasian S = SLBE

Type Trade/Work Activity []Sub []Supplier Federal ID	Company Name Address Phone & Fax	Total Sub Contract Or PO Amount	Amount Paid To Date Amount Pending Previously Reported	Amount To Be Paid For This Period Sub Pay Period Ending Date
			$	$
			$	$
			$	$
			$	$
			$	$
			$	$

(Modifying This Form or Failure to Complete and Sign May Result in Non-Compliance)

Certification: I hereby certify that the above information is a true and accurate account of payments to sub – contractors/consultants on this contract.

Signed:_____ Name/Title:_____ Date:_____

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

Page 2 of 2 – DMI Payment

Instructions for completing The DMI Sub-(Contractors/Consultants/ Suppliers) Payment Form (Form MBD-30)

This form must be submitted with all invoicing or payment requests where there has been subcontracting rendered for the pay period. If applicable, after payment has been made to the subcontractor, "Waiver and Release of Lien upon Progress Payment", "Affidavit of Contractor in Connection with Final Payment", or an affidavit of payment must be submitted with the amount paid for the pay period. The following will detail what data is required for this form. The instructions that follow correspond to the headings on the form required to be completed. **(Modifying or omitted information from this form my result in non-compliance).**

- **Contract No.** This is the number assigned by the City of Tampa for the bid or proposal.
- **W.O.#** If the report covers a work order number (W.O.#) for the contract, please indicate it in that space.
- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid or proposal.
- **Contractor Name.** The name of your business.
- **Address.** The physical address of your business.
- **Federal ID.** A number assigned to a business for tax reporting purposes.
- **Phone.** Telephone number to contact business.
- **Fax.** Fax number for business.
- **Email.** Provide email address for electronic correspondence.
- **Pay Period.** Provide start and finish dates for pay period. (e.g. 05/01/13 – 05/31/13)
- **Payment Request/Invoice Number.** Provide sequence number for payment requests. (ex. Payment one, write 1 in space, payment three, write 3 in space provided.)
- **City Department**. The City of Tampa department to which the contract pertains.
- **Total Amount Requested for pay period.** Provide all dollars you are expecting to receive for the pay period.
- **Total Contract Amount (including change orders).** Provide expected total contract amount. This includes any change orders that may increase or decrease the original contract amount.
- **Signed/Name/Title/Date**. This is your certification that the information provided on the form is accurate.
- **See attached documents.** Check if you have provided any additional documentation relating to the payment data. Located at the bottom middle of the form.
- **Partial Payment.** Check if the payment period is a partial payment, not a final payment. Located at the top right of the form.
- **Final Payment.** Check of this period is the final payment period. Located at the top right of the form.

The following instructions are for information of any and all subcontractors used for the pay period.

- **(Type) of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business or SLBE.
- **Trade/Work Activity.** Indicate the trade, service, or material provided by the subcontractor.
- **SubContractor/SubConsultant/Supplier.** Please indicate status of firm on this contract.
- **Federal ID.** A number assigned to a business for tax reporting purposes. This information is critical in proper identification of the subcontractor.
- **Company Name, Address, Phone & Fax**. Provide company information for verification of payments.
- **Total Subcontract Amount.** Provide total amount of subcontract for subcontractor including change orders.
- **Amount Paid To Date.** Indicate all dollars paid to date for the subcontractor.
- **Amount Pending, Previously Reported.** Indicate any amount previously reported that payments are pending.
- **Amount To Be Paid for this Period.** Provide dollar amount of dollars requested for the pay period.
- **Sub Pay Period Ending Date.** Provide date for which subcontractor invoiced performed work.

Forms must be signed and dated or will be considered incomplete. The company authorized representative must sign and certify the information is true and accurate. Failure to sign this document or return the document unsigned can be cause for determining a company is in non-compliance of Ordinance 2008-89.

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

SIGN EXAMPLE ONLY GRAPHIC TO BE DEVELOPED BY CONTRACTOR

3"

scale: 3"

Sign Information

Building a Better Tampa

Downtown Riverwalk

Creates a waterfront pedestrian walkway connecting the south edge of the CapTrust building with MacDill Park.

$1.5 Million investment
Scheduled for completion in October 2012

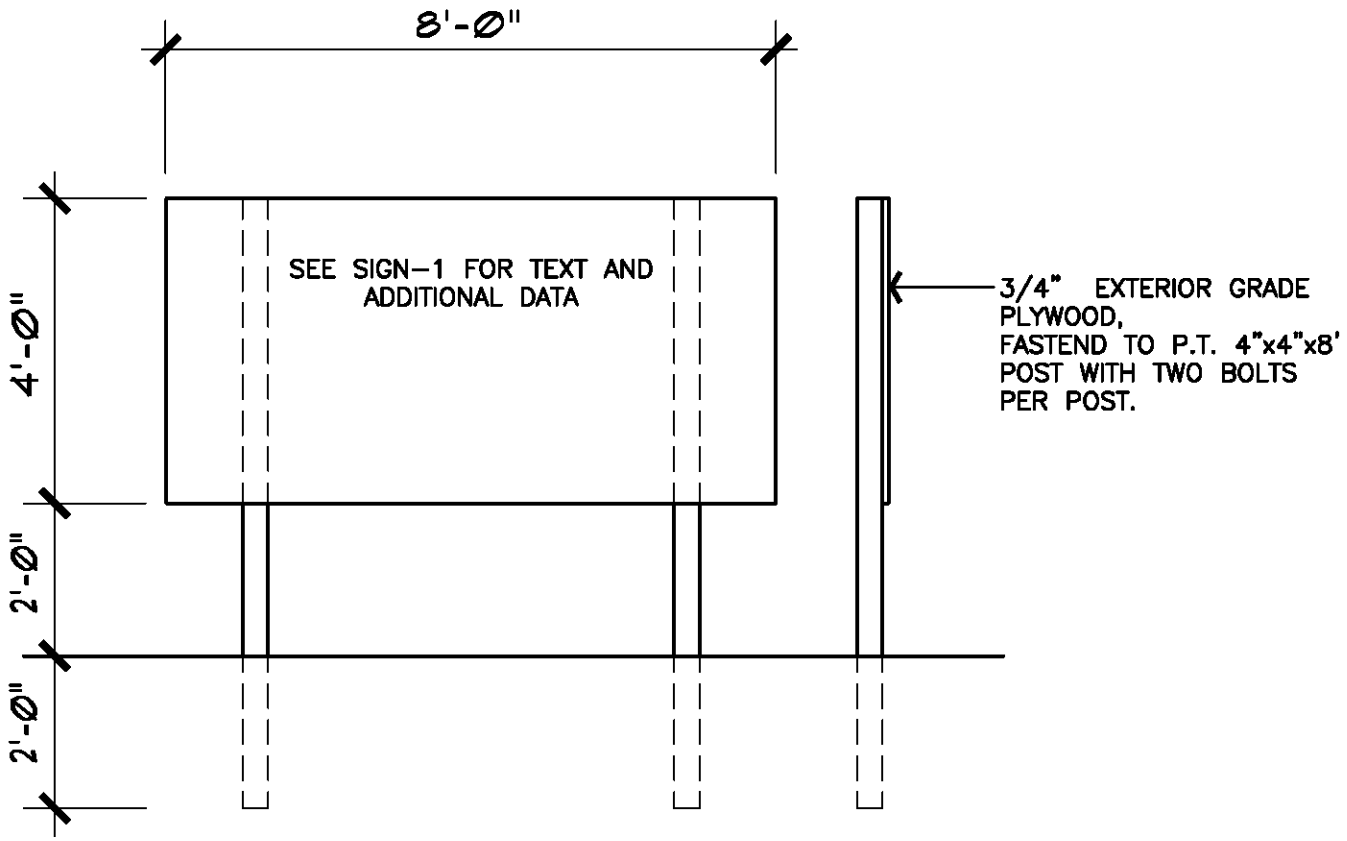
Orion Marine
Construction, Inc.

Colors

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

Font

Franklin Gothic



CITY OF TAMPA–PROJECT SIGN
REVISED 4/28/04

SECTION 01010 - SUMMARY OF WORK

1.0 GENERAL:

The work shall consist of furnishing all materials, labor, equipment, tools, and all items and services required for the complete construction in conformity with Contract Documents of:

Chlorine Piping and Chemical Building Improvements – D. L. Tippin WTF
at
7125 N. 30th Street
for the
City of Tampa

All construction work and materials, in addition to complying with requirements of Contract Documents, shall fully comply with all requirements of local building codes, all ordinances, and regulations of other Federal, State and public authorities having jurisdiction over this type of work in the given area.

2.0 SCOPE:

The work shall include but not be limited to, replacing carbon steel gas and liquid chlorine piping, valves, and appurtenances; replacing chlorination equipment; removing and replacing one roll-up door, in-kind; removing and replacing one roll-up door with a new masonry wall and foundation; reinforcing the north wall of the Rail Car Room; pressure washing and painting the interior of the Rail Car Room; and replacing lighting fixtures in the Rail Car Room and Chlorine Room with all associated work required for a complete project, as shown and indicated on the Drawings and in the Specifications.

3.0 LEGAL DESCRIPTION OF PROJECT SITE:

Not Applicable.

4.0 VERIFICATION OF OWNER'S SURVEY DATA:

Prior to commencing any work, the Contractor shall satisfy himself as to accuracy of all survey data which shall affect his work as indicated in these plans and specifications and/or provided by the City.

Should the Contractor discover any inaccuracies or errors which will affect his work, he shall notify the Engineer and/or Architect in order that proper adjustments can be ordered.

The exact location of the building and related items shall be determined on site jointly by the Contractor and the Engineer and/or Architect. NO work shall commence until said final approval of the locations is made by the Engineer and/or Architect.

5.0 CONTRACT DOCUMENTS:

a. BIDDING REQUIREMENTS; BID FORMS; CONTRACT FORMS

b. GENERAL PROVISIONS, SUPPLEMENTARY GENERAL PROVISIONS, AND SPECIAL CONDITIONS

6.0 SPECIFICATIONS: (DATED: June, 2014)

Divisions: 1, 2, 3, 4, 6, 7, 8, 9, 11, 15, 16.

7.0 DRAWINGS: (DATED: June, 2014)

Sheets:

G1, C1, S-1, S-2, S-3, S-4, M1, M2, M3, M4, M5, M6, E1, E2.

8.0 ADDENDA AND LETTERS OF CLARIFICATION:

All addenda and letters of clarification issued prior to bid opening time date.

SECTION 01020 - ALLOWANCES

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes administrative and procedural requirements governing allowances.

Types of allowances include the following:

Contingency allowances.

SELECTION AND PURCHASE

SUBMITTALS

Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

CONTINGENCY ALLOWANCES

Use the contingency allowance only as directed by the Owner.

The Contractor's related costs for services, products and equipment ordered by the Owner under the contingency allowance include delivery, installation, taxes, insurance, equipment rental, and similar costs.

Work Directive Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

At Project closeout, credit unused amounts remaining in the contingency allowance to the Owner by Change Order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

EXAMINATION

Examine products covered by an allowance promptly upon delivery for damage or defects.

PREPARATION

Coordinate materials and their installation for each allowance with related materials and installations to

ensure that each allowance item is completely integrated and interfaced with related work.

SCHEDULE OF ALLOWANCES

Include a contingency allowance of $50,000 for use according to the Owner's instructions. The allowance shall be included in the Base Bid.

END OF SECTION 01020

SECTION 01040 - PROJECT COORDINATION

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

Coordination.
Administrative and supervisory personnel.
General installation provisions.
Cleaning and protection.

PRE-BID SITE ACCESS

Pre-Bid Site Access Requirements – Prior to the Pre-Bid meeting, Bidders shall contact the Plant's Security Supervisor (Israel Vigier, 231-5242). Contractors shall fax a copy of photo I.D. of everyone from their company that will be attending the Pre-Bid meeting. Badges will be available at the Plant's security gate on the day of the Pre-Bid meeting.

COORDINATION

Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

Make adequate provisions to accommodate items scheduled for later installation.

Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

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 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 building 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.

The Contractor is responsible to schedule and coordinate with the City all required inspections and tests for all phases of work to obtain final approval thereof.

Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

Preparation of schedules.
Installation and removal of temporary facilities.
Delivery and processing of submittals.
Progress meetings.
Project Close-out activities.

Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Salvaged Materials and equipment shall b come property of the Contractor and shall be disposed of in a safe and legal manner.

SUBMITTALS

Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

Show the interrelationship of components shown on separate Shop Drawings.

Indicate required installation sequences.

Refer to Specification Divisions and Sections for specific coordination Drawing requirments.

Staff Names: At the Preconstruction Conference, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

GENERAL INSTALLATION PROVISIONS

Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

Recheck measurements and dimensions, before starting each installation.

Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

CLEANING AND PROTECTION

During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

Limiting Exposures: Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

Excessive static or dynamic loading.
Excessive internal or external pressures.
Excessively high or low temperatures.
Thermal shock.
Excessively high or low humidity.
Air contamination or pollution.
Water or ice.
Solvents.
Chemicals.
Light.
Radiation.
Puncture.
Abrasion.
Heavy traffic.
Soiling, staining and corrosion.
Bacteria.

Rodent and insect infestation.
Combustion.
Electrical current.
High speed operation,
Improper lubrication,
Unusual wear or other misuse.
Contact between incompatible materials.
Destructive testing.
Misalignment.
Excessive weathering.
Unprotected storage.
Improper shipping or handling.
Theft.
Vandalism.

FACILITY OPERATIONS DURING CONSTRUCTION

Contractor shall perform all work in recognition of, and coordination with, ongoing building activities. Adhere to approved sequence/layout plan and project schedule. Please note the following:

After the Contract is awarded plant staff will conduct a safety training session with the Contractor's designated supervisor(s). The supervisor(s) will then be responsible for informing their employees of plant safety procedures.

Company vehicles will be allowed on the premises provided that they are properly marked.

Individual workers will be required to park their personal cars outside the plant's security fencing and walk to the Security Guard House. For their first entry, they will be required to present a photo I.D. They will then be issued a badge. At the end of the work day the workers will turn in their badge at the Guard House; the guard at the security gate will re-issue the badge when they come to work the next day. The procedure will be followed every day.

Work hours are 7:00 a.m. to 3:30 p.m., Monday through Friday exclusive of City holidays.

Contractor shall not be allowed to use the Plant's Break Room or any other areas not a part of the limited construction area.

Contractor shall coordinate with Plant Operations staff, as required, to isolate work zones during activities that might activate fire or chlorine leak alarm systems.

Provide and install barricades, signage, etc. as needed to designate work areas, as well as protection for persons and existing materials to remain, in and adjacent to work areas. Maintain protections as needed throughout the course of the work.

Contractor shall perform work in a manner to minimize noise, vibration, dust and debris.

Deliveries or other use of non-designated areas around the perimeter of the Facility shall be coordinated in advance with the Facility.

Use of the Facility dumpster(s) shall not be allowed. Trash and debris shall be removed from the site by the Contractor on a regular basis.

Following each and every work session, leave site in clean and orderly fashion with site protections in place.

Failure to adhere to approved sequencing/layout plan and/or failure to have supervisory personnel present and/or failure to maintain appropriate site conditions will be cause for work stoppage without additional Contract time.

Staging areas shall be as designated, unless adjustments requested by the Contractor are pre-approved by the City.

The Contractor shall have a supervisor on-site with Contract related personnel at all times.

SEQUENCE OF CONSTRUCTION

The following summarizes the various activities and steps that will be required to complete the Chlorine Piping modifications. The Contractor shall develop and submit for approval a detailed sequence of construction plan that when implemented, will ensure the continuous operation of the chlorine piping system during the construction of the specified improvements.

General Requirements

1. The Contractor shall submit a sequence of construction plan to the City at least 20 working days before commencing any work activity. The plan must be approved by the City prior to commencing any physical work associated with the Chlorine Piping system.
2. The Contractor shall attend a safety training session to be conducted by City personnel, as specified elsewhere in these specifications. Among topics covered will be the City's chlorine system operating procedures and safety protocols. The Contractor is responsible for procuring and providing its employees with the proper safety gear and shall not rely on or use the City's safety gear. The Contractor shall comply with all applicable OSHA requirements.
3. The Chlorine system shall remain in service during the specified improvements, which will require close coordination with City staff. Contractor shall protect all existing equipment, piping and accessories during work activities, particularly the hood of the active Rail Car.
4. Upon receiving approval to proceed with the work, the Contractor may assume that there will be two Rail Cars in the Rail Car room. Contractor may undertake preparatory pipe demolition work before the emptying and removal of the first Rail Car is complete, but said work must be closely coordinated with the City. One Rail Car must remain in service at all times.
5. Only one Rail Car and its associated pair of Evaporators shall be taken out of service at a time. Only one Chlorinator may be taken out of service at a time, thus work must be completed in two phases (Phase 1 and 2). In addition, since the chlorine system will be in operation during construction, the Contractor shall use extreme care while performing the work.
6. Only City personnel will operate existing chlorine valves and equipment. This includes isolation, shutdown and start-up of existing Rail Cars, Evaporators, and Chlorinators.
7. The Rail Cars have motion detection systems that will alarm and automatically shut down the flow of chlorine from the Rail car if activated. Therefore, the Contractor shall take precautions to avoid setting off the motion detection systems.
8. Contractor shall be responsible for fabricating (but not installing) a temporary connection between the rail cars in the event that the improvements are not complete and the City has to obtain gas supply from an alternate rail car. The specifics of the temporary connection shall be coordinated with the City and are further defined on Sheet M-4.

Specific Requirements

Phase 1

This phase involves the replacement of the liquid and gas pressure piping, valves and appurtenances associated with either the East or West Rail car and Evaporators. The specific Rail Car will depend on the status of the City's operations at the time of the work activity.

This phase includes all the components from the downstream side of the flexible hose union at the East/West Rail car to the combination pressure reducing/vacuum regulator units on the discharge side of the two Evaporators, respectively. This work includes replacement of the evaporator pressure relief system and vent piping to the plenum.

The Phase I work is highlighted schematically on Drawing M1 and generally described below.

Step	Task Description	Responsible Party
1	Prior to commencing work, the Contractor shall request in writing that the City prepare the Rail Car system for the Contractor's work.	Contractor
2	Once the first tank is empty of product, the City will be responsible for evacuating and purging the chlorine from the chlorine liquid and gas piping to the extent possible. The contractor may assume 3 calendar days for the City to complete this work.	City
3	Once chlorine has been evacuated from the Rail Car piping system, City personnel will isolate the Rail Car and associated chlorine liquid and gas pressure piping, Evaporators and appurtenances from the Rail Car components.	City
4	The Contractor shall demolish the existing Rail Car chlorine liquid and gas pressure piping, valves, Evaporators and appurtenances to the extent described in these Contract Documents. The Contractor shall be aware that even after purging the line, off-gassing will likely still occur from the removed piping and accessories. As a result, proper safety gear must be worn at all times and the Contractor shall immediately store any demolished piping/accessories outside the chlorine feed and rail car rooms to avoid inadvertently activating the chlorine gas alarms.	Contractor
5	The Contractor shall construct new liquid and gas pressure piping, valves, Evaporators and appurtenances to replace the existing system. The Contractor shall make final connections to the new Evaporators and purge the new piping system using nitrogen gas in accordance with the specifications.	Contractor
6	The Contractor shall pressure/leak test the entire chlorine pressure piping system from the union connection at the Rail Car flexible hose to the vacuum regulator in accordance with the specifications. Upon successful completion of pressure testing and preliminary start-up check outs by the Evaporator manufacturer, the Contractor shall inform the City in writing that the Rail Car piping system is ready for start-up.	Contractor
7	The City shall make the connection to the new piping at the flexible hose flanged union at the upstream end of the new piping system. The City shall open the valves to initiate flow of gas or liquid chlorine from the Rail Car.	City
8	The Contractor shall start-up the system under the direction of City operating personnel and the Evaporator manufacturer.	Contractor
9	The time taken by the Contractor Items 4 through 8, inclusive, shall be limited to maximum of 21 calendar days.	Contractor
10	The new facilities will be operated by the City continuously for a maximum period of 7 calendar days prior to commencement of the next phase. If leaks or equipment failures are detected during the start-up period, the Contractor shall make necessary repairs and the start-up procedure will be repeated, unless otherwise directed by the City. If necessary, the Contractor shall install the temporary piping as described in the General Requirements No.8.	City (primary); Contractor (for repairs as needed)

Phase 2

The work associated with this phase is identical to the first phase except that it will involve the second Rail Car and Evaporators. The work is highlighted schematically on Drawing M2.

PROJECT PHOTOGRAPHS

Before construction, the Contractor will be required to furnish color photographs of the project site and surrounding area. The Contractor shall not perform any construction work until the pre-construction photographs are taken.

The Contractor shall submit pre-construction photographs in digital form (JPEG or PDF) to the City prior to the start of construction.

END OF SECTION 01040

SECTION 02120 – SODDING AND SEEDING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Work in this section consists of furnishing all labor, material and equipment to restore all areas disturbed during construction to match preconstruction conditions and to establish new grassed areas as specified herein. Establish a stand of grass within the areas disturbed by furnishing and placing grass sod where required, or by seeding and mulching areas not requiring sod.

1.02 REFERENCE DOCUMENTS

A. Use materials conforming to the requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction as follows:

1. Section 570 - Grassing (by Seeding)

2. Section 575 – Sodding

3. Section 981 - Grassing and Sodding Materials

4. Section 982 - Commercial Fertilizer

5. Section 983 - Water for Grassing

1.03 SUBMITTALS

A. Submit certifications and identification labels for all sodding supplied in accordance with General Provisions.

PART 2 -- PRODUCTS

2.01 SODDING

A. Types: Sod may be Bahia grass, as established prior to construction. Use well matted sod with roots. When replacing sod in areas that are already sodded, use sod of the same type as the existing sod.

B. Provide sod as required in accordance with Florida Department of Transportation Specifications 575 and 981. Furnish sod equal to and similar in type as that disturbed. Place and water in accordance with FDOT Specifications Section 575.

C. Use sod in commercial-size rectangles, preferably 12-inch by 24-inch or larger, except where 6-inch strip sodding is indicated on the drawings.

D. Use sod that is sufficiently thick to secure a dense stand of live grass. Use sod that is live, fresh and uninjured at the time of planting, having a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. Plant sod as soon as possible after being dug and shade and keep moist from the time it is dug until it is planted.

E. Handle sod in a manner to prevent breaking or other damage. Do not handle by dumping from trucks or other vehicles. Use care at all times to retain the native soil on the roots of each sod roll during stripping and handling. Sod that has been damaged by handling during delivery, storage or installation will be rejected.

F. Swales: Place sod to the proper grade and cross section in all flow areas to ensure the design flow of water in the ditch. In excavating for the placement of sod, provide a minimum of 3 inches of undercut.

G. Sod shall be placed in the following areas.

1. Any new or regraded stormwater ponds, including up to five feet beyond the top of the bank, the sloped sides, and the entire bottom of the pond.

2. Any areas within 20 feet of a new structure or road.

3. Any areas with a ground slope of 3:1 (horizontal:vertical) or greater.

2.02 FERTILIZER

A. Supply chemical fertilizer in suitable bags with the net weight certification of the shipment. Fertilizer shall be 12-8-8 and comply with Section 982 of the FDOT Standard Specification for Road and Bridge Construction.

B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash, contained in the fertilizer.

C. The chemical designation of the fertilizer shall be 12-8-8, with at least 50 percent of the nitrogen from a nonwater-soluble organic source. The nitrogen source may be a unrea-formaldehyde source provided it is not derived from a waste product of the plastic industry.

2.03 EQUIPMENT

A. Spread fertilizer uniformly at the specified rate.

2.04 NETTING

A. Netting is fabricated of material similar to Geoscope Landscape Fabric or approved equal.

2.05 SEEDING

A. Seed all unpaved areas disturbed during construction that do not require sod. Complete all seeding in conformance with FDOT Specifications Sections 570 and 981. Mulch and fertilize the grassed areas shall be mulched and fertilized in accordance with FDOT Specifications.

B. Provide mulch material free of weeds. Mulch shall be oat straw or rye, Pangola, peanut, Coastal Bermuda, or Bahia grass hay.

C. All seeds must have been tested within 6 months of planting. Submit a seed bag tag with final payment requests from each type or mixture of seed used.

2.06 TOPSOIL

A. Topsoil stockpiled during excavation may be used. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the Owner. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants, and grassing specified herein.

2.07 MULCH

A. Furnish small grain straw mulch. Apply mulch at a rate of 1.5 tons per acre, corresponding to a depth not less than 1-inch or more than 3-inches according to texture and moisture content of mulch material. Apply asphalt emulsion at a rate of 150 gallons per ton of straw to anchor the straw applied.

2.08 WATER

A. It is the Contractor's responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the work is accepted. Make whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs for the work. Furnish all necessary hose, equipment, attachments, and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

2.09 SOIL IMPROVEMENTS

A. Apply lime at the rate of 1 to 1.5 tons per acre. Apply 10-10-10 commercial fertilizer at the rate of 800 pounds per acre and work well into the top inch of topsoil.

PART 3 – EXECUTION

3.01 SOD BED PREPARATION

A. Clear areas to be sodded and/or seeded of all rough grass, weeds, and debris, and bring soil to an even grade.

B. Thoroughly till soil to a minimum 4-inch depth.

C. Bring area to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.02 INSPECTION

A. Verify that soil preparation and related preceding work has been completed.
B. Do not start work until conditions are satisfactory.

3.03 SOD HANDLING AND INSTALLATION

A. During delivery, prior to planting, and during the planting of sod areas, protect the sod panels at all times from excessive drying and unnecessary exposure of the roots to the sun. Stack sod during construction and planting so as not to be damaged by sweating or excessive heat and moisture.

B. After completion of soil conditioning as specified above, lay sod panels tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope. Immediately following sod laying, roll the lawn areas with a lawn roller customarily used for such purposes, and then thoroughly water.

C. Place sod at all areas where sod existed prior to construction, on slopes of 3 horizontal to 1 vertical (3:1) or greater, in areas where erosion of soils will occur, and as directed by the ENGINEER. On areas where the sod may slide, due to height and slope, the ENGINEER may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals.

3.04 SOD AND SEED MAINTENANCE

A. The sod shall produce a dense, well-established growth. Repair and re-sod all eroded or bare spots until project acceptance. Repair to sodding shall be accomplished as in the original work.

B. Perform sufficient watering to maintain adequate moisture for optimum development of the seeded and sodded areas, and no less than 1.5 inches of water per week for at least 2 weeks. Thereafter, apply water for a minimum of 60 days as needed until the sod takes root and starts to grow or until final acceptance, whichever is latest.

3.05 GUARANTEE

A. Guarantee a live and vigorous stand of permanent grass at the time of acceptance of the work consisting of 80 percent minimum coverage for seeded grass areas with no bare spots greater than 5 square feet.

3.06 CLEANING

A. Remove debris and excess materials from the project site.

- END OF SECTION -

SECTION 02224 - EXCAVATION AND BACKFILL FOR STRUCTURES

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Furnish all labor, equipment and materials required to complete all work associated with excavation, including off-site borrow excavation, dewatering, backfill, drainage layers beneath and around structures, foundation and backfill stone, filter fabric, embankments, stockpiling topsoil and any excess suitable material in designated areas, in place compaction of embankments, backfill and subgrades beneath foundations and roadways, excavation support, disposing from the site all unsuitable materials, providing erosion and sedimentation control grading, site grading and preparation of pavement and structure subgrade, and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

B. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Drawings or established by the Engineer.

C. It is the intent of this Specification that the Contractor conducts the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in the General Provisions, Supplementary General Provisions, and Special Conditions.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced Specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

2. American Society for Testing and Materials (ASTM):

ASTM C 127	Test for Specific Gravity and Absorption of Coarse Aggregate
ASTM C 136	Test for Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	Particle Size Analysis of Soils
ASTM D 423	Test for Liquid Limit of Soils
ASTM D 424	Test for Plastic Limit and Plasticity Index of Soils
ASTM C 535	Test for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM D 698	Standard Method of Test for the Moisture - Density Relations of Soils Using a 5.5 lb. (2.5 kg) Rammer and a 12-inch (305 mm) Drop
ASTM D1556	Test for Density of Soil in Place by the Sand-Cone Method
ASTM D1557	Test for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lbs. (4.5 kg) Rammer and 18-inch (457 mm) Drop
ASTM D2049	Test Method for Relative Density of Cohesionless Soils
ASTM D2167	Test for Density of Soil in Place by the Rubber-Balloon Method
ASTM D2216	Test for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures
ASTM D2487	Test for Classification of Soils for Engineering Purposes
ASTM D2922	Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.04 SUBSURFACE CONDITIONS

A. Information on subsurface conditions is referenced under General Provisions G-1.03 and G-5.01.

B. Attention is directed to the fact that there may be water pipes, storm drains and other utilities located in the area of proposed excavation. Locate existing underground utilities in areas of work. Test pits and hand excavation in critical areas will be required prior to initiating work. Perform all repairs to same in the event that excavation activities disrupt service.

C. All existing utilities including piping, electrical conduits, electrical duct banks and telephone cables that are shown on the Contract Documents to be relocated, shall be relocated prior to initiating earthwork. The Contractor shall coordinate relocation of utilities with utility companies having jurisdiction in the area. Should unknown or incorrectly identified piping or other utilities be encountered during excavation, the Contractor shall consult the City and the Engineer immediately for directions.

D. The Contractor shall cooperate with the City and utility companies in keeping respective services and facilities in operation.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the Supplementary General Provisions Section 2.2b, the Contractor shall submit the following:

1. Name and location of all material suppliers.

2. Certificate of compliance with the standards specified above for each source of each material.

3. List of disposal sites for waste and unsuitable materials and all required permits for use of those sites.

4. Plans and cross sections of open cut excavations showing side slopes and limits of the excavation at grade.

5. Construction drawings and structural calculations for any types of excavation support required. Drawings and calculations shall be signed and sealed by a currently registered Professional Engineer in the State of Florida.

6. Monitoring plan and pre-construction condition inspection and documentation of all adjacent structures, utilities, and roadways near proposed installation of excavation support systems.

7. Dewatering procedures: The Contractor shall submit its proposed methods of handling groundwater and the locations at which the water will be disposed of. Methods shall be acceptable to the Engineer before starting and excavating. Contractor shall submit plans showing the methods and location of dewatering and discharge. The drawings shall include a sufficient number of detailed sections to clearly illustrate the Scope of Work.

8. The Contractor shall notify the Engineer of the off-site or on-site sources of structural fill and submit to the Engineer a representative sample weighing approximately 50 lbs. The sample shall be delivered to a designated location on site.

9. Prior to any earthwork, the Contractor shall submit a sieve analysis of the proposed structural fill to Engineer for review and approval.

10. The Contractor shall not place any foundation reinforcement steel or formwork until excavations have been tested for compaction.

11. The Contractor shall apply for and obtain all necessary permits for dewatering as necessary. Contractor shall be responsible for all permit fees.

1.06 QUALITY CONTROL

A. All soils testing shall be performed by an independent testing laboratory retained by the City as specified in General Provisions Section G-5.01. The Contractor shall schedule its Work so as to permit a reasonable time for testing before placing succeeding lifts of backfill and shall keep the laboratory informed of its progress. In the event any test shows the work is not in conformance with these Contract Documents, the cost of any subsequent testing to show conformance shall be borne by the Contractor. All test results shall be sent directly to the Engineer.

1.07 PRODUCT HANDLING

A. Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site.

1.08 GROUNDWATER

A. The Contractor shall be responsible for anticipating groundwater conditions and shall provide positive control measures as required. Such measures shall ensure construction in the dry, stability of excavations, groundwater pressure control, prevention of tanks, pipes, and other structures from being lifted by hydrostatic pressures, and avoiding the disturbance of subgrade bearing materials.

1.09 USE OF EXPLOSIVES

A. The use of explosives for excavation work is strictly prohibited on this project.

1.10 PROTECTION OF PROPERTY AND STRUCTURES

A. The Contractor shall, at its own expense, sustain in place and protect from direct or indirect injury, all pipes, poles, conduits, walls, buildings, and all other structures, utilities, and property in the vicinity of its work. The Contractor shall take all risks attending the presence of proximity of pipes, poles, conduits, walls, buildings, and all other structures, utilities, and property in the vicinity of its work. He shall be responsible for all damage, and assume all expenses, for direct or indirect injury and damage, caused by its work, to any such pipe, structures, etc., or to any person or property, by reason of injury to them, whether or not such structures, etc., are shown on the Drawings.

PART 2 -- PRODUCTS

2.01 SELECT FILL

A. Soils from the excavations meeting requirements stipulated herein with the exceptions of topsoil and organic material may be used as select fill for backfilling, constructing embankments, reconstructing existing embankments, and as structural subgrade support. All fill material used for embankment construction shall be provided by the Contractor from any excess suitable on-site or from off-site sources, all subject to review by the Engineer prior to use. The Contractor must determine the volume of material required for the site.

B. Select fill used for embankment construction shall be non-cohesive, non-plastic, granular mixture of local sand and limerock, shall be free from vegetation, organic material or muck, and shall contain not more than 8 percent material by weight which passes the No. 200 sieve. Broken concrete shall not be used in the fill. Fill material for embankment construction containing limerock shall have sufficient sand to fill the voids in the limerock, and no individual rocks or pieces or hard material that will not pass a 6-inch diameter ring shall be used in the fill; except that the upper 4-inches of all backfill or fills shall not contain any rock or hard material that will not pass a 3-inch diameter ring.

C. Select fill used for backfilling shall either be material as described in Paragraph B or a granular soil material with a maximum Plasticity Index (PI) of 6. Backfill against walls shall not contain any rock larger than ½-inches.

D. Select fill used under structures (structural fill) shall be furnished from off-site or on-site sources as required. Structural fill material shall be clean sand or sand and limerock free from vegetation, organic material, muck, or other deleterious matter. Not more than 10 percent by weight shall pass the No. 200 sieve and shall have a Unified Soil Classification System designation of GP, GW, GP-GM, GW-GM, SP, SW, SP-SM, or SW-SM. All rock shall pass through a 3-inch diameter ring. Broken Portland cement or asphaltic concrete will not be considered an acceptable fill material. Unsuitable Fill

Material: Classified as A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-8 in accordance with AASHTO Designation M 145. Peat and other highly organic soils are also unsuitable as structural fill.

E. Regardless of material used as select fill, materials shall be compacted at a moisture content satisfactory to the Engineer, which shall be approximately that required to produce the maximum density except that the moisture content shall not be more than 2% below nor more than 2% above the optimum moisture content for the particular material tested in accordance with the ASTM D1557.

F. Select fill used as subgrade support shall be a coarse aggregate material meeting the gradation requirements of #57 or #67 aggregates in accordance with ASTM C-33.

G. Where excavated material does not meet requirements for select fill, Contractor shall furnish off-site borrow material meeting the specified requirements herein.

2.02 CLEAN SAND

A. Clean sand for use in backfilling shall be furnished from off-site or on-site sources as required. Material shall be clean sand free from vegetation, organic material, muck, or other deleterious material. Not more than 10 percent by weight shall pass the No. 200 sieve and shall have a classification of A-3 in accordance with AASHTO Designation M 145.

2.03 TOPSOIL

A. Topsoil shall be considered the surface layer of soil and sod, suitable for use in seeding and planting. It shall contain no mixture of refuse or any material toxic to plant growth.

2.04 GEOTEXTILES

A. The Contractor shall provide geotextiles as indicated on the Drawings and specified herein.

PART 3 -- EXECUTION

3.01 STRIPPING OF TOPSOIL

A. In all areas to be excavated, filled, paved, or graveled, the topsoil shall be stripped to its full depth and shall be deposited in storage piles on the site, at locations designated by the Engineer, for subsequent reuse. Remove all tree stumps, concentration of roots and other deleterious materials. Topsoil shall be kept separated from other excavated materials and shall be piled free of roots and other undesirable materials. Areas shall be cleared, grubbed, and stripped an area at least 10 feet beyond the maximum outside perimeter of structures and at least 5 feet beyond paved areas.

3.02 EXCAVATION

A. Highly organic soils (peat or muck), weak silty materials, asphalt and concrete shall be removed from all foundation areas. In addition, all sandy silt zones shall be completely removed from mat foundation and footing areas. Unsuitable material within structure footprints shall be over-excavated and backfilled with structural fill.

B. All excavation shall be made in such manner, and to such widths, as will give ample room for properly constructing and inspecting the structures they are to contain. As a minimum, excavations shall be carried 5-feet outside slab or footing limits or by one foot for each foot excavated below the bearing grade of the mat or footing, whichever is less, unless noted otherwise. A 12-inch over-excavation and subsequent backfill shall be performed at all structure footings.

C. All material excavated, regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, and weathered rock, rocks of all types, boulders, conduits, pipe, and all other obstacles encountered and shown to be removed within the limits of excavation shown on the Drawings or specified herein. The cost of excavation shall be included in the Lump Sum Bid Price and no additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.

D. Excavated unsuitable material shall be removed from the site and disposed of by the Contractor.

E. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or indicated by the Engineer. No excavation shall be wasted except as may be permitted by the Engineer. Refer to the drawings for specific location and placement of suitable excavated materials in the formation of embankments, backfill, and structural and roadway foundations. The Engineer will designate materials that are unsuitable. The Contractor shall furnish off-site disposal areas for the unsuitable material and shall dispose of unsuitable material at such areas. Where suitable materials containing excessive moisture are encountered above grade in cuts, the Contractor shall construct above grade ditch drains prior to the excavation of the cut material when in the opinion of the Engineer such measures are necessary to provide proper construction.

F. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such excavation support, pumping and drainage as may be required. Excavation shall be made in accordance with the grades and details shown on the Drawings and as specified herein.

G. Excavation slopes shall be flat enough to avoid slides that will cause disturbance of the subgrade or damage of adjacent areas, and if required to protect the safety of workmen, the general public, this or other work or structure, or excavation walls, the excavation shall be properly sheeted and braced for conditions encountered and OSHA requirements. The Contractor shall intercept and collect surface runoff both at the top and bottom of cut slopes. The intersection of slopes with natural ground surfaces, including the beginning and ending of cut slopes, shall be uniformly rounded as shown on the Drawings or as may be indicated by the Engineer. Concurrent with the excavation of cuts the Contractor shall construct intercepting berm ditches or earth berms along and on top of the cut slopes at locations shown on the Drawings or designated by the Engineer. All slopes shall be finished to reasonably uniform surfaces acceptable for seeding and mulching operations. No rock or boulders shall be left in place, which protrude more than 1 foot within the typical section cut slope lines, and all rock cuts shall be cleaned of loose and overhanging material. All protruding roots and other objectionable vegetation shall be removed from slopes. The Contractor shall be

required to submit plans of open-cut excavation for review by the Engineer before approval is given to proceed.

H. It is the intent of these Specifications that all structures shall bear on an aggregate base as specified in Article 2.01 F above as shown on the Drawings or not less than 6-inches, structural fill specified in Article 2.01D, or in place granular soils.

I. The bottom of all excavations for structures and pipes shall be examined by the Engineer for bearing value and the presence of unsuitable material. If, in the opinion of the Engineer, additional excavation is required due to the low bearing value of the subgrade material, or if the in-place soils are soft, yielding, pumping and wet, or if the limestone formation has been exposed and solution features in the form of slots or chimneys are found, the Contractor shall remove such material to the required width and depth and replace it with material acceptable to the Engineer. No payment will be made for subgrade disturbance caused by inadequate dewatering or improper construction methods.

J. All cuts shall be brought to the grade and cross section shown on the Drawings, or established by the Engineer, prior to final inspection and acceptance by the Engineer.

K. Slides and over-breaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as indicated by the Engineer at no additional cost to the City. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

L. Where the excavation exposes sludge, sludge contaminated soil or other odorous materials, the Contractor shall cover such material at the end of each workday with a minimum of 6-inches and a maximum of 24-inches of clean fill. The work shall be an odor abatement measure and the material shall be placed to the depth deemed satisfactory by the Engineer for this purpose.

M. The Contractor shall ensure that its excavation work does not adversely affect the bearing capacity of the structural subsurface. Also, the Contractor shall proceed with foundation work immediately after excavation work and as expeditiously as possible so as to minimize any potential for subsurface disturbance due to environmental factors, adverse weather, etc. The Contractor shall also take all necessary precautions to protect its work from potential adverse impacts. Where excavated areas are disturbed by subsequent operations or adverse weather, scarify surface, reshape, fill as required and compact to required density.

3.03 UNAUTHORIZED EXCAVATION

A. Excavation Work carried outside of the Work limits required by the Contract Documents shall be at the Contractor's expense, and shall be backfilled by the Contractor at its own expense with suitable material, as directed by the Engineer. Where, in the judgment of the Engineer, such over-excavation requires use of lean concrete or crushed stone, the Contractor, at its expense shall furnish and place such materials.

3.04 EXCAVATION SUPPORT

A. The Contractor shall furnish, place, and maintain such excavation support which may be required to support sides of excavation or to protect pipes and structures from possible damage and to provide safe working conditions. Excavation for deep structures shall be sufficient to provide a clearance between their outer surfaces and the face of the excavation, excavation support, or bracing, of not less than 3 feet. Materials encountered in the excavation which have a tendency to slough or flow into the excavation, undermine the bank, weaken the overlying strata, or are otherwise rendered unstable by the excavation operation shall be retained by an excavation support, stabilization, grouting or other acceptable methods. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, it may order additional supports put in at the expense of the Contractor. The Contractor shall be responsible for the adequacy of all supports used and for all damage resulting from failure of support system or from placing, maintaining and removing it.

B. Selection of and design of any proposed excavation support systems is exclusively the responsibility of the Contractor. Excavation support shall comply with all applicable OSHA requirements. Contractor shall submit drawings and calculations on proposed systems sealed by a Professional Engineer currently registered in the State of Florida.

C. The Contractor shall exercise caution in the installation and removal of supports to insure that excessive or unusual loadings are not transmitted to any new or existing structure. The Contractor shall promptly repair at its expense any and all damage that can be reasonably attributed to installation or removal of excavation support system.

D. Contractor shall monitor movement in the excavation support systems as well as movement at adjacent structures, utilities and roadways near excavation supports. Contractor shall submit a monitoring plan developed by the excavation support design engineer. All pre-construction condition assessment and documentation of adjacent structures on-site and off-site shall be performed by the Contractor. If any sign of distress such as cracking or movement occurs in any adjacent structure, utility or roadway during installation of supports, subsequent excavation, service period of supports, subsequent backfill and construction, or removal of supports, Engineer shall be notified immediately. Contractor shall be exclusively responsible for any damage to any roadway, structure, utility, pipes, etc. both on-site and off-site, as a result of its operations.

E. All excavation supports shall be removed upon completion of the work, except as indicated herein provided its removal will not jeopardize existing or new pipes or structures. The Engineer may permit supports to be left in place at the request and expense of the Contractor. Any excavation supports left in place shall be cut off at least two (2) feet below the finished ground surface or as directed by the Engineer.

3.05 PROTECTION OF SUBGRADE

A. To minimize the disturbance of bearing materials and provide a firm foundation, the Contractor shall comply with the following requirements:

1. Use of heavy rubber-tired construction equipment shall not be permitted on the final subgrade unless it can be demonstrated that drawdown of groundwater

throughout the entire area of the structure is at least 3 feet below the bottom of the excavation (subgrade). Even then, the use of such equipment shall be prohibited should subgrade disturbance result from concentrated wheel loads.

2. Subgrade soils disturbed through the operations of the Contractor shall be excavated and replaced with compacted select fill or crushed stone at the Contractor's expense as indicated by the Engineer.

3. The Contractor shall provide positive protection against penetration of frost into materials below the bearing level during work in winter months. This protection can consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other acceptable means.

3.06 PROOF-ROLLING

A. Proof-rolling of in-place granular soils shall be performed on the subgrade of all structures and all areas that will support pavements or select fill. After stripping of topsoil, excavation to subgrade and prior to placement of fills, the exposed subgrade shall be carefully inspected by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft, or loose soil, and other undesirable materials shall be removed. The exposed subgrade shall be proof-rolled with a self propelled vibratory roller which imparts a dynamic force of not less than 20,000 pounds. In areas between 5 and 25 feet from existing structures, a maximum drum roller weight of 4 tons shall be used. Areas within 5 feet of an existing structure shall be proof-rolled with a walk behind vibratory sled or roller. Proof-rolling shall continue to check for pockets of soft material hidden beneath a thin crust of better soil and until no further vertical settlement of the surface is visually discernable. Any unsuitable materials thus exposed shall be removed and replaced with an approved compacted material.

3.07 DEWATERING

A. The Contractor shall do all dewatering as required for the completion of the work. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review prior to any earthwork operations. Disposal of water to any surface water body will require silt screens and/or other practices in order to meet discharge quality requirements. All water removed by dewatering operations shall be disposed of in accordance with the Florida Air and Water Pollution Control Act. The Contractor is responsible for obtaining any dewatering permits as required by regulatory agencies.

B. The dewatering system shall be of sufficient size and capacity as required to control groundwater or seepage to permit proper excavation operations, embankment construction and reconstruction, subgrade preparation, and to allow concrete to be placed in a dry condition except where authorized tremie concrete construction work is shown or permitted. The system shall include a sump system or other equipment, appurtenances and other related earthwork necessary for the required control of water, and shall include automatic starting devices and standby pumps that will ensure continuous dewatering in the event of an outage of one or more pumps. The Contractor shall drawdown groundwater to at least 3 feet below the bottom of excavations (subgrade) at all times in order to maintain a dry and undisturbed condition. The groundwater level shall be controlled so as to permit the placing and curing of concrete and the maintenance of supporting foundations and adjacent work and structures. The Contractor is fully responsible for protecting structures from flotation until final acceptance of the work.

C. The Contractor shall control, by acceptable means, all water regardless of source. Water shall be controlled and its disposal provided for at each berm, structure, etc. The entire periphery of the excavation areas shall be ditched and diked to prevent water from entering the excavation. The Contractor shall be fully responsible for disposal of the water and shall provide all necessary means at no additional expense to the City. The Contractor shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the system.

D. The Contractor shall be responsible for and shall repair without cost to the City, any damage to work in place and the excavation, including damage to the bottom due to heave and including removal of material and pumping out of the excavated area. The Contractor shall be responsible for damages to any other area or structure caused by its failure to maintain and operate the dewatering system proposed and installed by the Contractor.

E. The Contractor shall take all the steps that it considers necessary to familiarize himself with the surface and subsurface site conditions, and shall obtain the data that is required to analyze the water and soil environment at the site and to assure that the materials used for the dewatering systems will not erode, deteriorate, or clog to the extent that the dewatering systems will not perform properly during the period of dewatering. Copies of logs of borings and laboratory test results are available to the Contractor. This data is furnished for information only, and it is expressly understood that the City and Engineer will not be held responsible for any interpretations or conclusions drawn therefrom by the Contractor.

F. Prior to the execution of the work, the Contractor, City and Engineer shall jointly survey the condition of adjoining structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

G. If a surface to receive foundation slabs cannot be maintained dry by the Contractor's dewatering efforts, then the Contractor shall provide tremie seals at no additional cost to the City. The placement of tremie seals shall not preclude dewatering operations specified herein. The limits of tremie seals shall be recommended by the Contractor and reviewed and accepted by the Engineer.

H. The Contractor shall be responsible to dispose of water from the dewatering operation in accordance with the Contract Documents, and shall obtain all necessary permits and conform to all local regulations and Codes. Water from the trenches and excavation shall be retained onsite. If Contractor cannot comply, the Contractor shall be responsible for hiring an independent Engineer to file for all appropriate dewatering permits. If the latter case happens,, the Contractor shall dispose of water from trenches and excavation in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, will not cause any interference with the use of the same by the public, or will not cause pollution of any waterway or stream.

I. The Contractor shall submit its dewatering method and points of discharge, if necessary, to the Engineer for review at least 20 days prior to any dewatering activities. The Contractor shall provide maintenance of downstream systems to which it discharges. The cost of maintaining these systems shall be included in the bid price. The Contractor shall remove siltation and haul and dispose of this material on a regular basis to

maintain the original base conditions at all time, so as not to impact drainage in the general area.

3.08 EMBANKMENTS

A. The Contractor shall perform the construction of embankments in such a manner that cut and fill slopes will be completed to final slopes and grade in a continuous operation. The operation of removing excavation material from any cut and the placement of embankment in any fill shall be a continuous operation to completion unless otherwise permitted by the Engineer.

B. Surfaces upon which embankments are to be constructed shall be stripped of topsoil, organic material, rubbish and other extraneous materials. After stripping and prior to placing embankment material, the Contractor shall compact the top 12-inches of in place soil as specified under Paragraph 3.10, COMPACTION.

C. Any soft or unsuitable materials revealed before or during the in place compaction shall be removed as indicated by the Engineer and replaced with select fill.

D. Ground surfaces, on which embankment is to be placed, shall be scarified or stepped in a manner which will permit bonding of the embankment with the existing surface. The embankment soils shall be as specified under Part 2 - Products, and shall be deposited and spread in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width of the cross section, and shall be kept approximately level by the use of effective spreading equipment. Hauling shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form during the construction of the embankment. The embankment shall be properly drained at all times. Each layer of the embankment shall be thoroughly compacted to the density specified under Paragraph 3.10, COMPACTION.

E. The embankment or fill material in the layers shall be of the proper moisture content before compacting to obtain the prescribed compaction. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken at frequent intervals. From these tests, corrections, adjustments, and modifications of methods, materials, and moisture content will be made to construct the embankment.

F. Where embankments are to be placed and compacted on hillsides, or when new embankment is to be compacted against embankments, or when embankment is built in part widths, the slopes that are steeper than 4:1 shall be loosened or plowed to a minimum depth of 6 inches or, if in the opinion of the Engineer, the nature of the ground is such that greater precautions should be taken to bind the fill to the original ground then benches shall be cut in the existing ground as indicated by Engineer.

G. When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portions of the embankments and the other material which meets the requirements for select fill shall be incorporated into the formation of the embankments. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the final grade. Stones,

fragmentary rock, or boulders larger than 12-inches in their greatest dimension will not be allowed in any portions of embankments and shall be disposed of by the Contractor as indicated by the Engineer. When rock fragments or stone are used in embankments, the material shall be brought up in layers as specified or directed and every effort shall be exerted to fill the voids with finer material to form a dense, compact mass which meets the densities specified for embankment compaction.

3.09 BACKFILLING

A. All structures and pipes shall be backfilled with the type of materials shown on the Drawings and specified herein. Select fill shall be deposited in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the ground nor within 6 inches of pipes. No stone or fragmentary rock larger than 12-inches in their greatest dimension will be allowed for any portion of backfill. Compaction shall be in accordance with the requirements of Paragraph 3.10, COMPACTION.

B. Where excavation support is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when supports are removed. If significant volumes of soil cannot be prevented from clinging to the extracted supports, the voids shall be continuously backfilled as rapidly as possible. The Contractor shall thereafter limit the depth below subgrade that supports will be installed in similar soil conditions or employ other appropriate means to prevent loss of support.

C. Backfill against concrete or masonry structure shall not be performed until the Work has been reviewed and backfilling permitted. Backfill against walls shall also be deferred until the structural slab for floors above the top fill line have been placed and attained design strength or earlier at the discretion of the Engineer. Partial backfilling against adequately braced wall may be considered by the Engineer on an individual situation basis. Where walls are to be waterproofed, all Work shall be completed and membrane materials dried or cured according to the manufacturer's instructions before backfilling.

3.10 COMPACTION

A. The Contractor shall compact embankments, backfill, crushed stone, aggregate base, and in place subgrade in accordance with the requirements of this Section. The densities specified herein refer to percentages of maximum density as determined by the noted test methods. Compaction of materials on the project shall be in accordance with the following schedule:

	Density % Std. Proctor (D698)	**Density % Mod. Proctor (D1557)**	**Max. Lift Thickness as Compacted Inches**
Embankments Beneath Structures*	--	98	8
Other Embankments	95	92	8
Backfill Around Structures	95	92	8
Backfill in Pipe Trenches	95	92	8
Crushed Stone Beneath Structures	**	**	12

	Density % Std. Proctor (D698)	Density % Mod. Proctor (D1557)	Max. Lift Thickness as Compacted Inches
Select Sand	--	98	8
Aggregate Base Course (ABC) Beneath Pavements and Structures	--	98	8
Crushed Stone Backfill	**	**	12
Crushed Stone Pipe Bedding	**	**	12
In place Subgrade Beneath Structures	--	95	12

** Embankments beneath structures shall be considered to include a zone 10 feet out from the foundation of the structure extending down to the natural ground on a 45º slope.*

*** The aggregate shall be compacted to a degree acceptable to the Engineer by use of a vibratory compactor and/or crawler tractor.*

B. Compaction shall be conducted as follows:

1. A vibratory compactor that imparts a dynamic force of not less than 20,000 pounds shall be used. Each section of subgrade shall be subjected to multiple, overlapping (minimum 20% overlap) coverages of the compactor as it operates at normal walking speed. Vibratory equipment shall not be used within 25 feet of any existing structure.

2. Within 25 feet of any existing structure, non-vibratory compaction equipment such as a drum roller with a maximum weight of 4 tons should be used. Within 5 feet of any existing structure, a walk behind vibratory sled or roller shall be used. A sufficient number of passes should be made within the construction area to compact the in-place soil as required in Article 3.10 A above.

C. Field density tests will be made by independent testing agency as described in Article 1.06. These tests shall be the basis for accepting or rejecting the compaction. In-place density tests will be performed in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. The Engineer will be the sole judge as to which test method will be the most appropriate. Failure to achieve the specified densities shall require the Contractor to re-compact the material or remove it as required. The Contractor shall, if necessary, increase the compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The Contractor shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

D. Testing will be performed as frequently as deemed necessary by the Engineer. As a minimum, one in-place density test shall be performed for each lift of compacted soil, each 1000 cubic yards of embankment placed, 500 cubic yards of backfill placed, 2500 square feet of foundation area, or one test performed each day for either.

E. Final grades shall be within 0.1 foot of elevations shown. Where shown on the Drawings surfaces shall be sloped for drainage or other purposes.

F. Vibration monitoring shall be performed at nearby structures when compaction work is ongoing. A single monitoring point using vibration monitoring equipment capable of detecting velocities of 0.1 inch/second or less and survey measurements shall be used for vibration monitoring at each of the nearest structures. An elevation measurement on

nearby structures shall be taken before compaction work starts, and then at least twice a day during the work with one reading taken at the conclusion of the day's operations. Elevation measurements shall be recorded to an accuracy of 0.001 foot. If at any time the Contractor detects settlement or heave of 0.005-feet or more, or vibration levels of 0.5 inch/second or more, the vibratory compaction shall be stopped immediately and the Engineer notified.

3.11 REMOVAL OF EXCESS AND UNSUITABLE MATERIALS

A. The Contractor shall remove and dispose of off-site all unsuitable materials. Within thirty (30) consecutive days after Notice to Proceed, the Contractor shall submit to the Engineer for review all required permits and a list of disposal sites for the unsuitable materials. If the disposal site is located on private property, the submittal shall also include written permission from the owner of record.

B. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

C. The Contractor shall obtain an off-site disposal area prior to beginning demolition or excavation operations.

D. All excess and unsuitable materials shall be hauled in trucks of sufficient capacity and tight construction to prevent spillage. Trucks shall be covered to prevent the propagation of dust.

E. When all excess and unsuitable material disposal operations are completed, the Contractor shall leave the disposal sites in a condition acceptable to the City and Owner(s) of the disposal site(s).

- END OF SECTION –

SECTION 02267 - TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall design, provide, maintain and remove temporary erosion and sedimentation controls as necessary.

B. Temporary erosion controls may include, but are not limited to, mulching, netting, and watering, on site surfaces and spoil and borrow are surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Owner.

C. Temporary sedimentation controls include, but are not limited to: silt dams, traps, barriers and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Owner.

D. Contractor shall provide effective temporary erosion and sediment control measures during construction or until final controls become effective.

1.02 SUBMITTALS

A. Submit a pollution prevention plan and a schedule for temporary erosion and sedimentation control.

PART 2 -- PRODUCTS

2.01 EROSION CONTROL

A. Seeding and mulching, fertilization and watering shall be in accordance with Section 570-1 through 570-3 of the FDOT Specifications.

B. Netting: Fabricated of material acceptable to the Owner.

2.02 SEDIMENTATION CONTROL

A. Bales: Clean, seed free cereal hay type.

B. Netting: Fabricated of material acceptable to the Owner.

C. Filter Stone: Crushed stone conforming to FDOT Specifications.

PART 3 -- EXECUTION

3.01 EROSION CONTROL

A. Seeding shall be in accordance with Section 570-4 through 570-5 of the FDOT Specifications. The Contractor shall insure that all seeded areas have sustained growth prior to acceptance.

B. Mulching shall be in accordance with Section 570-4.6 of the FDOT Specifications.

C. Minimum procedures for mulching and netting are:

1. Apply mulch loosely to a thickness of between 0.75 inches and 1.5 inches.

2. Apply netting over mulched areas on sloped surfaces.

3.02 SEDIMENTATION CONTROL

A. Install and maintain silt dams, traps and barriers as shown on the approved schedule. Hay bales which deteriorate and filter stone which is lodged shall be replaced as required.

3.03 PERFORMANCE

A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the Owner, Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

- END OF SECTION -

SECTION 03305 – CONCRETE AND GROUT

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment, materials and services necessary for the manufacture, transportation and placement of all plain and reinforced concrete work, as shown on the Drawings or as ordered by the Engineer, all in accordance with the Contract Documents.

B. The following types of concrete shall be covered in this Section:

1. Structural Concrete: Concrete to be used in all cases except where noted otherwise in the Contract Documents.

2. Sitework Concrete: Concrete to be used for curbs, gutters, catch basins, sidewalks, fence and guard post embedment, underground duct bank encasement and all other concrete appurtenant to electrical facilities unless otherwise shown or noted on the Drawings.

C. The following types of grout are covered in this Section:

1. Cement Grout: This type of grout shall be used wherever grout or cementitious grout is called for in the Contract Documents, unless another type is specifically referenced.

2. Non-Shrink Grout: Non-shrink cementitious grout or non-shrink epoxy grout shall be used whenever non-shrink grout is called for. Non-shrink cementitious grout shall be used at locations where there are no dynamic loads, the grout will not come in contact with wastewater or wastewater gases. Non-shrink epoxy grout shall be used in submerged (water or wastewater), under wastewater gas environment, and for anchorage of pump bases, motor bases, and any other equipment imparting dynamic loads to the support system.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Codes: Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the requirements of the Florida Building Code and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

B. Commercial Standards:

ACI 214	Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 301	Specifications for Structural Concrete for Buildings.
ACI 305	Hot Weather Concreting

ACI 306	Cold Weather Concreting
ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete Structures.
ACI 318	Building Code Requirements of Reinforced Concrete.
ACI 347	Recommended Practice for Concrete Formwork.
ASTM A 185	Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
ASTM A 615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
ASTM C 31	Test Methods for Making and Curing Concrete Test Specimens in the Field.
ASTM C 33	Specification for Concrete Aggregates.
ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens.
ASTM C 88	Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
ASTM C 94	Specification for Ready-Mixed Concrete.
ASTM C 114	Method for Chemical Analysis of Hydraulic Cement
ASTM C 136	Method for Sieve Analysis of Fine and Coarse Aggregate
ASTM C 143	Test Method for Slump of Portland Cement Concrete.
ASTM C 150	Specification for Portland Cement.
ASTM C156	Test Method for Water Retention by concrete Curing Materials
ASTM C 157	Test Method for length Change of Hardened Cement Mortar and Concrete
ASTM C 192	Method of Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 227	Standard Test Method for Potential Alkali Reactivity of Cement Aggregate Combinations (Mortar-Bar Method).
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete.
ASTM C 289	Standard Test Method for Potential Reactivity of Aggregates (Chemical Method)

ASTM C 309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
ASTM C 494	Specification for Chemical Admixtures for Concrete.
ASTM C 579	Test Methods for Compressive Strength of Chemical Resistant Mortars and Monolithic Surfacings.
ASTM C 618	Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete
ASTM C 827	Test Method for Early Volume Change of Cemetitious Mixtures.
ASTM D 1751	Specification for Preformed Expansion Joint Fillers for Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
CRD C 621	Non-Shrink Grout
CRSI	Manual of Standard Practice.

C. Any procedure, materials or operation specified by reference to the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), Building Code or other references shall comply with the requirements of the current and most recent specifications or standards. In conflicts between listed standards and this specification, the more stringent requirements shall govern.

D. The Contractor is expected to obtain the most recent issue of all standards, recommendations, codes or specifications referred to within this specification.

1.03 SUBMITTALS

A. General: The Contractor shall submit shop drawings and other information to the Engineer for review in accordance with the Supplementary General Provisions Section 2.2b.

B. Mix Designs: The design mixes to be used shall be prepared by qualified persons and submitted for review. The design of the mix is the responsibility of the Contractor subject to the limitations of the specifications. Review processing of this submission will be required only as evidence the mix has been designed by qualified persons and that the minimum requirements of the specifications have been met. Such review will in no way alter the responsibility of the Contractor to furnish concrete meeting the requirements of the specifications. If in the progress of the work the sources of materials change in characteristics or the Contractor requests a new source in writing, the Contractor shall, at his expense submit new test data and information for the establishment of a new design mix. Submit mix designs for all classes of concrete to be used under this Contract. Mix design submittals shall include the following:

1. Sources of all materials and certifications of compliance with specifications for all sources of each material.

2. Certified current (less than one year old) chemical analysis of Portland Cement or Blended Cement to be used.

3. Certified current (less than one year old) chemical analysis of fly ash to be used.

4. Aggregate test results showing compliance with required standards, i.e. sieve analysis, aggregate soundness tests, etc.

5. Manufacturer's data on all admixtures stating compliance with required standards and are compatible with one another. Written conformance to the above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to Mix design review by the Engineer.

6. Field experience records and/or trial mix data for the proposed concrete mixes.

C. Grout: The Contractor shall submit shop drawings for all types of grout for use in this Project. Shop drawings shall include certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

D. Accessories: The Contractor shall submit shop drawings for all types of concrete accessories to be used for this project including, but not limited to, form ties, water stops, joint materials and curing agents.

E. Delivery Tickets: Where ready-mix concrete is used, the Contractor shall submit delivery tickets at the time of delivery of each load of concrete. Each certificate shall show the State certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate and added at the batching plant as well as the amount of water allowed to be added at the site for the specific design mix. Each certificate shall, in addition, state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to when the batch was dispatched, when it left the plant, when it arrived at the job, the time that unloading began, and the time that unloading was finished.

F. Reinforcing Steel: The Contractor shall submit shop drawings of shop bending diagrams, placing lists, and Drawings of all reinforcing steel prior to fabrication.

1. The Contractor shall submit detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66) for all reinforcing steel. These drawings shall be made to such a scale as to clearly show joint locations, openings, the arrangement, spacing and splicing of the bars. Where opening sizes are dependent on equipment selection the Contractor shall indicate all necessary dimensions to define steel lengths and placing details.

2. Details of the concrete reinforcing steel and concrete inserts shall be submitted by the Contractor at the earliest possible date after receipt by the Contractor of the Notice to Proceed. Said details of reinforcing steel for fabrication and erection shall conform to ACI 315 and the requirements specified and shown. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop Drawings shall include bar placement diagrams which clearly indicate the dimensions of each bar splice.

3. Where mechanical couplers are shown on the Drawings to be used to splice reinforcing steel, the Contractor shall submit manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and size of coupler used; and shop Drawings which show the location of each coupler with details of how they are to be installed in the formwork.

4. If reinforcing steel is spliced by welding at any location, the Contractor shall submit mill test reports which shall contain the information necessary for the determination of the carbon equivalent as specified in AWS Dl.4. The Contractor shall submit a written welding procedure for each type of weld for each size of bar which is to be spliced by welding, merely a statement that AWS procedures will be followed is not acceptable. Welding of rebar shall be done only where shown on the Drawings or allowed in writing by the Engineer.

G. Curing: Submit the following in accordance with Supplementary General Provisions Section 2.2b.

1. Proposed procedures for protection of concrete under wet weather placement conditions.

2. Proposed normal procedures for protection and curing of concrete.

3. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

4. Proposed method of measuring concrete surface temperature changes.

5. Manufacturer's literature and material certification for proposed curing compounds.

1.04 QUALITY ASSURANCE

A. Tests on component materials and for compressive strength of concrete will be performed as specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.

B. The cost of initial trial mixes and initial laboratory tests to design the mixes including compression tests, sieve analysis, and tests on trial mixes shall be included in the Contract Price.

C. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the Owner. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications.

C. Concrete for testing shall be supplied by the Contractor at no cost to the Owner, and the Contractor shall provide assistance to the Engineer in obtaining samples. The Contractor shall dispose of and clean up all excess material.

F. Construction Tolerances: The Contractor shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the Specifications, permissible deviations will be in accordance with ACI 347.

1.05 QUALITY CONTROL

A. Compressive Strength

1. Compression test specimens shall be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the Engineer to insure continued compliance with these Specifications. At least one set of test specimens shall be made for each placement in excess of five cubic yards, or for each fifty (50) cubic yards of concrete placed, or for each 5000 square feet of surface area for slabs or walls, whichever is greater.

2. Samples of freshly mixed concrete shall be obtained in accordance with ASTM C 172, and compression test specimens for concrete shall be made in accordance with ASTM C 31. Specimens shall consist of at least five 6-inch diameter by 12-inch high cylinders, or eight 4-inch diameter by 8-inch high cylinders. Each cylinder shall be identified by a tag attached to the side of the cylinder.

3. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the specimens made in any four consecutive working days and to protect the specimens from falling over, being jarred or otherwise disturbed during the period of initial curing. The box shall be erected, furnished and maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C31. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Specimens shall

remain undisturbed in the curing box until ready for delivery to the testing laboratory but not less than sixteen hours

4. Compression test shall be performed in accordance with ASTM C 39. For 6x12 cylinders, two test cylinders will be tested at 7 days and 2 at 28 days. For 4x8 cylinders, three test cylinders will be tested at 7 days and three at 28 days. The remaining cylinders will be held to verify test results, if needed.

B. Consistency

1. Consistency of the concrete will be checked by the Engineer by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for delays, material or labor costs due to such eventualities.

2. Slump tests shall be made in accordance with ASTM C 143. Slump tests shall be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

C. Air Content

1. Samples of freshly mixed concrete will be tested for entrained air content by the Engineer in accordance with ASTM C 231.

2. Air content tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

D. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 215 and ACI 318, Chapter 5 "Concrete Quality Mixing and Placing", and as specified herein.

2. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.

3. All concrete which fails to meet the ACI requirements and these specifications, is subject to removal and replacement at the cost of the Contractor. Additional testing may also be required to verify compressive strength of concrete. Additional testing shall involve extraction and testing of concrete cores in accordance with ASTM C 42. Engineer shall determine locations where concrete cores shall be taken. Nondestructive test methods shall not be used to verify strength of in-place concrete.

PART 2 -- PRODUCTS

2.01 FORMWORK

A. Form Materials: Except as otherwise expressly accepted by the Engineer, all lumber for use as forms, shoring, or bracing shall be new material. Materials for concrete forms shall conform to the following requirements:

1. Form materials shall be metal, wood, plywood, or other acceptable material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade shown.

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 for Concrete Forms, Class 1, and shall be edge sealed. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Exterior Grade. Thickness shall be as required to support concrete at the rate it is placed, but not less than 5/8-inch thick.

C. Formwork Accessories:

1. Unless otherwise shown, exterior corners in concrete members shall be provided with ¾-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise shown.

2. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 1-1/2 inches; and all such fasteners shall be such as to leave holes of regular shape for reaming.

3. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when acceptable to the Engineer. At locations where acceptable, a preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie.

4. Form release agent shall be a blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms. It shall not stain the concrete and shall leave the concrete with a paintable surface. Formulation of the form release agent shall be such that it would minimize formation of "Bug Holes" in cast-in-place concrete.

2.02 CONCRETE MATERIALS

A. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Only one brand of cement shall be used. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.

B. All materials furnished for the work shall comply with the requirements of ACI 301, as applicable.

C. Storage of materials shall conform to the requirements of ACI 301.

D. Materials for concrete shall conform to the following requirements:

1. Cement shall be standard brand Portland cement conforming to ASTM C 150 Type II. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the Engineer. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner as to as to permit access for inspection and sampling. Certified mill test reports for each shipment of cement to be used shall be submitted to the Engineer, verifying compliance with these Specifications.

2. Water shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/1 TDS) shall not be used.

3. Fly ash shall meet the requirements of ASTM C 618 for Class F, except the loss on ignition shall not exceed 4%. The fly ash constituent shall be maximum 15% of the total weight of the combined Portland cement and fly ash.

4. Aggregates shall be obtained from pits acceptable to the Engineer, shall be non-reactive, and shall conform to the FBC and ASTM C 33. Lightweight sand for fine aggregate will not be permitted. Maximum size of coarse aggregate shall be as specified herein.

    a. Contractor shall submit a new mix design to the Engineer for approval whenever a different aggregate or gradation is proposed.

    b. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock or a combination of coarse aggregate and shall be of designated size for the mix being used for the application.

    c. Fine aggregates shall be natural sand or manufactured sand or a combination of natural and manufactured sand that are hard and durable.

    d. Combined aggregates shall be well graded from coarse to fine sizes, and shall be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.

e. When tested in accordance with "Organic Impurities in Sands for Concrete" (ASTM C 40), the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

f. When tested in accordance with "Resistance to Abrasion of Small size Coarse Aggregate by Use of the Los Angeles Machine" (ASTM C 131), coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions, or 10.5 percent after 100 revolutions.

g. When tested in accordance with "Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate" (ASTM C 88), the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.

5. Ready-mix concrete shall conform to the requirements of ASTM C 94.

6. Air-entraining Admixture meeting the requirements of ASTM C 260 shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 5 percent. The Engineer reserves the right, at any time, to sample and test the air-entraining agent received on the job by the Contractor. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement.

7. Water reducing and retarding admixtures shall be required at the Engineer's discretion or, if not required, may be added at the Contractor's option to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at no additional cost to the Owner. The use of an admixture shall be subject to acceptance by the Engineer. Admixtures permitted shall conform to the requirements of ASTM C 494 (chemical admixtures). Admixtures shall contain no free chloride ions, be non-toxic after 30 days and shall be compatible with and made by the same manufacturer as the air entraining admixture.

2.03 CURING MATERIALS

A. Materials for curing concrete conform to ASTM C 309 Type 1-D, Class B with a minimum solids content of 30% and shall contain a fugitive dye. Curing compound shall be SureCure 30 by Kaufman Products, Inc., CA D.O.T. Acrylic Cure by Symons Corporation, Sealtight CS-309-30 by W. R. Meadows, or approved equal.

B. Polyethylene sheet for use as a concrete curing blanket shall be white and have a nominal thickness of 6 mils.

2.04 JOINT MATERIALS

A. Materials for joints in concrete above grade nonhydraulic structures shall conform to the following requirements:

1. Preformed joint filler shall be a non-extruding, resilient, bituminous type conforming to the requirements of ASTM D 1751.

2. Joint sealer shall be in accordance to Section 07920 – Sealants and Caulking.

2.05 REINFORCING STEEL

A. General: All reinforcing steel for all reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement with supplementary requirement S-1, and shall be manufactured in the United States.

2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A185. All welded wire fabric reinforcement shall be galvanized.

B. Accessories: Accessories shall include all necessary bolsters, chairs, spacers and other devices for supporting and fastening reinforcing in place complying with CRSI recommendations conforming to Class 1 bar supports. Bolsters for slab on grade shall have gray plastic tipped legs.

C. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher comprehensive strength as specified for the concrete in which it is located. Where the concrete blocks are used on concrete surfaces exposed to view, the color and texture of the concrete blocks shall match that required for the finished surface. Wire ties shall be embedded in concrete block bar supports.

D. Couplers used to mechanically splice reinforcing steel shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcing bar being spliced. Hot forged sleeve type couplers shall not be used. Acceptable mechanical couplers are: Dayton Superior Dowel Bar Splicer System by Dayton Superior.

2.06 DOWEL ADHESIVE SYSTEM

A. Where shown on the Contract Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's recommendations. All holes shall be drilled with a carbide bit unless otherwise recommended by the manufacturer. If coring holes is allowed by the manufacturer and approved by the Engineer, cored holes shall be roughened in accordance with manufacturer requirements. Thoroughly clean drill holes of all debris and drill dust with compressed air followed by a wire brush prior to installation of adhesive and reinforcing bar. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Where depth of hole exceeds the length of the static mixing nozzle, a plastic extension hose shall be used to ensure proper adhesive injection from the back of the hole. Injection of adhesive into the hole shall utilize a piston plug to minimize the formation of air pockets. The embedment depth of the bar shall be per manufacturer's recommendations, so as to provide a minimum allowable bond strength that is equal to 125 percent of the yield strength of the bar, unless noted otherwise on the Drawings. The adhesive system shall comply with the latest revision of ICC-ES Acceptance Criteria AC308, and shall have a valid ICC-ES report in accordance with the applicable building code. The adhesive system shall be "HIT-HY 150 MAX-SD Injection Adhesive Anchoring System" as manufactured by Hilti, Inc. "PE-1000 SD" by Powers Fasteners, "SET-XP" by Simpson Strong-Tie Co. or "Epcon System G5" as manufactured by ITW Redhead.

Engineer's approval is required for use of this system in locations other than those shown on the Contract Drawings.

B. All individuals installing dowel adhesive system shall be certified as an Adhesive Anchor Installer in accordance with the ACI-CRSI Anchor Installation Certification Program.

2.07 READY-MIXED CONCRETE

A. Ready-mixed concrete shall conform to meeting the requirements as to materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94.

B. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one and one half hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first. In hot weather, or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 60 minutes.

2.08 CEMENT GROUT

A. Cement grout shall be composed of Portland cement and sand in the proportion specified in the Contract Documents and the minimum amount of water necessary to obtain the desired consistency. If no proportion is indicated, cement grout shall consist of one part Portland cement to three parts sand. Water amount shall be as required to achieve desired consistency without compromising strength requirements. White Portland cement shall be mixed with Portland cement as required to match color of adjacent concrete.

B. The minimum compressive strength at 28 days shall be 4000 psi.

C. For beds thicker than 1-1/2 inch and/or where free passage of grout will not be obstructed by coarse aggregate, 1-1/2 parts of coarse aggregate having a top size of 3/8 inch should be added. This stipulation does not apply for grout being swept in by a mechanism. These applications shall use a plain cement grout without coarse aggregate regardless of bed thickness.

D. Sand shall conform to the requirements of ASTM C144.

2.09 NON-SHRINK GROUT

A. Non-shrink Cement Grout:

1. Non-shrink cement grout shall be a prepackaged, inorganic, non-gas liberating, nonmetallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of nonshrink grout specified herein shall be that recommended by the manufacturer for the particular application.

2. Non-shrink cement grouts shall have a minimum 28 day compressive strength of 5000 psi (ASTM C109, restrained), shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C 827, and shall have no shrinkage (0.0 percent) and a maximum of 0.2

percent expansion in the hardened state when tested in accordance with CRD C 621.

3. Cement based grout shall be Five Star Grout as manufactured by Five Star Products, Inc., Fairfield, Connecticut, or approved equal.

4. Cementitious non-shrink grout shall be used at locations where there are no dynamic loads, the grout will not come in contact with wastewater or wastewater gases, and where non-shrink grout is identified on the Drawings. Applications include, but are not limited to, structural steel column base plates, gate frames and guides, and precast concrete to cast-in-place concrete joints.

B. Non-shrink Epoxy Grout:

1. Epoxy-based non-shrink grout shall be a three component, 100 percent solids, solvent-free system designed for machinery grouting. Applications include, but are not limited to, anchoring, pump and motor bases, and any other equipment imparting dynamic loads to the support system.

2. When non-shrink grout is identified on the Drawings in submerged (water or wastewater) or under wastewater gas environment, epoxy-based non-shrink grouts shall be used.

3. The epoxy grout shall be delivered to site as prepackaged, three-component systems composing of the resin, hardener, and specially blended aggregates. The components shall be stored as recommended by the manufacturer until use.

4. Non-shrink epoxy grout shall be Five Star DP Epoxy Grout by Five Star Products, Inc., Fairfield, Connecticut, or approved equal.

2.10 BONDING COMPOUND

A. For bonding freshly-mixed, plastic concrete to hardened concrete, Sikadur 32 Hi-Mod Epoxy Adhesive, as manufactured by Sika Corporation; Concresive Liquid (LPL), as manufactured by Master Builders; BurkEpoxy MV as manufactured by The Burk Company; or approved equal shall be used.

2.11 CONCRETE DESIGN REQUIREMENTS

A. General: The Contractor shall be responsible for the concrete mix designs subject to the requirements specified herein. Concrete shall be composed of cement, admixtures, aggregates and water. The exact proportions in which these materials are to be used for different parts of the work shall be determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the Owner. All changes shall be subject to review by the Engineer.

B. The Contractor is cautioned that the limiting parameters specified below are not design mixes. Additional cement or water reducing agent may be required to achieve workability demanded by the Contractor's construction methods. The Contractor is responsible for any costs associated with furnishing concrete with the required workability.

C. Water-Cement Ratio and Compressive Strength: The minimum compressive strength and cement content shall be not less than specified as follows:

Type of work	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (in.)	Min. Cement per cu yd (sacks)	Max. W/C Ratio (by wt.)
Structural Concrete:				
All reinforced concrete unless noted otherwise below.	4,000 (Class A)	3/4	6	0.45
Sitework Concrete:				
Concrete fill, pavement, curbs and sidewalks.	3,000 (Class B)	3/4	5.5	0.5

Note: One sack of cement equals 94 lbs.

D. Consistency: The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Application	Slump	Variation
Footings and Slabs	3"	± 1/2" to -1"
Mortar or grout for construction joints	8"	± 1 1/2"
All Other Applications	4"	± 1"

PART 3 -- EXECUTION

3.01 GENERAL FORMWORK REQUIREMENTS

A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The Contractor shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed and replaced at the Contractor's expense. All design, construction, maintenance, preparation, and removal of forms shall be in accordance with the FBC, ACI 347 and the requirements specified herein.

B. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete.

3.02 FORMWORK CONSTRUCTION

A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is called for by the Engineer.

B. Construction Joints: Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete.

C. Form Ties: Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spilling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1 inch back from the formed face or faces of the concrete.

3.03 REUSE OF FORMS

A. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view.

3.04 REMOVAL OF FORMS

A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. Members which must support their own weight shall not have their forms removed until they have attained at least 75 percent of the 28-day strength of the concrete as specified herein. Forms for all vertical walls and columns shall remain in place at least 2 days after the concrete has been placed. Forms for all parts of the Work not specifically mentioned herein shall remain in place for periods of time as determined by the Engineer.

3.05 FABRICATION OF REINFORCING STEEL

A. Reinforcing steel shall be accurately formed to the dimensions and shapes shown on the Drawings, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings.

B. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold, unless otherwise permitted by the Engineer. No bars partially embedded in concrete shall be field-bent except as shown or specifically permitted by the Engineer.

3.06 PLACING REINFORCING STEEL

A. Reinforcing steel shall be accurately positioned as shown on the Drawings, and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcing steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcing steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcing steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the Contractor shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.

B. The portions of all accessories in contact with the formwork shall be made of concrete, plastic, or steel coated with a 1/8 inch minimum thickness of plastic which extends at least 1/2 inch from the concrete surface. Plastic shall be gray in color.

C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

D. Bars additional to those shown which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at its own expense.

E. Reinforcement placing tolerances shall be within the limits specified in ACI 318, unless otherwise directed by the Engineer.

F. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters having gray, plastic-coated standard type legs as specified herein. Slab bolsters shall be spaced not less than 30 inches on centers, shall extend continuously across the entire width of the reinforcing mat, and shall support the reinforcing mat in the plane shown.

G. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

3.07 SPLICING

A. Reinforcement bar splices shall only be used at locations shown. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the Engineer.

B. Lap length for reinforcement bars shall be in a Class B Splice in accordance with ACI 318, unless otherwise shown. Laps of welded wire fabric shall be in accordance with the ACI 318.

3.08 CLEANING AND PROTECTION OF REINFORCING STEEL

A. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

B. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed. Where there is a delay in depositing concrete, reinforcing shall be reinspected and, if necessary, recleaned.

3.09 PREPARATION OF SURFACES FOR CONCRETING

A. General: No concrete shall be placed until the reinforcement steel and formwork have been erected in a manner acceptable to the Engineer. The Contractor shall notify the Engineer not less than two working days prior to concrete placement, allowing for inspection and any corrective measures which are required. Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the old concrete has been stopped or interrupted so that, as determined by the Engineer, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accomplished by sandblasting, followed by thorough washing. All pools of water shall be removed form the surface of construction joints before the new concrete is placed.

C. Existing concrete surfaces upon or against which concrete is to be placed shall be given a roughened surface for good bond. Joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accomplished by hydroblasting. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

D. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means that will secure proper union with subsequent work, provided that construction joints shall be made only where acceptable to the Engineer.

E. Embedded Items: No concrete shall be placed until all formwork, installation of parts to -be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the Engineer at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

F. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown on the Drawings or by shop drawings and shall be acceptable to the Engineer before any concrete is placed. Accuracy of placement is the responsibility of the Contractor.

G. Casting Against Old Concrete: Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting (exposing aggregate) prior to the

application of an epoxy bonding agent. Application shall be according to the bonding agent manufacturer's instructions and recommendations.

H. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited under water nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the Engineer.

I. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.

J. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items, and any part of the concrete reinforcement will not be permitted.

K. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.10 MIXING, HANDLING, TRANSPORTING, AND PLACING

A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section.

B. Mixing: Mixing of concrete shall conform to the requirements of Chapter 7 of ACI 301.

C. Retempering: Retempering of concrete or mortar which has partially hardened will not be permitted.

D. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the Work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by and at the expense of the Contractor.

E. Unauthorized Placement: No concrete shall be placed except in the presence of duly authorized representative of the Owner. The Contractor shall notify the Engineer in writing at least 24 hours in advance of placement of any concrete.

F. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the pour. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screened in an up-slope direction.

G. Placement in Wall Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, whether reinforcement is present or not, causing separation of the coarse

aggregate from the mortar on account of repeatedly hitting rods or the sides of the form as it falls, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing, and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 5 feet of vertical rise per hour.

H. The surface of the concrete -shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4 inch thick shall be tacked to the forms on these surfaces. The concrete shall be carded about 1/2 inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

I. Conveyor Belts and Chutes: All end of chutes, hopper gates and all other points of concrete discharge throughout the Contractor's conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the Engineer. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered. Sufficient illumination shall be provided in the interior of all forms so that the concrete, at the places of deposit, is visible from the deck or runway.

J. Temperature of Concrete: The temperature of concrete, when it is being placed, shall not be more than 90 degrees F nor less than 40 degrees F in moderate weather, and not less than 50 degrees F in whether during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessarily to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the Contractor shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The Contractor shall be entitled to no additional compensation on account of the foregoing requirements.

3.11 PUMPING OF CONCRETE

A. If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. The minimum diameter of the hose (conduits) shall be 4 inches.

C. Minimum compressive strength, cement content, and maximum size of aggregates shall be as specified herein. Gradation of coarse aggregates shall conform to ASTM C 33 and shall be as close to the middle range as possible. Gradation of fine aggregate shall conform to ASTM C 33, with 15 to 30 percent passing the number 50 screen and 5 to 1 0 percent passing the number 1 00 screen. The fineness modulus of sand shall not be over 3.00.

3.12 TAMPING AND VIBRATING

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense homogeneous mass, filling all comers and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be high speed power vibrators (8,000 or 10,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required.

B. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified with 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.13 FINISHING CONCRETE SURFACES

A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions shown on the Drawings are defined as tolerances and are specified herein. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. Formed Surfaces: After removal of forms, the finishes described below shall be applied in accordance with Article 3.13, D. unless the finish schedule specifies otherwise, all surfaces shall receive at least a Type I finish. The Engineer shall be the sole judge of acceptability of all concrete finish work.

1. Type I - Rough: All fins, burrs and other projections left by the forms shall be removed. All holes left by removal of ends of ties, and all other holes, depressions, or voids shall be filled solid with cement grout after first being thoroughly wetted. Honeycombs shall be chipped back to solid concrete as directed, prior to patching with cement grout. Holes shall be filled with a small tool that will permit packing the hole solidly with cement grout. Cement grout shall consist of one part cement to three parts sand, and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall match the adjacent wall surface. At locations where concrete coatings are specified to be

applied, epoxy based patch material or filler surfaces compatible with the coating shall be used in lieu of cement grout specified herein. Concrete finish shall be in strict conformance to the coating / paint manufacturer's recommendations.

2. Type II - Grout Cleaned: Where this finish is required, it shall be applied after completion of Type I finish. After the concrete has been predampened, slurry consisting of one part cement (including an appropriate quantity of white cement in order to produce a color matching the surrounding concrete) and 1-1/2 parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Any surplus shall be removed by scraping and then rubbing with clean burlap. The finish shall be kept damp for at least 36 hours after application.

3. Type III - Smooth Rubbed: Where this finish is required, it shall be applied after the completion of the Type I finish. No rubbing shall be done before the concrete is thoroughly hardened and the mortar used for patching is firmly set. A smooth, uniform surface shall be obtained by wetting the surface and rubbing it with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities requires it, the general surface of the concrete shall not be cut into. Corners and edges shall be slightly rounded by the use of the carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted.

C. Unformed Surfaces: The finishes described below shall be applied to unformed surfaces such as floors, slabs, flow channels and top of walls in accordance with Article 3.05 - Concrete Finish Schedule. The Engineer shall be the sole judge of acceptability of all such finish work.

1. Type "A" - Screeded: This finish shall be obtained by placing screeds at frequent intervals and striking off to the surface elevation required. When a Type "F" finish is subsequently to be applied, the surface of the screeded concrete shall be roughened with a concrete rake to ½" minimum deep grooves prior to final set.

2. Type "B" - Wood Floated: This finish shall be obtained after completion of a Type "A" finish by working a previously screeded surface with a wood float until the desired texture is reached. Floating shall begin when the water sheen has disappeared and when the concrete has sufficiently hardened so that a person's foot leaves only a slight imprint. If wet spots occur, water shall be removed with a squeegee. Care shall be taken to prevent the formation of laitance and excess water on the finished surface. The finished surface shall be true, even, and free from blemishes and other irregularities.

3. Type "C" - Cork Floated: This finish shall be similar to Type "B" but slightly smoother than that obtained with a wood float. It shall be obtained by power or band floating with cork floats.

4. Type "D" - Steel Troweled: This finish shall be obtained after completion of a Type "B" finish. When the concrete has hardened sufficiently to prevent excess fine material from working to the surface, the surface shall be compacted and smoothed with not less than two thorough and complete steel troweling operations. In areas, which are to receive a floor covering such as tile, resilient flooring, or carpeting, only

one troweling operation is required. The finish shall be brought to a smooth, dense surface, free from defects and blemishes.

5. Type "E" - Broom or Belt: This finish shall provide the surface with a transverse scored texture by drawing a broom or burlap belt across the surface immediately after completion of a Type "B" finish.

6. Type "F" - Swept in Grout Topping: This finish shall be applied after a completion of a Type "A" finish. The concrete surface shall be properly cleaned, washed, and coated with a mixture of water and Portland cement. Cement grout in accordance with Section 03315 shall then be plowed and swept into neat conformance with the blades or arms of the apparatus by turning or rotating the previously positioned mechanical equipment. Special attention shall be paid to true grades, shapes and tolerances as specified by the manufacturer of the equipment. Before beginning this finish, the Contractor shall notify the Engineer and the equipment manufacturer of the details of the operation and obtain approval and recommendations of the equipment manufacturer.

7. Type "G" - Hardened Finish: Either a liquid hardened finish or an aggregate hardened finish shall be provided at the Contractor's option.

   a. Liquid hardened finish shall be provided by application of a liquid floor hardener. Floors to receive this finish shall have previously received a Type "D" finish. Liquid hardener shall be applied between 30 to 60 days after concrete placement. Surface to be treated shall be dry, clean and free of all loose dust, dirt, oil, wax, sealers and curing compounds. Application procedure shall be in accordance with manufacturer's instructions and shall consist of a three-coat treatment.

   b. Aggregate hardened finish shall be provided by applying an aggregate floor hardener concurrently with the application of a Type "D" finish. Application procedure shall be in accordance with manufacturer's instructions.

8. Type "H" - Non-Slip Finish: This finish shall be provided by applying a non-slip shake-on aggregate concurrently with the application of a Type "D" finish. Application procedure shall be in accordance with manufacturer's instructions.

9. Type "J" - Raked Finish: This finish shall be provided by raking the surface as soon as the condition of the concrete permits by making depressions of +/-1/4-inch.

D. CONCRETE FINISH SCHEDULE

Item	Type of Finish
Inner face of walls of tanks, flow channels, wet wells, perimeter walls, and miscellaneous structures to be coated in accordance with the Section entitled “Painting”	I
Exterior concrete walls below grade	I
Exterior exposed concrete walls and columns (including top of wall) to one foot below grade. All other exposed concrete surfaces not specified elsewhere	II

Item	Type of Finish
All interior exposed concrete vertical surfaces in buildings	III
Interior exposed ceiling, including beams	III
Floors of process equipment tanks or basins, and slabs to receive roofing material or waterproof membranes	B
All interior finish floors of buildings and structures and walking surfaces which will be continuously or intermittently wet	C
All interior finish floors of buildings and structures which are not continuously or intermittently wet	D
Floors to receive tile, resilient flooring, or carpeting	D
Concrete in flow channels not specified to be coated	D
Exterior concrete sidewalks, steps, ramps, decks, slabs on grade and landings exposed to weather	E
Floors of process tanks indicated on Drawings or in the specifications to receive cement grout topping	F
Precast concrete form panels, hollow core planks, double tees	J

3.14 CURING AND DAMPPROOFING

A. All concrete shall be cured for not less than 14 days after placing, in accordance with the methods specified herein for the different parts of the work, and described in detail in the following paragraphs.

FINISH SCHEDULE

Surface to be Cured or Dampproofed	Method
Unstripped forms	1
Construction joints between footings and walls, and between floor slab and columns	2
Encasement concrete and thrust blocks	3
All concrete surfaces not specifically provided for elsewhere in this Paragraph	4

B. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removed. If steel forms are used, the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 14 days of placing the concrete, curing shall be continued in accordance with Method 4.

C. Method 2: The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

D. Method 3: The surface shall be covered with moist earth not less than 4 hours, nor more than 24 hours, after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.

E. Method 4: The surface shall be sprayed with a liquid curing compound. It shall be applied in accordance with the manufacturers printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.

F. Care shall be exercised to avoid damage to the seal during the curing period. Should the seal be damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.

G. Wherever curing compound may have been applied by mistake to faces against which concrete subsequently is to be placed and to which it is to adhere, said compound shall be entirely removed by hydroblasting just prior to the placing of new concrete.

H. Curing compound shall be applied as soon as the concrete has hardened enough to prevent marring on uniformed surfaces, and within 2 hours after removal of forms from contact with formed surfaces. Repairs required to be made to formed surfaces shall be made within the said 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound, following which repairs shall be made as provided herein.

3.15 PROTECTION

A. The Contractor shall protect all concrete against injury until final acceptance by the Engineer. Fresh concrete shall be protected from damage due to rain. The Contractor shall provide such protection while the concrete is still plastic and whenever such precipitation is imminent or occurring.

3.16 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the Engineer. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. All repairs and replacements herein specified shall be promptly executed by the Contractor at its own expense.

B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 1/2 inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for

bonding by the removal of all laitance or soft material, and not less than 1/32 inch depth of the surface film from all hard portions, by means of an efficient sandblast. The material used for repair proposed shall be acceptable to the Engineer.

C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed, but shall be repaired in an approved manner with dry-packed cement grout.

D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

3.17 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense. This stipulation includes concrete experiencing cracking due to drying or thermal shrinkage of the concrete. Structural cracks shall be repaired using an epoxy injection system approved by the Engineer. Non-structural cracks shall be repaired using a hydrophilic resin pressure injected grout system approved by the Engineer, unless other means or repair are deemed necessary and approved by the Engineer.

3.18 GROUT INSTALLATION

A. All surface preparation, curing, and protection of cement grout shall be as specified herein. The finish of the grout surface shall match that of the adjacent concrete.

B. The Contractor through the manufacturer of non-shrink grout shall provide on-site technical assistance upon request, at no additional cost to the Owner.

C. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

D. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

- END OF SECTION –

SECTION 04220 - CONCRETE BLOCK MASONRY

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall construct all concrete masonry Work for the project, complete, including furnishing, fabricating, and placing of required reinforcing steel and the furnishing and setting of embedded items and all other appurtenant work, all in accordance with the requirements of the Contract Documents. The Contractor is responsible for coordinating the Work of this section with that of other trades.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Supplementary General Provisions Section 2.2b

B. Section 03305 - Concrete and Grout

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all Work specified herein shall conform to or exceed the requirements of the Florida Building Code (FBC) and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section.

B. Products and their installation shall be in accordance with the following trade standards, as applicable:

1. Masonry Design Manual (MDM) shall mean the Masonry Design Manual published by the Masonry Industry Advancement Committee.

2. Manufacturer's published recommendations and specifications.

3. Federal Specifications (FS) as reference herein.

4. American Society for Testing and Materials (ASTM) Specifications, as referenced herein.

5. "Specifications for the Design and Construction of Load Bearing Concrete Masonry" published by the National Concrete Masonry Assoc., P.O. Box 9185, Rosslyn Station, Arlington, VA.

6. "Building Code Requirements for Concrete Masonry Structures" (ACI 530/ASCE 5).

7. "Specifications for Masonry Structures" (ACI 530.1/ASCE 6).

8. LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS

1.04 SUBMITTALS

A. Samples of concrete masonry unit (CMU) color ranges for each texture, as specified under products, shall be submitted to the Engineer for selection of color. Full size samples of the blocks selected shall be submitted for final review by the Engineer after color selection.

B. Submit compressive test reports of concrete block units satisfying the design strength requirements noted on the drawings and a notarized affidavit that the block units conform to the requirements of this Section.

C. Samples of mortar colors shall be submitted for color selection by the Engineer.

D. Submit manufacturer's product data and installer's detailed descriptive plans for installing the foamed-in-place wall insulation. The insulation shall be installed by installers certified by the manufacturer. Submit manufacturer certification of the installer contracted to perform the work.

E. Manufacturer's literature indicating mortar strength and composition.

F. Submit shop drawings for precast concrete lintels.

G. In addition to the items above, the Contractor shall submit two samples of each of the following for review:

1. Masonry units.

2. Reinforcements.

3. Ties.

4. Control joint filler (with manufacturer's literature).

5. Grout mix design - Quantities listed in the mix design shall be listed both by weight and by bulk volume for each component.

6. Accessories.

H. The Contractor through the manufacturer of the concrete masonry units shall furnish certificates, in triplicate, prior to delivery of any units to the jobsite. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the Contractor, the project location, the quantities, and date or dates of shipment and delivery to which the certificate applies. Units shall be certified for conformance with these Specifications.

1.05 QUALITY ASSURANCE

A. Before any masonry is laid, a sample panel shall be constructed for review by the Engineer. The sample panel shall be 6-feet wide by 4-feet high, showing the CMU face, reinforcement, grouting, and type, color and tooling of mortar and bond. The reviewed wall sample panel shall remain in place for the duration of all masonry work, to serve as

the standard of reference for all masonry. The sample panel shall be removed by the Contractor at the completion of the project.

B. The Owner reserves the right to test materials for compliance with these specifications. Sampling and testing will be done in accordance with ASTM standards by an independent testing agency employed by the Owner. Materials that fail to meet requirements are considered defective. Subsequent tests to establish compliance (of the same or new materials) shall be paid for by the Contractor.

1. Mortar testing shall be performed in accordance with ASTM C 109.

2. Masonry grout testing shall be performed in accordance with ASTM C 1019.

1.06 SHIPPING, HANDLING, AND STORAGE

A. All mortar materials shall be delivered, stored, and handled so as to prevent damage, deterioration, or contamination. All materials shall be stored under cover in a dry place and in the original packaging.

B. All concrete masonry units shall be stored under cover, in a dry place and in a manner to prevent damage, breakage, or staining. Blocks shall be delivered to the site dry, in conformance with the specification limitation for moisture content, and kept dry by storing off the ground and under cover. Blocks which have become wet shall be removed from the site by the Contractor.

C. All accessories shall be delivered to the site and stored in the manufacturers' original packaging. All materials shall be stored above ground and under weather tight cover.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. General:

1. All concrete masonry units shall be load bearing blocks conforming to ASTM C 90. Units shall be normal weight units unless shown or specified otherwise. Block shall be smooth finish block. Net area compressive strength of concrete masonry units shall be a minimum of 1,900 psi when tested in accordance with ASTM C 140. Compressive strength F'm shall be minimum of 1500 psi in accordance with ACI 530.1 when these units are tested with the mortar specified, unless otherwise indicated on the structural drawings. Reinforced wall units shall be 2 cell end blocks with cells aligned vertically when constructed.

2. All units shall be obtained from one manufacturer to ensure even color and texture throughout.

3. Nominal face dimensions shall be 8-inch by 8-inch by 16-inch, 12-inch by 8-inch by 16-inch, or "U" shaped CMU as indicated on the Drawings.

4. All bond beam, corner, lintel, sill, and other specially shaped blocks shall be provided and used where required or necessary. Specially shaped nonstructural

blocks may be constructed by saw cutting. Color and texture shall match that of the adjacent units.

B. Sound Absorptive Concrete Masonry Units: (Not Used)

C. Fire-Rated Units: (Not Used)

2.02 MORTAR AND GROUT

A. Mortar shall be Type "M" mortar with average compressive strength at 28 days of 2,500 psi; in accordance with ASTM C 270.

B. The mortar shall be dry mixed to laboratory established proportions with only as much water added as required to produce a workable mix.

C. Hydrated lime shall conform to the requirements of ASTM C 207, Type "S", domestic manufactured.

D. Sand shall be clean, durable particles, free from injurious amounts of organic matter. The sand shall conform to the requirements of ASTM C 144.

E. Water shall be from a potable source, suitable for domestic consumption.

F. Admixture for the mortar shall be Master Builders "Omicron Mortarproofing"; Sika Chemical Company "Sika Red Label"; or approved equal. The admixture shall not be detrimental to the bonding of the mortar.

G. Masonry Grout shall conform to the requirements of ASTM C 476 and ACI 530.1. Grout shall be plant batched coarse grout with 3000 psi 28 day compressive strength.

H. Sand for grout shall conform to ASTM C 144 or ASTM C 33, as required.

I. Admixture for grout shall be Sika Chemical Company "Sika Grout Aid", Type II; Master Builders "Pozzolith", normal; or approved equal.

2.03 MASONRY ACCESSORIES

A. The following list of companies manufacture products that are acceptable for this section, subject to conformance with the specified requirements: Dur-O-Wall Products, A.A. Wire Products; Hohman Barnard, Keystone Steel and Wire Company, or approved equal.

B. Masonry Joint Reinforcement:

1. All masonry joint reinforcement shall be fabricated from cold- drawn steel wire, conforming to ASTM A 951. Reinforcement wire shall have a minimum recycled content of 80% post-consumer.

2. Reinforcement shall consist of two parallel longitudinal deformed wires, not less than 8 gage weld connected with cross-wires, not less than 9 gage, in a triangular pattern.

3. Out to out spacing of the longitudinal wires shall be 2 inches less than the nominal width of the wall.

4. The distance between the welded contacts of cross wires with each longitudinal wire shall not exceed 16 inches, staggered.

5. Cross wires shall be in the same plane with the longitudinal wires.

6. Reinforcement shall be provided in minimum 10-foot sections. All corners and tees shall be provided prefabricated, of the same materials as the joint reinforcement.

7. Joint reinforcement shall be Dur-O-Wall, Dur-O-Wall Products; Block-Lok, A.A. Wire Products; Truss-Mesh Lock, Hohman Barnard; Key-Wall Truss, Keystone Steel and Wire Company; or approved equal.

8. Reinforcing bars shall conform to "Specifications for Deformed Billet Steel Bars for Concrete Reinforcement" (ASTM A615), Grade 60.

C. Anchor and Ties:

1. Anchors and ties shall be hot-dip galvanized ferrous metals.

2. Wire mesh ties shall be minimum 16-gage, ½-inch mesh of steel wire. Ties shall be a minimum of 12-inches in length, and 1-inch less in width than the wall in which they are placed.

3. Rigid steel anchors shall be 1 ½-inch by ¼-inch with ends turned up ¼-inch at the outer end.

4. Dovetail anchors shall be minimum 16-gage, 1-inch wide, and turned up ¼-inch at the outer end.

5. Corrugated or crimped metal ties shall be made of steel sheet not less than 7/8-inch wide, 22 gage in thickness, 6-inches in length.

2.04 FOAMED-IN-PLACE MASONRY WALL INSULATION

A. Insulation shall be a two-component, foamed-in-place thermal insulation comprising of an amino-plast resin and a catalyst foaming agent surfactant that when injected into open cavities of block will flow and completely fill the open cells.

B. Foamed-in-place insulation shall conform to the requirements of Core-Fill 500 as manufactured by Tailored Chemical Products, Hickory, NC, or approved equal. Tailored Foam of Florida, Inc., Sanford, Florida is an approved applicator of Core-Fill 500 foam insulation.

C. Insulation shall be non-combustible, Class A building material.

D. Insulation shall have an R value of 4.9 per inch at 32 degrees Fahrenheit per ASTM C-177.

PART 3 – EXECUTION

3.01 GENERAL

A. All Work shall be performed in accordance with the provisions of the FBC for concrete hollow unit masonry.

B. All masonry shall be laid plumb and true to line. Bond shall be maintained such that the horizontal or vertical alignment of the foundation shall not be more than 1-inch out of plumb.

C. The Contractor shall set or embed in the Work all anchors, bolts, reglets, sleeves, conduits, and other items as required. Where bolts or other items are anchored into the masonry, those cells shall be grouted solid after the embedded items are in place.

D. No construction support shall be attached to the wall except where specifically permitted by the Engineer.

E. All masonry slots, chases, or openings required for the proper installation of the Work of other Sections shall be constructed as indicated on the Drawings, or in accordance with information furnished, prior to starting Work in those areas. No chase shall be cut into any constructed hollow unit masonry wall, except as directed or reviewed by the Engineer.

F. Surfaces shall be brushed as Work progresses, and maintained as clean as is practicable. Unfinished Work shall be raked back where possible, and toothed only where absolutely necessary.

G. All fresh or unfinished Work shall be fully covered and protected against rain and wind. Before continuing work, all previously laid Work shall be swept clean. The tops of walls or other unfinished Work shall be protected against all damage by means of waterproof paper, tarpaulins, boards, or other means satisfactory to the Engineer.

H. Anchors and ties shall be placed a minimum of 16-inches vertically and 24-inches horizontally, unless otherwise indicated. Anchors and ties for masonry shall be provided into adjacent concrete walls, columns, or beams at the above specified spacings.

I. Over-plumbing and pounding shall be avoided, at corners and jambs, for fitting stretcher units after they are set in position. Where adjustment must be made after mortar has started to harden, the mortar shall be removed and replaced with fresh mortar.

J. Concrete brick shall be used to course out walls which are concealed in the finished work.

K. Masonry units shall be cut straight, and true, using power masonry saws.

3.02 LAYOUTS

A. The Contractor shall lay out the coursing horizontally and vertically, as shown on the Drawings.

B. Block cuts less than 4-inches wide shall be avoided.

C. Vertical coursing shall be 8-inches, with 3/8-inch thick mortar joints.

D. Bed joints shall be indicated to receive masonry joint reinforcing, ties, and/or anchors.

3.03 REINFORCING

A. All reinforced horizontal joints shall be reinforced continuously with ends lapped 8-inches, and laps staggered vertically. Horizontal reinforcing shall have a vertical spacing of 16-inches on center unless noted otherwise. Prefabricated corners and tees shall be provided at all horizontal wall intersections.

B. Reinforcing shall be provided in the bed joints immediately above and below all masonry openings.

C. Mortar joints with wire reinforcement shall be at least twice the thickness of the wire.

D. Where knock-out openings are indicated on the Drawings, no steel or joint reinforcement shall run continuously through the openings.

E. Prior to placing metal reinforcing, anchors, and ties, all loose rust, tie wires, tags and all other foreign matter that may reduce bond shall be removed.

F. Reinforcing shall be placed as indicated on the Drawings and general notes. Place a minimum of two No. 5 bars in each bond beam or lintel, and a minimum of one No. 5 bar at all jambs, corners, intersections and wall ends of concrete block walls, whether indicated or not. Lintels shall extend 8-inches past the openings. Lap reinforcing bars 48 diameters or 30 inches minimum at splices. All cells containing reinforcing shall be filled solid with grout.

G. When a dowel does not line up with a vertical core, it shall not be sloped more than 1 horizontal in 6 vertical. Dowels shall be grouted into a core in vertical alignment, even though they are in adjacent cell to the vertical wall reinforcing.

3.04 BOND AND JOINTS

A. All load bearing masonry units shall be laid in running bond by lapping units in successive courses a distance of one-half unit.

B. The starting joint of foundations and floor slab shall be laid with full mortar coverage on the bed except that the area where grout occurs shall be kept free from mortar so that the grout will bond (contact) with concrete already placed.

C. All courses shall be level, with joints of uniform width. Units shall have full mortar coverage of the face shells in both the horizontal and vertical joints. Reinforced cells

shall have mortar coverage on cross webs also to prevent grout leakage to adjacent cells.

D. All joints shall be painted solid with mortar on both sides and wall of block. Joints in exposed Work shall be finished concave with finishing tool, to create a dense surface. Interior and exterior joints in non-exposed or plaster covered masonry shall be flush.

E. All sound absorptive concrete masonry units shall be laid in stack bond with the open ends of the cavities facing downward, and shall be seated in a full bed of mortar.

F. Slots shall be provided to expose the areas where sound absorption is desired, as indicated on the Drawings. Care shall be taken to ensure that the slots are kept free of mortar or debris above mortar joints.

3.05 CONTROL JOINTS

A. Control joints shall be installed as detailed and where shown on the Drawings or needed.

B. The maximum horizontal distance between vertical control joints shall be 30 feet, but joints shall be located only as reviewed by the Engineer or as shown.

C. Joints shall be equal in width to the standard mortar joints.

D. Horizontal joint reinforcing shall be discontinuous at control joints.

3.06 MORTAR AND GROUT

A. All equipment used in placing, moving, and storing mortar shall be thoroughly cleaned at the end of each day's work.

B. Mortar that, in the opinion of the Engineer, has begun to set shall not be used.

C. All courses shall be laid in full mortar beds. All units shall be laid with mortar applied to the face shells of blocks previously laid, as well as to blocks being laid, to ensure well filled joints.

D. Where new masonry is joined to existing or partially set work, loose mortar and joints shall first be cleaned. When it is necessary to stop a horizontal run, rack back one-half block length in each course; toothing shall not be permitted.

E. Hollow metal frames, mullions, and spaces around built-in items shall be filled solidly with grout.

F. Proportioning and Mixing of Mortar:

1. Measurement of materials shall be such that the specified proportions are controlled and accurately maintained.

2. Workability of consistency of the mortar on the board shall be sufficiently wet to be worked under the trowel. Water for tempering shall be available on the scaffold at

all times. Mortar which has begun to set after initial mixing shall be discarded. Mortar which has stiffened due to evaporation shall be re-tempered to restore its workability. Retempering the mortar at the mixer shall not be permitted.

3. Mortar shall be machine mixed in a type of mortar mixer which is acceptable to the Engineer, and in which the quantity of water can be accurately and uniformly controlled.

4. The mixing time shall not be less than 5 minutes, approximately 2 minutes of which shall be for mixing the dry materials, and not less than 3 minutes for continuing the mixing after the water has been added.

5. Where hydrated lime is used for mortar requiring a lime content, the Contractor has the option of using the dry-mix method or first converting the lime into a putty. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious materials have been thoroughly distributed throughout the mass. After this point, the water shall be gradually added.

G. Mortar and grout drippings shall be cleaned from exposed masonry and adjacent surfaces immediately, to prevent surfaces from being permanently stained. Drippings and smears shall be removed before mortar and/or grout sets or hardens. Mortar extruded beyond faces of walls or partitions shall be removed.

H. Grouting:

1. Grouting shall not be started until walls have cured a minimum of 24 hours.

2. Reinforcing steel shall be secured in place and inspected before grouting starts. Inform Engineer for inspection.

3. Mortar drippings shall be kept out of the grout space.

4. Vertical cells to be filled shall have vertical alignment to maintain a continuous unobstructed cell area not less than 2-inch by 3-inch.

5. All cells to be grouted including those with reinforcing shall be solidly filled with grout. Consolidate at time of pouring by puddling (rodding) or vibrating with mechanical vibrators and reconsolidate again after 5 to 10 minutes and no later than 20 minutes to allow water absorption by concrete block.

6. Grout shall be consolidated by puddling or mechanical vibrating during placement, and reconsolidated after excess moisture has been absorbed, but before plasticity is lost.

7. All anchor bolts and other embedded items shall be securely held in place during the grouting operation.

8. Grouting shall be done in pours not exceeding 10 ft and lifts of a maximum of 5 feet. Provide pre-cut full block height clean out holes at the first course of all cores containing vertical reinforcement and at the bottom of each subsequent grout

pour. As successive masonry lifts are laid, remove mortar dripping from the grout space and off the reinforcing steel. Prior to grouting and boarding the cleanout opening, remove all leftover mortar drippings and loose materials and flush out the reinforced cell with water. Board up the opening only after Engineer's inspection and approval.

I. Installation of all masonry accessories shall be in strict accordance with manufacturer's recommendations for the particular product. In the event that no specific installation instructions are provided by the manufacturer, accepted industry standard shall be adhered to.

3.07 INSULATION

A. After construction of the building, all masonry block, including exterior and interior walls with empty cells shall be filled with a foamed-in-place masonry wall insulation system where indicated on the drawings.

B. Install foamed-in-place insulation in un-grouted cells of masonry units from interior, or as specified. Comply with manufacturer’s instructions.

C. The foamed-in-place insulation shall be pressure injected through a series of 5/8-inch to 7/8-inch holes drilled into every vertical column of un-grouted block cells beginning at an approximate height of four feet from the finished floor level. Holes shall be patched with mortar and scored to resemble existing surface.

D. Foamed-in-place insulation shall be placed prior to installation of interior finish work, after all masonry and structural concrete work is in place, and once moisture content of in-place CMU is acceptable to the manufacturer. Installation shall comply with manufacturer’s instructions.

D. Remove excess materials and debris promptly. Remove mortar drippings from masonry and adjacent work before final set.

E. All holes and openings in the wall through which insulation can escape shall be permanently sealed or caulked prior to installation of the insulation. Copper, galvanized steel, or fiber glass screening shall be used in all weep holes.

3.08 BUILT-IN WORK

A. Furnish and install all anchor bolts, access doors and frames, and all metal work to be built into masonry which is not specified to be furnished under any other heading of the specifications.

B. The masonry contractor shall thoroughly familiarize himself with all the requirements of the structural steel and reinforced concrete work and specifications, and its must make its own work conform to the requirements therein illustrated or described. He shall build in all the structural steel and miscellaneous iron work of every description.

C. Thoroughly tie in all anchors and secure masonry work to the concrete work in a careful manner. All pockets and openings must be filled solidly with mortar so as to leave no air

space or pockets to collect moisture. No iron work shall be covered or built-in unless thoroughly painted by the contractor setting it.

D. The masonry contractor shall build-in items furnished by others.

E. The masonry contractor shall coordinate its work with mechanical and electrical trades in order to accommodate all built-in pipes and conduits.

3.09 LINTELS

A. Unless otherwise noted on the Drawings that masonry over openings shall be reinforced, furnish and install precast reinforced concrete lintel at all openings in masonry walls not having poured lintel or tie beam at top. Provide 8" minimum bearing either side of opening. Bottom flange of precast lintels shall be pre-cut at bearing to allow passage of reinforcing and grout.

3.10 CLEANING AND POINTING

A. All masonry to be left exposed shall be cleaned thoroughly with 5 percent muriatic acid solution using stiff brush and rinse thoroughly with clear water.

B. Point all holes and chipped areas in exposed masonry. Cut out defective joints and repaint them with like mortar.

C. Remove all loose and excess mortar prior to cleaning.

3.11 PARGING

A. Parge masonry walls where shown or indicated on the drawings in two uniform costs of mortar. Maintain 3/4 inch total thickness.

B. Dampen masonry walls prior to application.

C. Scarify base coat to ensure full bond to subsequent coat.

D. Steel trowel surface smooth and flat.

- END OF SECTION –

SECTION 05010 - METAL MATERIALS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Metal materials not otherwise specified shall conform to the requirements of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Materials for fasteners are included in Section 05050 entitled "Metal Fastening".

B. Requirements for specific products made from the materials specified herein are included in other sections of the Specifications. See the section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A.	ASTM A36	Standard Specification for Structural Steel
B.	ASTM A47	Standard Specification for Malleable Iron Castings
C.	ASTM A48	Standard Specification for Gray Iron Castings
D.	ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
E.	ASTM A167	Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
F.	ASTM A276	Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
G.	ASTM A307	Standard Specification for Carbon Steel Externally Threaded Standard Fasteners
H.	ASTM A446	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) quality
I.	ASTM A500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
J.	ASTM A501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
K.	ASTM A529	Standard Specification for Structural Steel with 42,000 psi (290 Mpa) Minimum Yield Point (1/2 in. (12.7 mm) Maximum Thickness)

L.	ASTM A536	Standard Specification for Ductile Iron Castings
M.	ASTM A570	Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
N.	ASTM A572/A572M-94C	Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50
O.	ASTM A666	Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications
P.	ASTM B26	Standard Specification for Aluminum-Alloy Sand Castings
Q.	ASTM B85	Standard Specification for Aluminum-Alloy Die Castings
R.	ASTM B108	Standard Specification for Aluminum-Alloy Permanent Mold Castings
S.	ASTM B138	Standard Specification for Manganese Bronze Rod, Bar, and Shapes
T.	ASTM B209	Standard Specification for Aluminum-Alloy Sheet and Plate
U.	ASTM B221	Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
V.	ASTM B308	Standard Specification for Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded
W.	ASTM B574	Standard Specification for Nickel-Molybdenum-Chromium Alloy Rod
X.	ASTM F468	Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

1.04 SUBMITTALS

A. Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.

1.05 QUALITY ASSURANCE

A. CITY may engage the services of a testing agency to test any metal materials for conformance with the material requirements herein. If the material is found to be in conformance with Specifications the cost of testing will be borne by the CITY. If the material does not conform to the Specifications, the cost of testing shall be paid by the CONTRACTOR and all materials not in conformance as determined by the ENGINEER shall be replaced by the CONTRACTOR at no additional cost to the CITY. In lieu of replacing materials the CONTRACTOR may request further testing to determine conformance, but any such testing shall be paid for by the CONTRACTOR regardless of outcome of such testing.

PART 2 -- PRODUCTS

2.01 CARBON AND LOW ALLOY STEEL

A. Material types and ASTM designations shall be as listed below:

1. Structural W Shapes	A 992 (50 ksi)
2. Structural S, M, C, L Shapes	A 36 (36 ksi)
3. Structural HP Shape	A 572, Grade 50 (50 ksi)
4. Structural Tubing	A 500, Grade B or A 501 (42 ksi)
5. Structural Pipe	A 53, Type E or S, Grade B (35 ksi)
6. Plates and Bars	A 36 U.N.O. (36 ksi)
7. Sheet Steel	A 570, Grade C
8. Cold-Formed Structural Studs and Joists (18-22 gauge)	A 446, Grade C
8. Cold-Formed Structural Studs and Joists (12-16 gauge)	A 446, Grade D

2.02 STAINLESS STEEL

A. All stainless steel fabrications shall be Type 316.

B. Material types and ASTM designations are listed below:

1. Plates and Sheets	ASTM A167 or A666 Grade A
2. Structural Shapes	ASTM A276

2.03 ALUMINUM

A. All aluminum shall be alloy 6061-T6, unless otherwise noted or specified herein.

B. Material types and ASTM designations are listed below:

1. Structural Shapes	ASTM B308
2. Castings	ASTM B26, B85, or B108
3. Extruded Bars	ASTM B221 - Alloy 6061

4.	Extruded Rods, Shapes and Tubes	ASTM B221 - Alloy 6063
5.	Plates	ASTM B209 - Alloy 6061
6.	Sheets	ASTM B221 - Alloy 3003

C. All aluminum structural members shall conform to the requirements of Section 05140 entitled "Structural Aluminum".

D. All aluminum shall be provided with mill finish unless otherwise noted.

E. Where bolted connections are indicated, aluminum shall be fastened with Type 316 stainless steel bolts.

F. Aluminum in contact with dissimilar materials shall be insulated with an approved dielectric.

2.04 CAST IRON

A. Material types and ASTM designations are listed below:

1.	Gray	ASTM A48 Class 30B
2.	Malleable	ASTM A47
3.	Ductile	ASTM A536 Grade 60-40-18

2.05 BRONZE

A. Material types and ASTM designations are listed below:

1.	Rods, Bars and Sheets	ASTM B138 - Alloy B Soft

2.06 HASTELLOY

A. All Hastelloy shall be Alloy C-276.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 05035 - GALVANIZING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Where galvanizing is called for in the Contract Documents, the galvanizing shall be performed in accordance with the provisions of this Section unless otherwise noted.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Further requirements for galvanizing specific items may be included in other Sections of the Specifications. See section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Building Code

2. ASTM A123 - Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

5. ASTM A780 - Standard Practice of Repair of Damaged Hot-Dip Galvanized Coatings

1.04 SUBMITTALS

A. Submit the following in accordance with the Supplementary General Provisions Section 2.2 (b).

1. Certification that the item(s) are galvanized in accordance with the applicable ASTM standards specified herein. This certification may be included as part of any material certification that may be required by other Sections of the Specifications.

PART 2 -- PRODUCTS

2.01 GALVANIC COATING

A. Material composition of the galvanic coating shall be in accordance with the applicable ASTM standards specified herein.

PART 3 -- EXECUTION

3.01 FABRICATED PRODUCTS

A. Products fabricated from rolled, pressed, and forged steel shapes, plates, bars, and strips, 1/8-inch thick and heavier which are to be galvanized shall be galvanized in accordance with ASTM A123. Products shall be fabricated into the largest unit which is practicable to galvanize before the galvanizing is done. Fabrication shall include all operations necessary to complete the unit such as shearing, cutting, punching, forming, drilling, milling, bending, and welding. Components of bolted or riveted assemblies shall be galvanized separately before assembly. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the zinc coating.

B. Components with partial surface finishes shall be commercial blast cleaned prior to pickling.

C. Sampling and testing of each lot shall be performed prior to shipment from the galvanizer's facility per ASTM A123.

3.02 HARDWARE

A. Iron and steel hardware which is to be galvanized shall be galvanized in accordance with ASTM A153.

3.03 ASSEMBLED PRODUCTS

A. Assembled steel products which are to be galvanized shall be galvanized in accordance with ASTM A123. All edges of tightly contacting surfaces shall be completely sealed by welding before galvanizing.

3.04 SHEETS

A. Iron or steel sheets which are to be galvanized shall be galvanized in accordance with ASTM A924.

3.05 REPAIR OF GALVANIZING

A. Galvanized surfaces that are abraded or damaged at any time after the application of zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 coats of zinc rich paint meeting the requirements of Federal Specification DOD-P-21035A and shall be thoroughly mixed prior to application. Zinc rich paint shall not be tinted. The total thickness of the 2 coats shall not be less than 6 mils. In lieu of repairing by painting with zinc rich paint, other methods of repairing galvanized surfaces in accordance with ASTM A780 may be used provided the proposed method is acceptable to the ENGINEER.

- END OF SECTION –

SECTION 05050 - METAL FASTENING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all materials, labor, and equipment required to provide all metal welds and fasteners not otherwise specified, in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 - Metal Materials

B. Section 05035 - Galvanizing

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1.	Florida Building Code	
2.	AC 193	Acceptance Criteria for Mechanical Anchors in Concrete Elements
3.	AC 308	Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements
4.	ACI 318	Building Code Requirements for Structural Concrete
5.	ACI 355.2	Qualifications of Post-Installed Mechanical Anchors in Concrete
6.	AISC 348	The 2009 RCSC Specification for Structural Joints
7.	AISC	Specification for Structural Joints Using ASTM A325 or A490 Bolts.
8.	AISC	Code of Standard Practice
9.	AWS D1.1	Structural Welding Code - Steel
10.	AWS D1.2	Structural Welding Code – Aluminum
11.	AWS D1.6	Structural Welding Code – Stainless Steel

12.	Aluminum Association	Specifications for Aluminum Structures
13.	ASTM A572/A572M-94C	Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50
14.	ASTM A36	Standard Specification for Carbon Structural Steel
15.	ASTM A307	Standard Specification for Carbon Steel Externally Threaded Standard Fasteners
16.	ASTM A325	Standard Specification for High-Strength Bolts for Structural Steel Joints
17.	ASTM E488	Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
18.	ASTM F436	Standard Specification for Hardened Steel Washers
19.	ASTM A489	Standard Specification for Eyebolts
20.	ASTM A490	Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints
21.	ASTM A563	Standard Specifications for Carbon and Alloy Steel Nuts
22.	ASTM F593	Standard Specification for Stainless Steel Bolts; Hex Cap Screws, and Studs
23.	ASTM F594	Standard Specification for Stainless Steel Nuts
24.	ASTM D1785	Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe
25.	ASTM F1554	Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

1.04 SUBMITTALS

A. Submit the following items in accordance with Supplementary General Provisions, Section 2.2 (b).

1. Shop Drawings providing the fastener's manufacturer and type and certification of the fastener's material and capacity.

2. Manufacturer’s installation instructions.

3. Copy of valid certification for each person who is to perform field welding.

4. Certified weld inspection reports, when required.

5. Welding procedures.

6. Installer qualifications

7. Certification of Installer Training

8. Inspection Reports

9. Results of Anchor Proof Testing

10. For outdoor equipment, anchorage calculations to resist design wind loads, signed and sealed by a Professional Engineer registered in the State of Florida.

1.05 QUALITY ASSURANCE

A. Fasteners not manufactured in the United States shall be tested and certification provided with respect to specified quality and strength standards. Certifications of origin shall be submitted for all U.S. fasteners supplied on the project.

B. Installer Qualifications: Drilled-in anchors shall be installed by an Installer with at least three years of experience performing similar installations. Installer shall be certified as an Adhesive Anchor Installer in accordance with ACI-CRSI Adhesive Anchor Installation Certification Program.

C. Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the Installer on the project. Training shall consist of a review of the complete installation process for drilled-in anchors, to include but not be limited to the following:

1. Hole drilling procedure.

2. Hole preparation and cleaning technique.

3. Adhesive injection technique and dispenser training/maintenance.

4. Rebar doweling preparation and installation.

5. Proof loading/torquing.

D. All steel welding shall be performed by welders certified in accordance with AWS D1.1. All aluminum welding shall be performed by welders certified in accordance with AWS D1.2. All stainless steel welding shall be performed by welders certified in accordance with AWS D1.6. Certifications of field welders shall be submitted prior to performing any field welds.

E. Welds and high strength bolts used in connections of structural steel will be visually inspected in accordance with Article 3.04 of this Section.

F. The City may engage an independent testing agency to perform testing of welded connections and to prepare test reports in accordance with AWS. Inadequate welds

shall be corrected or redone and retested to the satisfaction of the Engineer and/or an acceptable independent testing laboratory, at no additional cost to the City.

G. Provide a welding procedure for each type and thickness of weld. For welds that are not prequalified, include a Performance Qualification Report. The welding procedure shall be given to each welder performing the weld. The welding procedure shall follow the format in Annex E of AWS D1.1 with relevant information presented.

PART 2 -- PRODUCTS

2.01 ANCHOR RODS (ANCHOR BOLTS)

A. For all conditions throughout this Contract, all anchor bolts shall be Type 316 stainless steel conforming to ASTM F-593 unless noted otherwise.

B. Nuts shall conform to ASTM F-594, alloy 316.

C. Where anchor rods are used to anchor galvanized steel or are otherwise specified to be galvanized, anchor rods and nuts shall be hot-dip galvanized. Galvanized anchor rods shall conform to ASTM F1554 Grade 36, and nuts shall conform to ASTM A563 Grade A.

D. Where pipe sleeves around anchor rods are shown on the Drawings, pipe sleeves shall be cut from Schedule 80 PVC plastic piping meeting the requirements of ASTM D1785, unless noted otherwise.

E. Equipment manufacturers, fabricators, and suppliers shall design and furnish anchor bolts as required to install the supplied units. The anchor bolt layout shall be coordinated with concrete work as specified herein.

F. Drilled in type anchor bolts, either adhesive types or mechanical types shall not be used unless approved in writing by the manufacturer/fabricator of equipment or covers, subject to acceptance by the Engineer. All operating pieces of equipment such as pumps, generators, motors etc. shall not be anchored with wedge anchors or other mechanical anchors. Drilled in type anchor bolts shall be Type 316 stainless steel. Drilled in type anchor bolts are specified under Article 2.04 of this Section entitled "Concrete Anchors".

2.02 HIGH STRENGTH BOLTS

A. High strength bolts and associated nuts and washers shall be in accordance with ASTM A325 or ASTM A490. Bolts, nuts and washers shall meet the requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

B. Where high strength bolts are used to connect galvanized steel or are otherwise specified to be galvanized, bolts, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A325.

2.03 STAINLESS STEEL BOLTS

A. Stainless steel bolts shall conform to ASTM F-593. All underwater fasteners, fasteners in confined areas containing fluid, and fasteners in corrosive environments shall be Type 316 stainless steel. Unless otherwise specified, fasteners for aluminum and stainless steel members shall be Type 316 stainless steel.

B. Stainless steel bolts shall have hexagonal heads with a raised letter or symbol on the bolts indicating the manufacturer, and shall be supplied with hexagonal nuts meeting the requirements of ASTM F594. Nuts shall be of the same alloy as the bolts.

2.04 CONCRETE ANCHORS

A. General

1. Where concrete anchors are called for on the Drawings, one of the types listed below shall be used; except, where one of the types listed below is specifically called for on the Drawings, only that type shall be used. Unless otherwise noted, all concrete anchors which are submerged, or are used in hanging items or have direct tension induced upon them, or which are subject to vibration from equipment such as pumps and generators, shall be adhesive anchors. The determination of anchors equivalent to those listed below shall be on the basis of test data performed by an approved independent testing laboratory. There are two types used:

    a. Expansion anchors shall be mechanical anchors of the wedge, sleeve, drop-in or undercut type.

    b. Adhesive anchors shall consist of threaded rods or bolts anchored with an adhesive system into hardened concrete. Adhesive anchors shall be two part injection type using the manufacturer's static mixing nozzle and shall be supplied as an entire system.

2. Expansion anchors shall not be used to hang items from above or in any other situation where direct tension forces are induced in anchor.

3. Unless otherwise noted, all concrete anchors which are submerged or are used in hanging items or have direct tension induced upon them, or which are subject to vibration from equipment such as pumps and generators, shall be adhesive anchors.

4. Adhesive anchors shall conform to the requirements of ACI 355.4 or alternately to AC308. Expansion or mechanical anchors shall conform to the requirements of ACI 355.2 or alternately to AC 193.

5. All anchors installed within fire resistant construction shall either be enclosed in a fire resistant envelope, be protected by approved fire-resistive materials, be used to resist wind loads only, or anchor non-structural elements.

B. Concrete Anchor Design"
An anchor design consists of specifying anchor size, quantity, spacing, edge distance

and embedment to resist all applicable loads. Where an anchor design is indicated on the Drawings, it shall be considered an engineered design and anchors shall be installed to the prescribed size, spacing, embedment depth and edge distance. If all parts of an anchor design are provided on the Drawings except embedment depth, the anchors will be considered an engineered design and the Contractor shall provide the embedment depth as indicated in Paragraph B.3 unless otherwise directed by the Engineer. Where an anchor design is not indicated by the Engineer on the Drawings, the Contractor shall provide the anchor design per the requirements listed below.

1. Structural Anchors: All concrete anchors shall be considered structural anchors if they transmit load between structural elements; transmit load between non-structural components that make up a portion of the structure and structural elements; or transmit load between life-safety related attachments and structural elements. Examples of structural concrete anchors include but are not limited to column anchor bolts, anchors supporting non-structural walls, sprinkler piping support anchors, anchors supporting heavy, suspended piping or equipment, anchors supporting barrier rails, etc. For structural anchors, the Contractor shall submit an engineered design with signed and sealed calculations performed by an Engineer currently registered in the State of Florida. Structural anchors shall be of a type recommended by the anchor manufacturer for use in cracked concrete and shall be designed by the Contractor in accordance with ACI 318 Appendix D.

2. Non-Structural Anchors: All other concrete anchors may be considered non-structural concrete anchors. The Contractor shall perform an engineered design for non-structural anchors. The Engineer may request the Contractor provide anchor design details for review, but submission of a signed, sealed design is not required. Non-structural anchors shall be designed by the contractor for use in uncracked concrete.

3. Minimum anchor embedment shall be as indicated on the Drawings or determined by the Contractor's engineered design. Concrete anchors shall be embedded no less than the manufacturer's standard embedment (expansion or mechanical anchors) or to provide a minimum allowable bond strength equal to the allowable yield capacity of the rod/bolt (adhesive anchors).

C. Structural Anchors:

1. Mechanical Anchors:

a. Wedge Anchors: Wedge anchors shall be "Kwik Bolt TZ" by Hilti, Inc., "TruBolt +" by ITW Redhead, "Strong-Bolt" or "Strong-Bolt 2" by Simpson Strong-Tie Co. or "Powerstud SD-1" or "Powerstud SD-2" by Powers Fasteners.

b. Screw Anchors: Screw anchors shall be "Kwik HUS-EZ" and "KWIK HUS-EZ-I" by Hilti, Inc., "Titen HD" by Simpson Strong-Tie Co., or "Wedge-Bolt +" by Powers Fasteners. Bits specifically provided by manufacturer of chosen system shall be used for installation of anchors.

c. Sleeve Anchors: Sleeve anchors shall be “HSL-3 Heavy Duty Sleeve Anchor” by Hilti, Inc. or “Power-Bolt +” by Powers Fasteners.

d. Undercut Anchors: Undercut anchors shall be “HDA Undercut Anchor” by Hilti, Inc., “Torq-Cut Undercut Anchor” by Simpson Strong-Tie Co., “Atomic + Undercut Anchor” by Powers Fasteners

2. Adhesive Anchors:

a. Adhesive anchors shall be “Epcon G5” by ITW Redhead, “HIT HY-150 Max SD” by Hilti, Inc., “SET-XP” by Simpson Strong-Tie Co., or “Powers 1000+” by Powers Fasteners.

b. Structural adhesive anchor systems shall be IBC compliant and capable of resisting short term wind and seismic loads (Seismic Design Categories A through F) as well as long term and short term sustained static loads in both cracked and uncracked concrete in all Seismic Design Categories. Structural adhesive anchor systems shall comply with the latest revision of ICC-ES Acceptance Criteria AC308, and shall have a valid ICC-ES report in accordance with the applicable building code. No or equal products will be considered unless prequalified and approved by the Engineer and City.

D. Non-Structural Anchors: In addition to the acceptable non-structural anchors listed below, all structural anchors listed above may also be used as non-structural anchors.

1. Mechanical Anchors:

a. Wedge Anchors: Wedge anchors shall be “Kwik Bolt 3” by Hilti, Inc. or “TruBolt” by ITW Redhead.

b. Screw Anchors: Screw anchors shall be “Kwik HUS” by Hilti, Inc., “Wedge-Bolt” by Powers Fasteners or “Large Diameter Tapcon (LDT) Anchor” by ITW Redhead. Bits specifically provided by manufacturer of chosen system shall be used for installation of anchors.

c. Sleeve Anchors: Sleeve anchors shall be “HSL Heavy Duty Sleeve Anchors” by Hilti, Inc. “Power-Bolt” by Powers Fasteners or “Dynabolt Sleeve Anchor” by ITW Redhead.

d. Drop-In Anchors: Drop-in anchors shall be “Drop-In” by Simpson Strong-Tie Co., “HDI Drop-In Anchor” by Hilti, Inc. or “Multi-Set II Drop-In Anchor” by ITW Redhead.

e. Undercut Anchors: Undercut anchors shall be “HDA Undercut Anchor” by Hilti, Inc.

2. Adhesive Anchors:

   a. Adhesive anchors shall be “Epcon A7” or “Epcon C6” by ITW Redhead, “HIT HY-150 Max” by Hilti, Inc., “SET Epoxy Tie” or “AT” by Simpson Strong-Tie Co., or “Powers AC 100+ Gold” or “T308+ Epoxy” by Powers Fasteners.

   b. Non-structural adhesive anchors systems shall be IBC compliant and capable of resisting short term wind and seismic (Seismic Design Categories A and B) as well as long term and short term sustained static loads in uncracked concrete

   c. Non-structural adhesive anchor embedment depth of the rod/bolt shall provide a minimum allowable bond strength that is equal to the allowable yield capacity of the rod/bolt unless noted otherwise on the Drawings.

   d. No or equal products will be considered unless prequalified and approved by the Engineer and City.

E. Concrete Anchor Rod/Bolt Materials:

1. Concrete anchors used to anchor structural steel shall be a threaded steel rod per manufacturer’s recommendations for proposed adhesive system, but shall not have a yield strength (fy) less than 58 ksi nor an ultimate strength (fu) less than 72.5 ksi, unless noted otherwise. Where steel to be anchored is galvanized, concrete anchors shall also be galvanized unless otherwise indicated on the Drawings.

2. Concrete anchors used to anchor aluminum, FRP, or stainless steel shall be Type 304 stainless steel unless noted otherwise. All underwater concrete anchors shall be Type 316 stainless steel.

3. Nuts, washers, and other hardware shall be of a material to match the anchors.

2.05 MASONRY ANCHORS

A. Anchors for fastening to solid or grout-filled masonry shall be adhesive anchors as specified above for concrete anchors.

B. Anchors for fastening to hollow masonry or brick shall be adhesive anchors consisting of threaded rods or bolts anchored with an adhesive system dispensed into a screen tube inserted into the masonry. The adhesive system shall use a two-component adhesive mix and shall inject into the screen tube with a static mixing nozzle. Thoroughly clean drill holes of all debris and drill dust with nylon (not wire) brush prior to installation of adhesive and anchor. Contractor shall follow manufacturer’s installation instructions. The adhesive system shall be “Epcon System A7 or C6” as manufactured by ITW Ramset/Redhead, “HIT HY-70 System” as manufactured by Hilti, Inc., “SET Epoxy-Tie” or “AT Acrylic-Tie” as manufactured by Simpson Strong-Tie Co., or “AC-100+ Gold by Powers Fasteners.

C. Masonry anchors used to anchor steel shall be a threaded steel rod per manufacturer's recommendations for proposed adhesive system, but shall not have a yield strength (fy) less than 58 ksi nor an ultimate strength (fu) less than 72.5 ksi, unless noted otherwise. All masonry anchors shall be Type 316 stainless steel except where steel to be anchored is galvanized; masonry anchors shall also be galvanized.

D. Masonry anchors used to anchor aluminum, FRP, or stainless steel shall be Type 316 stainless steel unless noted otherwise.

2.06 WELDS

A. Electrodes for welding structural steel and all ferrous steel shall comply with AWS Code, using E70 series electrodes for shielded metal arc welding (SMAW), or F7 series electrodes for submerged arc welding (SAW).

B. Electrodes for welding aluminum shall comply with the Aluminum Association Specifications and AWS D1.2.

C. Electrodes for welding stainless steel and other metals shall comply with AWS D1.6.

2.07 WELDED STUD CONNECTORS

A. Welded stud connectors shall conform to the requirements of AWS D1.1 Type C.

2.08 EYEBOLTS

A. Eyebolts shall conform to ASTM A489 unless noted otherwise.

2.09 HASTELLOY FASTENERS

A. Hastelloy fasteners and nuts shall be constructed of Hastelloy C-276.

2.10 ANTISEIZE LUBRICANT

A. Antiseize lubricant shall be Graphite 50 Anti-Seize by Loctite Corporation, 1000 Anti-Seize Paste by Dow Corning, 3M Lube and Anti-Seize by 3M, or approved equal.

PART 3 -- EXECUTION

3.01 MEASUREMENTS

A. The Contractor shall verify all dimensions and review the Drawings and shall report any discrepancies to the Engineer for clarification prior to starting fabrication.

3.02 ANCHOR INSTALLATION

A. Anchor Rods, Concrete Anchors, and Masonry Anchors

1. Anchor rods shall be installed in accordance with AISC "Code of Standard Practice" by setting in concrete while it is being placed and positioned by means

of a rigidly held template. Overhead adhesive anchors, and base plates or elements they are anchoring, shall be shored as required and securely held in place during anchor setting to prevent movement during anchor installation. Movement of anchors during curing is prohibited.

2. The Contractor shall verify that all concrete and masonry anchors have been installed in accordance with the manufacturer's recommendations and that the capacity of the installed anchor meets or exceeds the specified safe holding capacity.

3. Concrete anchors shall not be used in place of anchor rods without Engineer's approval.

4. All stainless steel threads shall be coated with antiseize lubricant.

B. High Strength Bolts

1. All bolted connections for structural steel shall use high strength bolts. High strength bolts shall be installed in accordance with AISC "Specification for Structural Joints, using A325 or A490 Bolts." All high strength bolts installed by the "turn-of-nut" method shall have the turned portion marked with reference to the steel being connected after the nut has been made snug and prior to final tightening. These marks will be considered in inspection.

2. All stainless steel bolts shall be coated with antiseize lubricant.

C. Concrete Anchors

1. Concrete at time of anchor installation shall be a minimum age of 21 days.

2. Concrete anchors designed by the Contractor shall be classified as structural or non-structural based on the requirements indicated above.

3. Concrete Anchor Testing:

a. At all locations where concrete anchors meet the requirements for structural anchors at least 25 percent of all concrete anchors installed shall be proof tested to the value indicated on the Drawings, with a minimum of one tested anchor per anchor group. If no test value is indicated on the Drawings but the installed anchor meets the requirements for structural anchors, the Contractor shall notify the Engineer to allow verification of whether anchor load proof testing is required.

b. Contractor shall submit a plan and schedule indicating locations of anchors to be tested, load test values and proposed anchor testing procedure (including a diagram of the testing equipment proposed for use) to the Engineer for review prior to conducting any testing. Testing of anchors shall be in accordance with ASTM E488 for the static tension test. If additional tests are required, inclusion of these tests shall be as stipulated on Contract Drawings.

c. Where Contract Documents indicate anchorage design to be the Contractor's responsibility and the anchors are considered structural per the above criteria, the Contractor shall submit a plan and schedule indicating locations of anchors to be proof tested and load test values, sealed by a Professional Engineer currently registered in the State of North Carolina. The Contractor's Engineer shall also submit documentation indicating the Contractor's testing procedures have been reviewed and the proposed procedures are acceptable. Testing procedures shall be in accordance with ASTM E488.

d. Concrete Anchors shall have no visible indications of displacement or damage during or after the proof test. Concrete cracking in the vicinity of the anchor after loading shall be considered a failure. Anchors exhibiting damage shall be removed and replaced. If more than 5 percent of tested anchors fail, then 100 percent of anchors shall be proof tested.

e. Proof testing of concrete anchors shall be performed by an independent testing laboratory hired directly by the Contractor and approved by the Engineer. The Contractor shall be responsible for costs of all testing, including additional testing required due to previously failed tests.

4. All concrete anchors shall be installed in strict conformance with the manufacturer's printed installation instructions. A representative of the manufacturer shall be on site when required by the Engineer.

5. All holes shall be drilled with a carbide bit unless otherwise recommended by the manufacturer. No cored holes shall be allowed unless specifically approved by the Engineer. If coring holes is allowed by the manufacturer and approved by the Engineer, cored holes shall be roughened in accordance with manufacturer requirements. Thoroughly clean drill holes of all debris and drill dust with compressed air followed by a wire brush prior to installation of adhesive and threaded rod/bolt unless otherwise recommended by the manufacturer. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Where depth of hole exceeds the length of the static mixing nozzle, a plastic extension hose shall be used to ensure proper adhesive injection from the back of the hole. Injection of adhesive into the hole shall utilize a piston plug to minimize the formation of air pockets. Wipe rod free from oil that may be present from shipping or handling.

D. Other Bolts

1. All dissimilar metal shall be connected with appropriate fasteners and shall be insulated with a dielectric or approved equal. Unless otherwise specified, where aluminum and steel members are connected together they shall be fastened with Type 316 stainless steel bolts and insulated with micarta, nylon, rubber, or approved equal.

3.03 WELDING

A. All welding shall comply with AWS Code for procedures, appearance, quality of welds, qualifications of welders and methods used in correcting welded work.

B. Welded stud connectors shall be installed in accordance with AWS D1.1.

3.04 INSPECTION

A. High strength bolting will be visually inspected in accordance with AISC 348 "The 2009 RCSC Specification for Structural Joints". Rejected bolts shall be either replaced or retightened as required. In cases of disputed bolt installation, the bolts in question shall be checked by a calibrated wrench certified by an independent testing laboratory. The certification shall be at the Contractor's expense.

B. Field welds will be visually inspected in accordance with AWS Codes. Inadequate welds shall be corrected or redone as required in accordance with AWS Codes.

C. Post installed anchors shall be inspected as required by ACI 318.

3.05 CUTTING OF EMBEDDED REBAR

A. The Contractor shall not cut embedded rebar cast into structural concrete during installation of post-installed fasteners without prior approval of the Engineer.

- END OF SECTION -

SECTION 05500 - METAL FABRICATIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, fabricate, and install miscellaneous metalwork and appurtenances, complete, all in accordance with the requirements of the Contract Documents.

B. Work shall include but may not be limited to lintels, guard posts, hoppers, and chutes.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05035 - Galvanizing

B. Section 05050 - Metal Fastening

C. Section 09990 - Painting

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the requirements of the Florida Building Code and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section:

1. American Society for Testing and Materials (ASTM), specifications as referred to herein.

2. American Welding Society (AWS) "Structural Welding Code-Steel" (AWS D1.1) which includes qualification procedures for welders.

3. American Institute of Steel Construction (AISC) "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and "Commentary on the AISC Specification."

4. American Iron and Steel Institute (AISI) "Specifications for the Design of Cold-Formed Steel Structural Members" and "Commentary on the AISI Specification."

5. Occupational Safety and Health Administration (OSHA) Regulations.

6. Aluminum Association "Specifications for Aluminum Structures" and "Engineering Data for Aluminum Structures."

7. National Association of Architectural Metal Manufacturers "Metal Stairs Manual."

B. References herein to "Building Code" shall mean the Florida Building Code.

1.04 SUBMITTALS

A. Shop drawings of all miscellaneous metalwork shall be submitted to the Engineer for review in accordance with the Supplementary General Provisions Section 2.2 (b).

B. Safe working load capacity in tension and shear for each size and type of concrete anchor used shall be submitted to the Engineer for review.

PART 2 -- PRODUCTS

2.01 METAL MATERIALS

A. Materials are specified in Section 05010 entitled "Metal Materials".

2.02 METAL FASTENING

A. All welds and fasteners used in metal fabrication shall conform to Section 05050 entitled “Metal Fastening”.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the Drawings and shall be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. Bolts and welds shall conform to Section 05050, Metal Fastening. All fastenings shall be concealed where practicable.

G. Fabricated items shall be shop painted when specified in Section 09900, Painting.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metals where site welding is required.

B. Supply items required to be cast into concrete with setting templates, to appropriate sections.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on Drawings.

D. Obtain Engineer approval prior to site cutting or making adjustments not scheduled.

E. Fabrication and Erection: Except as otherwise shown, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

3.04 WELDING

A. All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.

B. In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS Code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp comers of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

- END OF SECTION –

SECTION 06100 - ROUGH CARPENTRY

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all items of rough carpentry work, necessary for a complete installation, as shown on the Drawings and as specified herein.

B. Wood and plywood used for the Administration Building shall be from FSC certified sources.

C. Principal items of work include:

1. Wood blocking, nailers, grounds, furring, ties, centering, etc., necessary or required for attachment or support of work under this Section, and other Sections.

2. Fasteners, including nails, screws, bolts, anchors and other fastenings, required to secure work under this Section.

3. Temporary enclosures and protective boarding.

4. Wood preservative treatment for all wood members in contact with roofing, masonry, concrete, and exposed to the elements.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03305 – Concrete and Grout

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Lumber to conform to American Lumber Standards' Product Standard PS 20-70. Graded by rules of manufacture's association under whose rules lumber is produced. Evidence of grade and mill marked on each piece.

B. National Design Specification for Wood Construction - 1991 (National Forest Products Association).

C. Southern Pine Association.

D. Western Wood Products Association.

E. American Plywood Association.

F. Forest Stewardship Council (FSC)

G. Moisture Content: Moisture content of lumber shall be maintained within the requirements of the association under whose grading rules it is produced.

1.04 SUBMITTALS

A. Submit product data for each product that will be permanently installed in the Administration Building.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Lumber: Lumber for headers, rafters, wood grounds, nailers and blocking shall be No. 2 common yellow pine or standard grade Douglas Fir. Moisture content shall not exceed 19%.

B. Fire Retardant Lumber and Plywood

1. Sizes shown or noted on the Drawings shall be used for all wood members except rot protected pressure treated lumber herein specified.

2. Each piece shall be treated with Koppers Co., "Dricon" process, Hoover Exterior Fire-X Blue, or approved equal, meeting the U.L. FR-S classification for flame spread and smoke contribution.

C. Pressure Treated Lumber

1. Lumber that is required to be pressure treated shall be treated with waterborne preservatives in accordance with AWPA Standard U1 to the requirements of Use Category 3 (UC3B) for above ground use and Use Category 4 (UC4B) for ground contact.

2. Each piece of the pressure-treated lumber shall be treated in accordance with the proper requirements, of the standard specifications of the American Wood Preservers Association and shall bear the brand conforming to the standard of AWPA.

3. Cut or sawed surfaces in preservative treated member shall receive two coats of the same preservative used in the original treatment.

D. Rough Hardware: Rough hardware shall be the most suitable for project requirements. Expansion shields or bolts and toggle bolts shall be provided as required. All bolts, nails, screws, anchors, straps, clips, etc., shall be galvanized.

E. Connecting Hardware

1. Nails shall be stainless steel common wire for exterior work.

2. Screws shall be standard domestic manufacture, stainless steel for exterior use and of brass, bronze, aluminum or stainless steel when used to attach items made of those materials.

3. Bolts shall be machine bolts (or carriage bolts if called for on Drawings) of Series 300 stainless steel with hexagon nuts, of sizes noted on Drawings. Wood fascia fasteners shall be galvanized steel and conform to the requirements of ASTM Designation A 307.

4. Steel plates and angles shall be carbon steel, ASTM A 36, galvanized after fabrication for temporary items and stainless steel for permanent items as shown on the Drawings.

5. Lag screws, shear plates and split ring connectors shall conform to the requirements of the "National Design Specifications for Wood Construction from the National Forest Products Association and shall be stainless steel.

6. Power actuated fasteners shall conform to Federal Specification GGG-D-777a, and shall be installed as per manufacturer's printed directions. Power charge shall be

powerful enough to prevent spalling of concrete.

2.02 PLYWOOD SHEATHING

A. All roof sheathing shall be Exterior Type Plywood, C-D, EXT-DFPA. Each panel shall be identified with the DFPA grade trademark of the American Plywood Association, and shall meet the requirements of Product Standard PS-1-83 for Construction and Industrial Plywood.

B. Plywood thickness shall be as shown on the drawings. Install with face grain across supports with metal clips along unsupported edges as per manufacturers specifications. Fastening of the sheathing to the wood framing shall be specified on the Drawings.

C. Nails shall be galvanized with annular ring shanks.

PART 3 -- EXECUTION

3.01 SHIPPING, HANDLING AND STORAGE

A. Materials shall be kept dry during delivery and storage. The Contractor shall protect materials against exposure from weather and contact with damp or wet surfaces. Lumber shall be stacked with provisions for air circulation within stacks.

3.02 JOB CONDITIONS

A. Protection: Installed carpentry Work shall be protected from damage by Work of other trades until final acceptance of work. Wood surfaces to be finished shall be protected from moisture and dirt until prime coat has been applied.

B. Coordination: Fit carpentry Work to other work; scribe and cope as required for accurate fit. Correlate location of during, nailers, blockings, grounds and similar supports to allow proper attachment of other work.

C. Inspection: The Contractor shall examine the substrates, supporting structure and the condition under which carpentry will be installed. Work shall not be started until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: The Contractor shall provide and install all rough hardware for proper installation of carpentry, nails, spikes, screws, machine bolts and similar items shall be of types and sizes sufficient to draw and rigidly secure members into place. All rough hardware shall be hot dipped galvanized on both interior and exterior work.

B. Quality: Units of material with defects which might impair the quality of work, and units which are too small to fabricate the Work with minimum joints or the optimum joint arrangement shall be discarded.

C. Carpentry Work shall be set accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

D. Fastening: Carpentry Work shall be securely attached to substrates by anchoring and fastening shown and as required by recognized standards. All connections between members shall be tight. Fasteners shall be installed without splitting of wood; pre-drill as required.

E. Fasteners shall be of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Bolts and nuts shall be countersunk flush with surfaces, unless otherwise shown.

F. All work shall be erected level and plumb and shall meet required heights, layout and details. All work shall be well nailed or bolted and adequately braced. All work shall be executed in accordance with the best practices of the trade by men skilled in the craft. Nailing shall be in accordance with the provisions of the Florida Building Code.

G. Furring shall be 1-inch x 2-inch strips, 12-inches o.c., or 1-inch x 3-inch strips, 16-inches o.c., securely attached to masonry and concrete with casehardened nails.

- END OF SECTION-

SECTION 07920 - SEALANTS AND CAULKING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide sealant and caulking work required for a complete installation as is indicated on the Drawings and specified herein. The required applications of sealants and caulking include, but are not necessarily limited to, the following general locations:

1. Masonry joints, exterior and interior.

2. Joints at penetrations of walls, decks by piping, doors, windows, louvers and other services and equipment.

3. Joints between items of equipment and other construction.

4. Exterior Insulation Finish joints.

1.02 SUBMITTALS

A. Submit shop drawings and color samples of sealant for review in accordance with the Supplementary General Provisions Section 2.2 (b).

B. Submit a two year guarantee on sealant type caulking work against joint failure. Joint failure is defined as leaks of air or water; evidence of loss of cohesion; fading of sealant material; migration of sealant; evidence of loss of adhesion between sealant and joint edge.

1.03 ACCEPTABLE MANUFACTURERS

A. The following list of manufacturer products are acceptable for this Section, subject to conformance with the specified requirements: Tremco, Thiokol, Dymoric or approved equal.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Primer: Where required by sealant manufacturer, the primer shall be a compound designed to insure the adhesion of sealant. Material shall be provided by the sealant manufacturer and shall be selected for compatibility with substrate.

B. Sealant

1. Type 1: Multi-component, non-sag, low-modulus polyurethane rubber sealant meeting ASTM C-920, Type M, Grade NS, Class 25, use NT, M, A, and O. Capable of withstanding 50% in extension or compression such as Sikaflex-2C NS/SL, Sika Corporation, or approved equal.

2. Type 2: Single component polyurethane sealant meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, A, and O. Capable of withstanding 25% in extension or compression such as Sikaflex 1A by Sika Corporation or approved equal.

3. Type 3: Single component, low-modulus moisture curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Capable of withstanding 50% extension and compression. Pecora 890 by Pecora Corporation, or approved equal.

4. Type 4: Single component, mildew resistant, moisture-curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Pecora 898 by Pecora Corporation, or approved equal.

5. Type 5: Single component, acrylic latex meeting ASTM C-834. AC-20+ Silicone by Pecora Corporation, or approved equal.

6. Type 6: High grade butyl sealant meeting Federal Specification TT-S-00-1657. BC-158 by Pecora Corporation or approved equal.

7. Type 7: Multi-component chemical resistant polysulfide sealant conforming to ASTM C-920, Type M, Grade NS, Class 25 such as Sonolastic Two Part by BASF Construction Chemicals, or approved equal.

8. Type 8: Non-sag, Multi Component, traffic grade polyurethane sealant meeting ASTM C920, Type 19, Grate NS, Class 25, use T, M, A, and O. DynaTread by Pecora Corporation or approved equal.

C. Joint Backing shall be closed cell foam. Material shall be nonreactive with caulking materials and non-oily. Minimum density shall be 3.24 pcf. Use no asphalt or bitumen-impregnated fiber with sealants.

D. Joint cleaner shall be as recommended by sealant or caulking compound manufacturer.

E. Joint Primer shall be as recommended by sealant manufacturer.

F. Bond Breaker tape shall be either polyethylene or plastic as recommended by the sealant manufacturer.

G. Color: Where manufacturer’s standard colors do not closely match materials being sealed, provide a custom color.

PART 3 -- EXECUTION

3.01 GENERAL

A. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

3.02 SHIPPING, HANDLING AND STORAGE

A. Store and handle materials so as to prevent the inclusion of foreign matter or the damage of materials by water or breakage. Procure and store in original containers until ready for use. Material showing evidence of damage will be rejected.

B. Store and handle materials so as to prevent the inclusion of foreign matter or the damage of materials by water or breakage. Procure and store in original containers until ready for use. Material showing evidence of damage shall be rejected.

3.03 INSTALLATION

A. Employ only proven installation techniques, which will insure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surface equally on opposite sides. Except as otherwise indicated, the Contractor shall fill the sealant rabbet to a concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a

slight cove, so that joint will not trap moisture and dirt.

B. Install sealants to depths as specified, or if not, as recommended by the sealant manufacturer and as follows:

1. Moving Joints: For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

2. Sealed Joints: For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in the range of 75% to 125% of joint width.

3. Thresholds: Set thresholds in full bed of caulking compound; remove excess materials.

3.04 SCHEDULE

Schedule of Sealants

Application	Sealant	Color
Vertical and horizontal joints bordered on both sides by concrete, masonry, precast concrete, EIFS, or other porous building material.	Type 2	To closely match adjacent surfaces or mortar and as selected by the City.
Vertical and horizontal joints bordered on both sides by painted metals, anodized aluminum, mill finished aluminum, PVC, glass or other non-porous building material.	Type 3	To closely match adjacent surfaces and as selected by the City.
Masonry expansion and control joints less than 1¼" wide.	Type 2	To closely match adjacent surfaces and as selected by the City.
Masonry expansion and control joints equal or greater than 1¼ inches wide and not to exceed 2".	Type 1	To closely match adjacent surfaces and as selected by the City.
Interior – wood trim and finish joints.	Type 5	Color to be selected by City
Sanitary areas, joints in ceramic tile, around plumbing fixtures, countertops, and back splashes. See Note 1.	Type 4	To closely match adjacent surfaces and as selected by the City.
Perimeter sealing of doors, windows, louvers, piping, ducts, and electrical conduit. See Note 2.	Type 2 OR Type 3	To closely match adjacent surfaces and as selected by the City.
Below thresholds.	Type 6	Manufacturer's standard
Submerged in liquids. See Note 4.	Type 1	Manufacturer's standard
Submerged in liquids with high concentration of chlorine (> 2 ppm).	Type 7	Manufacturer's standard
Horizontal Joints exposed to vehicular or pedestrian traffic.	Type 8	To closely match adjacent surfaces.

Application	Sealant	Color
Other joints indicated on the drawings or customarily sealed but not listed.	Type recommended by manufacturer	To closely match adjacent surfaces and as selected by the City.

Note 1. Sealant for Laboratory Countertop shall be as recommended by countertop manufacturer.
Note 2. Provide UL approved sealants for penetrations thru fire-rated walls and as specified in Section 07270.
Note 3. Sealants which will come in contact with potable water shall meet the requirements of NSF 61.
Note 4. Where sealant will be immersed in liquid chemicals verify compatibility prior to installation of sealant.

3.05 PROTECTION OF ADJOINING SURFACES

A. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.06 SEALANT BACKER ROD

A. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

3.07 BOND BREAKER

A. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to insure that elastomeric sealants will perform properly.

3.08 SPILLAGE

A. Sealants or compounds shall not overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces. Masking tape or other precautionary devices shall be used to prevent staining of adjoining surfaces.

3.09 CURING

A. Sealants and caulking compounds shall be cured in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability.

3.10 CLEANING

A. Excess and spillage of compounds shall be promptly removed as the work progresses. Adjoining surfaces shall be cleaned by whatever means may be necessary to eliminate evidence of spillage. Do not damage the adjoining surfaces or finishes.

- END OF SECTION -

SECTION 08330 - ROLL-UP DOORS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all roll-up door assemblies and frames and all appurtenant work, complete and operable, including manual drive systems and power drive systems, including locking hardware, and control systems, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09990 - Painting

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Codes: All codes, as referenced herein, are specified in the Section entitled "Reference Standards".

B. Commercial Standards

NEMA National Electric Manufacturers Association

NEC National Electric Code

C. Trade Standards

1. American Rolling Door Institute

2. National Association of Garage Door Manufacturers

D. Manufacturers' Standards: In addition to the standards listed above, the roll-up doors and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.04 SUBMITTALS

A. General: All submittals shall be in accordance with the requirements of the Section entitled the Supplementary General Provisions Section 2.2 (b).

B. Manufacturer's Information: Manufacturer's literature, wiring diagrams, manufacturer's installation instructions.

C. Guide and Jamb Details: The manufacturer shall assume responsibility for the design and selection of all anchor bolts and hardware. Details of guide and hood shall be submitted.

D. A complete door schedule indicating openings versus the proposed doors, door frames and the associated door hardware.

E. Florida Department of Business & Professional Regulation Product Approval, current at the time of submittal.

F. Operation and Maintenance Instructions: Upon completion, the Contractor shall deliver to the Engineer complete operation and maintenance instructions for the overhead door assemblies.

G. The Engineer will review and return the submittals to the Contractor. The Contractor shall then submit the accepted package to the Building Department. No fabrication or installation shall begin until the Building Department approval is obtained by the Contractor. The Owner will not assume responsibility for any cut or schedule impacts due to the approval process of the Building Department. It is the Contractor's responsibility to customize the submittals based on the Building Department's published submittal processes.

1.05 ACCEPTABLE MANUFACTURERS

A. Roll-up Doors shall be manufactured by Cornell Iron Works, Pennsylvania, Overhead Door Corporation, Texas or approved equal.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials shall be delivered in original and unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. Storage: All materials shall be carefully stored in an area that is protected from the elements. Storage shall be in a manner that will prevent damage or marring of the door and its finish.

PART 2 -- PRODUCTS

2.01 ROLL-UP DOORS

A. General:

1. Slats: Slats shall be of sufficient shape and thickness for the wind loads specified. Material shall be as identified below. Slats shall be insulated with a foamed-in-place, closed cell urethane material to achieve a flame spread index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.

2. Endlocks: Each end of every slat shall be fitted with endlocks to act as a wearing surface in the guides and to maintain alignment. Endlocks shall be cast malleable iron or carbon cast steel in accordance with Product Approval.

3. Windlocks: Door guides shall be provided with windlock bars of the same material as endlocks in accordance with Product Approval.

4. Guides: The guide assembly shall be fastened to the masonry opening with stainless steel anchor bolts sized and spaced to the manufacturer's requirements. The guide assembly shall be designed to retain the curtain against specified wind forces in accordance with Product Approval. Guides shall be fully weather stripped with the manufacturer's standard vinyl or neoprene weather-stripping. Weather-stripping shall be secured with metal pressure bars.

5. Counterbalance Mechanism: Doors shall be counterbalanced by means of adjustable steel helical torsion springs, mounted around a steel shaft and mounted in a spring barrel and connected to the door curtain with the required barrel rings. Grease-sealed ball bearings or self-lubricating graphite bearings shall be used for all rotating members.

    a. Spring barrel shall be fabricated of hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support the roll-up of curtain without distortion of slats and limits barrel deflection to not more than 0.03 inches per foot of span under full load. The barrel shall be galvanized.

    b. Spring balance shall be fabricated of one or more oil-tempered, heat-treated steel helical torsion springs.

    c. Torsion rod for counterbalance shaft shall be fabricated of case-hardened steel, of required size to hold the fixed spring ends and carry the torsional load.

    d. Mounting brackets shall be manufacturer's standard design, either cast iron or cold-rolled steel plate with bell mouth guide groove for curtain.

6. Door Hoods: Hoods shall be formed to enclose coiled curtain at opening head, as indicated. Top and bottom edges shall be rolled and reinforced for stiffness. Closed ends shall be provided for surface-mounted hoods. Intermediate support brackets for hoods 18 feet or more wide shall be provided unless closer spacing is required by door manufacturer. Hoods for doors shall be fabricated of not less than 24 gauge stainless steel.

7. Door Operators: Roll-up doors shall be provided with manual and electric door operation.

    a. Each power operated roll-up door shall be equipped with a complete, packaged, prewired power operator unit, designed and built by the door manufacturer. The power unit shall be tested and listed by Underwriters Laboratories. Motor and electrical components shall be Class 1, Division 2 explosion proof.

    b. Motor operator for power operated roll-up door shall be an integral enclosed assembly with high strength torque motor, worm gear reducer operating in an oil bath, self-locking gearing limit switch which breaks the circuit at the termination of travel, solenoid brake, electrical cut-out switch to prevent motor operation during chain operation, internal reversing magnetic starter, internal prewiring to terminal block, push button station with “Open”, “Close”, and “Stop” buttons. The motor shall be a maximum 1 hp, 230 volt, 3 phase, 15 Amp and shall have a capacity to operate the door at 0.67 feet per second. Manual operation shall be provided on all motor operated doors as specified below.

    c. Manual operation shall be by means of an endless stainless steel handchain, sprocket and reduction gears. The bottom of the chain shall be 4' -0" above the finished floor. A pull of 20 lbs. shall be sufficient to raise or lower the door.

d. All electrical controls shall be in corrosion-resistant enclosure and shall be factory prewired and connected to terminal strips to facilitate field connections to power source and pushbutton station.

e. Safety feature shall include a pressure bar at the bottom of the door which will reverse the door when closing on an obstruction.

8. Locks: Roll-up doors shall be provided with a slide bolt lock. Interlocks shall be furnished on motor operated doors to prevent operation when the doors are locked.

B. Steel Roll-Up Doors

1. Slats: Door slats shall be galvanized steel, minimum 20 gauge, or thicker if required to meet wind design criteria, ASTM A446, Grade C or ASTM A653, Type B, Grade 40, of sufficient shape and thickness for the wind loads specified in accordance with Product Approval. Finish shall be G90, galvanized coating per ASTM A525. Color shall be submitted to the City of approval.

2. Guides: Guide angles shall be fabricated of structural steel angles, ASTM A36, minimum 1/4-inches thick per Product Approval.

3. Bottom Bar: Bottom bar shall consist of two steel angles, ASTM A36.

PART 3 -- EXECUTION

3.01 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials shall be delivered in original and unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. Storage: All materials shall be carefully stored in an area that is protected from the elements. Storage shall be in a manner that will prevent damage or marring of the door and its finish.

3.02 GENERAL

A. Installation shall be in accordance with the manufacturer's printed recommendations and instructions.

3.03 INSTALLATION

A. Door and frames shall be accurately cut, fitted, and installed level, square, plumb, and in alignment. Fasteners shall be of sufficient length, and shall be sized for loads imposed. Doors and frames shall be provided with accurately made cutouts, and shall be reinforced for strength where necessary. Doors shall be adjusted to provide smooth, unbinding operation with all hardware fully operable.

3.04 PAINTING

A. Galvanized rolling doors shall be painted in the field, but may be primed in the shop or in the field by the Contractor. The Contractor shall consult with the paint manufacturer about proper surface preparation before applying the paint system, and strictly follow their

requirements. The prime coat shall be compatible with the final painting system applied in the field. As a minimum, all galvanized surfaces shall be cleaned with solvent, or steam cleaned free from oil contamination before the application of any paint coating system and shall comply with the following:

B. Galvanized, Zinc and Copper Alloy Surfaces:

All copper, or galvanized metal surfaces shall be given one coat of metal passivator or metal conditioner before applying the prime coat. The passivator or conditioner (Tnemec Epoxoline Primer as shown below) shall be compatible with the complete paint system and shall be identified on the paint schedule submitted by the Contractor. Galvanized steel rolling doors shall receive the following paint system by TNEMEC Protective Coating, Inc. or equal. Color shall match existing.

Application	*Description*	*Dft*
First - One Coat	66-AY72 Arabis Epoxoline Primer	3.0 - 5.0
Finish Coat	73-AY52 Tourmaline Endurashield	2.0 - 3.0

The minimum Dry Film Thickness for the above paint system shall be 6.5 Mils.

- END OF SECTION –

SECTION 09210 - STUCCO

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install the stucco exterior finish of all new wall and overhang surfaces to match the existing finish, including exterior finish concrete columns and beams installed under this contract as shown on the drawings, areas requiring repair caused by Contractor's construction activities, and specified herein.

B. Stucco is a final architectural treatment prior to painting and therefore it shall provide a decorative, durable, and consistent, even finish with no imperfections of the substrate telegraphing through the stucco.

1.02 REFERENCES

A. Except as modified by governing local codes and by this specification, conforms to provisions and recommendations of the following standards.

1. ASTM C 926

2. Portland Cement Plaster Manual (Stucco) for reference.

3. ASTM C 91

1.03 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's specifications, samples, and installation instructions for each material required, including other data as may be required in accordance with the Supplementary General Provisions Section 2.2(b).

B. Sample: For final review of each texture, complete one 4 ft x 4 ft wall area on job site 5 working days minimum before proceeding with the work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Source of supply: Do not change brands or source of supply for materials during course of work.

B. Protection: Deliver materials except for sand and water in manufacturer's unopened containers fully identified with name, brand, type and grade. Protect stucco materials from contamination and dampness until used by storing in a dry ventilated space off the ground.

PART 2 -- PRODUCTS

2.01 PRODUCTS

A. Aggregates:

1. Portland Cement stucco base aggregates shall be ASTM C 897 Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plaster.

2. Portland Cement stucco finish shall be graded silica sand passing a 30 mesh screen.

B Fiber Reinforcement: Fiber reinforcement shall be fiberglass "fibermesh", or equal, 1/2 inch long, free from grease, oil dirt and other impurities. Separate before use.

C. Metal Lath: Shall be expanded metal lath, galvanized steel diamond-mesh conforming to ASTM C847 with asphalt impregnated paperback conforming to FS-UU-B-790A Type I, grade D, style 2. Metal lath shall be provided between all concrete and block surfaces.

D. Masonry Cement: ASTM C 91 Type M

E. Portland Cement: ASTM C 150 Type II

F. Accessories: Corner beads, casing beads and expansion joints; Polyvinyl PVC conforming to ASTM D1785 and C1063. Corner beads shall be provided with 2½-inch x 2½-inch legs.

2.02 MIXES

A. General:

1. All mixes are by volume unless otherwise specified. All mix proportions are suggestive only; variations to meet local conditions to achieve desired finish are permitted within limits specified in ASTM C 926.

2. Water shall be potable and free from deleterious materials which would impair the work and from a source approved by Engineer.

B. Stucco: Install in three coats as follows:

1. Scratch and Brown Coats (2 coats)

a. Low absorption bases (concrete surfaces)

i. 1 part Masonry Cement (or 1 part Portland Cement + ¾ to 1½ parts lime).

ii. Bonding Agent.

iii. 2½ to 4 parts aggregate.

iv. 1 lb. fiber per sack of cement (on metal lath).

b. High absorption base (concrete block)

i. 1 part Masonry Cement (or 1 part Portland cement + ¾ to 2 parts lime)

ii. Bonding Agent

iii. 2½ to 5 parts aggregate

iv. 1 lb. fiber per sack of cement

2. Finish Coat:

a. Finish coat shall bring total stucco application to full thickness (3/4 inch) and provide a texture pattern as approved by the Engineer. Finish texture shall be smooth.

i. 1 part Masonry Cement (or 1 part Portland Cement + ¾ to 1½ parts lime)

ii. Bonding Agent

iii. 1½ to 3 parts aggregate

PART 3 -- EXECUTION

3.01 EXAMINATION OF SUBSTRATES

A. Examine substrates and the conditions under which the stucco work is to be installed. Do not proceed until unsatisfactory conditions detrimental to the proper and timely completion of the work have been corrected.

3.02 INSTALLATION

A. General: Apply 3-coat work on all substrates indicated to receive Stucco on plan for total of 3/4 inch. Scratch coat shall be 3/8 inch thick, brown coat shall be ¼ inch thick, and finish coat shall be 1/8 inch thick. Apply finish coat with a reasonable uniform thickness over entire surface, with vertical surfaces flat, straight and plumb. Make interior angles square, and make corners square but slightly rounded. Where casing beads do not occur at the juncture of stucco and hollow metal frames cut a groove in the base coat and later in the finish coat to minimize the appearance of cracks at these joints.

B. Mixing:

1. Use mechanical mixers for mixing stucco only. Do not use caked or lumped material. Clean mechanical mixers, mixing boxes and tools after mixing each batch; keep free of stucco from previous mixes. Thoroughly mix stucco with proper amount of water until uniform in color and consistency. Tempering of stucco will not be permitted; discard stucco which has begun to stiffen. Provide waterproof protection under mixer.

2. Machine Applied Stucco: Determine proper consistency by slump test as follows: Take slump test samples from nozzle of stucco cone. Take samples as often as may be required or as directed by Engineer. Maximum slump shall be 2½- inches.

C. Application:

1. Install all stucco accessories including strip lath at all junctures of dissimilar substrate materials (masonry-concrete), corner beads, and other accessories to complete the work before proceeding with base coat of stucco work. Metal lath shall be installed in conformance to ASTM C1063.

2. Application shall be by hand or machine. Limit machine application to base coats, except where machine texture finish is specified.

3.03 FIELD QUALITY CONTROL

A. Patching:

1. Work containing cracks, blisters, pits, checks, or discoloration will not be accepted. Remove such work, including rejected work, and replace with new. Patching of defective work permitted only after notification of Engineer.

2. Perform cutting, patching, repairing and pointing-up operations neatly and thoroughly. Repair the cracks and indented surfaces by moistening the stucco and filling with new material, troweled or tamped flush with adjoining surfaces. Point-up and finish surfaces around fixtures, outlet boxes, piping, fittings, tile and other work installed more than 48 hours, cut existing stucco at an angle of approximately 45 degrees with the surface before installing new stucco.

3.04 CLEANING AND PROTECTION

A. Make provisions to minimize spattering of stucco on other work. Promptly clean windows and other surfaces which have been soiled.

B. Protect stucco from the weather, premature drying, dirt, dust, marring or other damage throughout the construction period so it will be without any indication of damage at time of acceptance by Owner.

- END OF SECTION -

SECTION 09990 PAINTING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, tools, materials, supervision and equipment necessary to do all the work specified herein and as required for a complete installation, including surface preparation, priming and painting of Contractor furnished equipment, materials, and structures.

1.02 GENERAL INFORMATION AND DESCRIPTION

A. The term "paint," as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers, cement filler, cement-latex filler and other coatings, whether used as prime, intermediate, or finish coats.

B. All paint for concrete and metal surfaces shall be especially adapted for use around water treatment plants and shall be applied in conformance with the manufacturer's published specifications and as identified herein. Spray application is not allowed.

C. All paint for final coats shall be fume resistant, compounded with pigments suitable for exposure to gases, especially to hydrogen sulfide and to carbon dioxide. Pigments shall be materials which do not tend to darken, discolor, or fade due to the action of sewage gases. If a paint manufacturer proposes use of paint which is not designated "fume resistant" in its literature, it shall furnish full information concerning the pigments used in this paint.

D. Coatings used in conjunction with potable water supply systems shall have U.S. Environmental Protection Agency (EPA), National Science Foundation (NSF), and Food and Drug Administration (FDA) approval for use with potable water and shall not impart a taste or odor to the water.

E. All building, facilities, structures, and appurtenances, as indicated on the Drawings and as specified herein, shall be painted with not less than one shop coat and two field coats, or one prime coat and two finish coats of the appropriate paint. Items to be painted include, but are not limited to exterior and interior concrete, structural steel, miscellaneous metals, steel and aluminum doors and frames, concrete block, ductwork, sluice gates, operators, pipe fittings, valves, mechanical equipment, motors, conduit, and all other work which is obviously required to be painted unless otherwise specified.

F. Baked-on enamel finishes and items with standard shop finishes such as graphic panels, electrical equipment, toilet partitions, lockers, instrumentation, etc., shall not be field painted unless the finish is damaged during shipment or installation. Aluminum, stainless steel, fiberglass and bronze work shall not be painted unless color coding and marking is required or otherwise specified. A list of surfaces not to be coated is included in Article 1.09 of this Section.

G. The Contractor shall obtain all permits, licenses and inspections and shall comply with all laws, codes, ordinances, rules and regulations promulgated by authorities having jurisdiction which may bear on the work. This compliance will include Federal Public Law 91-596 more commonly known as the "Occupational Safety and Health Act of 1970".

1.03 MANUFACTURERS

A. All painting materials shall be as manufactured by Tnemec, Carboline, Ameron, Sherwin Williams, DuPont, or approved equal.

1.04 SUBMITTALS

A. The Contractor shall submit paint manufacturer's data sheets, application instructions, and samples of each finish and color to the Engineer for review, before any work is started in accordance with the Supplementary General Provisions Section 2.2 (b).

B. Submitted samples of each finish and color shall be prepared so that the area of each sample indicates the appearance of the various coats. For example, where a three-coat system is specified, the sample shall be divided into three areas indicating one coat only, two coats and all three coats. The Engineer will provide written authorization constituting a standard, as to color and finish only, for each coating system.

C. The Contractor shall prepare a complete schedule of surfaces to be coated and shall identify the surface preparation and paint system it proposes to use. The Paint Schedule shall be in conformance with Article 3.03 of this Section. The schedule shall contain the name of the paint manufacturer, and the name, address and telephone number of the manufacturer's representative that will inspect the Work. The schedule shall be submitted to the Engineer for review as soon as possible following the Notice to Proceed so that the schedule may be used to identify colors and to specify shop painting systems on order for fabricated equipment.

D. Name and detailed qualifications of the protective coatings applicator or subcontractor. Qualifications shall include, but not be limited to, three (3) references which show that the painting applicator or subcontractor has previous successful experience with the specified or comparable coating systems in the past five (5) years, a list of installations that are currently in service and documentation that applicator or subcontractor is currently a qualified applicator or the proposed coatings by the manufacturer.

1.05 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The Contractor shall purchase paint from an acceptable manufacturer. The manufacturer shall assign a representative to inspect the application of its product both in the shop and field. The Contractor, through the manufacturer's representative, shall submit its report to the Engineer at the completion of its Work identifying the products used and verifying that said products were properly applied and that the paint systems were proper for the exposure and service.

B. Services shall also include, but not be limited to, inspecting prior coatings of paint, determination of best means of surface preparation, inspection of complete work, and re-inspection of painted work to be performed six months after the job is completed.

1.06 MANUFACTURER'S INSTRUCTIONS

A. The manufacturer's published instructions for use as a guide in specifying and applying the manufacturers proposed paint shall be submitted to the Engineer. Paint shall not be delivered to the job before acceptance of the manufacturer's instructions is given by the Engineer.

B. A manufacturer's paint will not be considered for use unless that manufacturer's published instructions meets the following requirements:

1. The instructions must have been written and published by the manufacturer for the purpose and with the intent of giving complete instruction for the use and application of the proposed paint in the locality and for the conditions for which the paint is specified or shown to be applied under this Contract.

2. All limitations, precautions, and requirements that may adversely affect the paint; that may cause unsatisfactory results after the painting application; or that may cause the paint not to serve the purpose for which it was intended; that is, to protect the covered material from corrosion, shall be clearly and completely stated in the instructions. These limitations and requirements shall, if they exist, include, but not be limited to the following:

a. Methods of application

b. Number of coats

c. Thickness of each coat

d. Total thickness

e. Drying time of each coat, including primer

f. Primer required to be used

g. Primers not permitted

h. Use of a primer

I. Thinner and use of thinner

j. Temperature and relative humidity limitations during application and after application

k. Time allowed between coats

l. Protection from sun

m. Physical properties of paint including solids content and ingredient analysis

n. Surface preparation

o. Touch up requirements and limitations

C. Concrete surfaces specified by the paint manufacturer to be acid etched shall be etched in accordance with the manufacturer's instructions. The surface shall then be thoroughly scrubbed with clean water, rinsed, and allowed to dry. The surface shall be tested with a moisture meter to determine when dry before coating.

1.07 QUALITY ASSURANCE

A. The Contractor shall give the Engineer a minimum of three days advance notice of the start of any field surface preparation work of coating application work.

B. All such Work shall be performed only in the presence of the Engineer, unless the Engineer has specifically allowed the performance of such Work in its absence.

C. Review by the Engineer, or the waiver of review of any particular portion of the work, shall not relieve the Contractor of its responsibility to perform the Work in accordance with these Specifications.

D. Where coatings are to be performed by a subcontractor, the Contractor shall provide three references which show that the painting subcontractor has previous successful experience with the specified or comparable coating systems in the past five years.

1.08 SAFETY AND HEALTH REQUIREMENTS

A. In accordance with requirements of OSHA Safety and Health Standards for Construction (29CFR1926) and the applicable requirements of regulatory agencies having jurisdiction, as well as manufacturer's printed instructions, appropriate technical bulletins, manuals, and material safety data sheets, the Contractor shall provide and require use of personnel protective and safety equipment for persons working in or about the project site.

B. All paints must comply with the requirements of the National Ambient Air Quality Standards.

1.09 SURFACES NOT TO BE COATED

A. The following items shall not be coated unless otherwise noted:

1. Stainless steel work.

2. Galvanized checkered plate.

3. Aluminum handrails, walkways, windows, louvers, grating and checkered plate.

4. Flexible couplings lubricated bearing surfaces and insulation.

5. Packing glands and other adjustable parts of mechanical equipment.

6. Finish hardware.

7. Plastic switch plates and receptacle plates.

8. Signs and nameplates.

1.10 QUALITY WORKMANSHIP

A. The Contractor shall be responsible for the cleanliness of its painting operations and shall use covers and masking tape to protect the work whenever such covering is necessary, or if so requested by the Owner any unwanted paint shall be carefully removed without damage to any finished paint or surface. If damage does occur, the entire surface, adjacent to and including the damaged area, shall be repainted without visible lapmarks and without additional cost to the Owner.

B. The Contractor shall provide covers made of plywood or other acceptable material to protect Filters in operation while painting work is ongoing in off-line filter.

1.11 ADDITIONAL PAINT

A. At the end of the project, the Contractor shall turn over to the Owner a gallon can of each type and color of paint, primer, thinner or other coating used in the field painting. If the manufacturer packages the material concerned in gallon cans, then it shall be delivered in unopened labeled cans as it comes from the factory. If the manufacturer does not package the material in gallon cans, and in the case of special colors, the materials shall be delivered in new gallon containers, properly closed with type labels indicating brand, type, color, etc. The manufacturer's literature described the materials and giving directions for their use shall be furnished in three bound copies. A type-written inventory list shall be furnished at the time of delivery.

1.12 SHIPPING, HANDLING AND STORAGE

A. All painting materials shall be brought to the job site in the original sealed labeled containers of the paint manufacturer and shall be subject to review by the Engineer. Where thinning is necessary, only the product of the manufacturer furnishing the paint shall be used. All such thinning shall be done strictly in accordance with the manufacturer's instructions, and with the full knowledge of the Engineer.

B. Materials and their storage shall be in full compliance with the requirements of pertinent codes and fire regulations. Receptacles shall be placed outside buildings for paint gates and containers. Paint waste shall not be disposed of in plumbing fixtures, process drains or other plant systems or process units.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Table 09990-1 depicts the coatings referenced in Article 3.03 of this Section entitled, "Paint Schedule". Table 09990-1 lists Tnemec products as a reference. Equivalent products by the manufacturers listed in Article 1.03 of this Section may be submitted for review.

TABLE 09990-1

PRODUCT LISTING

Ref. No.	Description	MANUFACTURERS REFERENCE Tnemec
102	Inorganic Water-based Epoxy	1254 Epoxoblock WB
103	Vinyl Acrylic Filler	54 – Masonry Filler
105	Polyamidoamine Epoxy	N69 – Hi Build Epoxoline II
106	Acrylic Emulsion	181 – W.B. Tneme-Crete
110	Acrylic Polyurethane	1074U Endurashield
114	Waterborne Polyamide Epoxy	151 - Elasto-Grip
115	Aromatic Urethane, Zinc Rich	90-97 Tneme Zinc
116	Cementitious Repair Mortar	217 Mortarcrete
117	Modified Polyamine Epoxy	215 Surfacing Epoxy

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

A. Surfaces to be painted shall be clean and dry, and free of dust, rust, scale and all foreign matter. No solvent cleaning, power or hand tool cleaning shall be permitted unless acceptable to the Engineer or specified herein.

B. Except as otherwise provided, all preparation of metal surfaces shall be in accordance with Specifications SP-1 through SP-10 of the Steel Structures Painting Council (SSPC). Where Steel Structures Painting Specifications are referred to in these Contract Documents, the corresponding Pictorial Surfaces Preparation Standard shall be used to define the minimum final surface conditions to be supplied. Grease and oil shall be removed and the surface prepared by hand tool cleaning, power tool cleaning or blast cleaning in accordance with the appropriate Specification SP-1 through SP-10.

C. Weld flux, weld spatter and excessive rust scale shall be removed by power tool cleaning as per SSPC-SP-3-63.

D. Threaded portions of valve and gate stems, machined surfaces which are limited for sliding contact, surfaces which are to be assembled against gaskets, surfaces or shafting on which sprockets are to fit, or which are intended to fit into bearings, machined surfaces of bronze trim on slide gates and similar surfaces shall be masked off to protect them from the blast cleaning of adjacent surfaces. Cadmium-plated or galvanized items shall not blast cleaned unless hereinafter specified, except that cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment to the blast cleaned shall be blast cleaned in the same manner as the unprotected metal. All installed equipment, mechanical drives, and adjacent painted equipment shall be protected from blast cleaned. Protection shall prevent any sand or dust from entering the mechanical drive units or equipment where damage could be caused.

E. Hardware accessories, machined surfaces, plates, lighting fixtures and similar items in place prior to cleaning and painting, and not intended to be painted, shall be protected or removed during painting operations and repositioned upon completion of painting operations.

F. Any abraded areas of shop or field applied coating shall be touched up with the same type of shop or field applied coating, even to the extent of applying an entire coating, if necessary. Touch-up coating and surface preparations shall be in addition to and not considered as the first field coat.

G. Exposed Pipe

1. Bituminous coated pipe shall not be used in exposed locations. Pipe which shall be exposed after project completion shall be primed in accordance with the requirements herein. Any bituminous coated ferrous pipe which is inadvertently installed in exposed locations shall be blast cleaned to SSPC-SP-5 White Metal before priming and painting.

2. After installation and prior to finish painting, all exterior, exposed flanged joints shall have the gap between adjoining flanges and gaps between the pipe wall and threaded-on flanges sealed with a single component Thiokol caulking to prevent rust stains.

H. Ferrous Metal Surfaces

1. All ferrous metal surfaces not required to be galvanized shall be cleaned of all oil grease, dirt, rust and tight and loose mill scale by blasting in accordance with the following: SSPC-SP-5, White Metal Blast Cleaning and comply with the visual standard NACE 1, for shop prepared and shop primed metal to be submerged. SSPC-SP-10 Near White Metal Blast Cleaning, and comply with the visual standard NACE 2 for field prepared metal to be submerged, SSPC-SP6 and comply with the visual standard NACE 3, for field prepared metal in all other locations. Pickling, complying with SSPC-SP-8, may be substituted for Near White Blast in areas as determined by the Engineer. Priming shall follow blast cleaning before any evidence of corrosion occurs, before nightfall and before any moisture is on the surface.

I. Field surface preparation of small, isolated areas such as field welds, repair of scratches, abrasions or other marks to the shop prime or finish shall be cleaned by power tools in accordance with SSPC-SP-3, or in difficult and otherwise inaccessible areas by hand cleaning in accordance with SSPC-SP-2 and spot primed.

J. Primed or Coated Surfaces and Non-Ferrous Surfaces

1. All coated surfaces shall be cleaned prior to application of successive coats. All non-ferrous metals not to be coated shall be cleaned. This cleaning shall be done in accordance with SSPC-SP-1, Solvent Cleaning.

K. Shop Finished Surfaces

1. All shop-coated surfaces shall be protected from damage and corrosion before and after installation by treating damaged areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be prepared in accordance with SSPC-SP-2, Hand Tool Cleaning and then touched up with the same materials as the shop coat.

2. All shop coated surfaces which are faded, discolored, or which require more than minor touch-up, in the opinion of the Engineer, shall be repainted. Cut edges of galvanized sheets, electrical conduit, and metal pipe sleeves, not to be finish painted, shall be cleaned in accordance with SSPC-SP-1, Solvent Cleaning and primed with zinc dust-zinc oxide metal primer.

L. Galvanized and Copper Alloy Surfaces

1. All copper or galvanized metal surfaces shall be brush blasted and given one coat of epoxy primer.

M. Concrete and Masonry Surfaces

1. Concrete and masonry surfaces to be painted shall be prepared by removing efflorescence, chalk, dust, dirt, grease, oil, form coating, tar and by roughening to remove glaze. All surfaces shall be repaired prior to commencement of the coating operation.

2. Concrete and masonry surfaces are to be cured for at least 28 days prior to coating them.

N. New concrete immersion surfaces that are to be coated shall be brush blasted per SSPC-SP7 to produce the necessary "sandpaper texture" surface required for satisfactory adherence of the paint. Areas of concrete, which contain blow holes or voids, shall be filled with the manufacturer's approved filler material.

O. Existing Painted Concrete and Masonry Surfaces

1. Existing painted concrete and masonry surfaces requiring paint as identified herein shall be prepared by applying a minimum 3500 psi high pressure water blast to the existing painted surface to remove all loose paint, chalk, dust, dirt, grease, oil, latents, and other foreign materials. Cracks, chips or voids in the existing concrete shall be repaired in accordance with paint manufacturer recommendations. Contractor shall protect all equipment during work.

P. PVC Pipe Surfaces

1. All pipe surfaces shall be lightly sanded before painting.

3.02 SHOP PAINTING

A. All fabricated steel work and equipment shall receive at the factory at least one shop coat of prime paint compatible with the paint system required by these Specifications. The Contractor shall coordinate all shop priming to ensure compatibility with paint system specified. Surface preparation prior to shop painting shall be as specified. Finish coats may be applied in the shop if acceptable to the Engineer. All shop painted items shall be properly packaged and stored until they are incorporated in the Work. Any painted surfaces that are damaged during handling, transporting, storage or installation shall be cleaned, scraped, and patched before field painting begins so that Work shall be equal to the original painting received at the shop. Equipment or steel Work that is to be assembled on the site shall likewise receive a minimum of one shop coat of paint at the factory. Surfaces of exposed members that will be inaccessible after erection shall be prepared and painted before erection.

B. The Contractor shall specify the shop paints to be applied when ordering equipment in order to assure compatibility of shop paints with field paints. The paints and surface preparation used for shop coating shall be identified on shop drawings submitted to the Engineer for review. Shop paint shop drawings will not be reviewed until the final project paint system has been submitted by the Contractor and reviewed by the Engineer.

C. Shop finish coats may be the standard finish as ordinarily applied by the manufacturer if it can be demonstrated to the Engineer that the paint system is equal to and compatible with the paint system specified. However, all pumps, motors and other equipment shall receive at least one field applied finish coat after installation.

3.03 PAINT SCHEDULE

A. The Contractor shall adhere to this paint schedule, providing those paints named or equal. DFT shall mean the minimum dry film thickness per application measured in mils. Products are referenced by numbers listed in Table 09850-1 of this Section entitled "Product Listing." The paint schedule identifies the minimum DFT required per coat. If the Contractor does not achieve the specified DFT range in a single coat, it shall provide additional coats as necessary at no additional cost to the Owner.

B. Metal Surfaces, Atmospheric (Exterior) Exposure

1. Existing and proposed Metal surfaces exposed to the atmosphere, and that do not come into contact with wastewater or corrosive atmosphere, including the following types of surfaces shall be painted as described below:

   a. Pumps, motors, process equipment, machinery, etc.

   b. Above ground piping, valves, and pipe supports

   c. Miscellaneous steel shapes, angles, etc.

   d. Exposed surfaces of conduit, ductwork, etc.

   Surface Preparation: Blast clean in accordance with SSPC-SP6

   Ferrous Metal

Application	No.	Description	DFT
First -1 coat	115	Aromatic Urethane Zinc Rich	2.0 - 4.0
Second	105	Polyamidoamine Epoxy	4.0-6.0
Finish - 1 coat	110	Acrylic Polyurethane	2.0 - 3.0
		Min. Total	10.0 Mils

C. Metal Surfaces, Interior Exposure

1. Existing and proposed interior metal surfaces (non-submerged) that do not come in contact with water or the corrosive atmosphere including the following types of surfaces shall be painted as follows:

   a. Pumps, motors, process equipment, machinery, etc.

   b. Piping, valves and supports.

   c. Miscellaneous steel shapes, angles, rails, etc.

   d. Exposed surfaces of conduit, ductwork, etc.

   Surface Preparation: Blast clean in accordance with SSPC-SP6

Application	No.	Description	DFT
First - 1 coat	115	Aromatic Urethane Zinc Rich	2.0 - 4.0
Second - 1 coat	105	Polyamidoamine Epoxy	4.0 - 6.0
Finish – 1 coat	110	Acrylic Polyurethane	2.0 - 3.0
		Min. Total	10.0 Mils

D. Ductile Iron Pipe, Exterior or Interior Exposure

1. Ductile iron pipe exterior or interior exposure shall receive the following types of paint:

   Surface Preparation: Blast clean in accordance with SSPC-SP6

Application	No.	Description	DFT
Prime – 1 coat	115	Aromatic Urethane, zinc rich	2.0 – 4.0
First - 1 coat	105	Hi-Build Epoxoline II	4.0 - 6.0
Finish – 1 coat	110	Acrylic Polyurethane	2.0 –3.0
		Min. Total	8.0 Mils

E. PVC Pipes, Exterior or Interior Exposure

1. PVC pipes, valves, and accessories, shall receive the following types of paint:

Surface Preparation: Light sanding

Application	No.	Description	DFT
First - 1 coat	105	Hi-Build Epoxoline	2.0 - 3.0
Finish - 1 coat	110	Acrylic Polyurethane	2.0 - 3.0
		Min. Total	4.0 Mils

F. Concrete and Masonry Walls, Existing Painted Exterior

1. Exterior of existing walls shall be painted as described below:

Surface Preparation: Remove unsound paint, excess mortar, laitance, and efflorescence. Pressure wash with TSP/Chlorine solution and fresh water rinse.

Application	No.	Description	DFT
Surfacer (*)	116	Cementitious Repair Mortar	As req'd
Surfacer (**)	117	Modified Polyamine Epoxy	As req'd
First - 1 coat	114	Waterborne Polyamide Epoxy	1.0 - 2.0
Finish - 1 coat	106	Acrylic Emulsion	7.0 - 9.0
		Min. Total	10.0 Mils

(*) Surfacer to be applied to fill voids >1/4-inch deep

(**) Surfacer to be applied to fill voids < ¼-inch deep

G. Concrete and Masonry Walls, Existing Painted Interior

1. Interior existing masonry and concrete walls, shall be painted as described below:

Surface Preparation: Remove unsound paint, excess mortar, laitance, and efflorescence. Pressure wash with fresh water.

Application	No.	Description	DFT
First - 1 coat	105	Hi-Build Epoxoline II	4.0 – 6.0
Finish - 1 coat	105	Hi-Build Epoxoline II	4.0 – 6.0
		Min. Total	10.0 Mils

H. New Concrete, Stucco and Masonry Surfaces, Exterior exposure of non water bearing structures

1. The exterior above grade surfaces of all new non water bearing structures and new surfaces at existing non water bearing structure shall receive the following:

Surface Preparation: Surface shall be clean and dry. Allow concrete to cure for 28 days.

Application	No.	Description	DFT
Block Filler (*)	103	Water Based Epoxy	80 - 100 SF/Gal

First - 1 coat	106	Acrylic Emulsion	4.0 – 6.0
Finish - 1 coat	106	Acrylic Emulsion	4.0 – 6.0
		Min. Total	10.0 Mils

(*) Block filler only to be used on new masonry CMU / formed concrete.

I. New Concrete and Masonry Surfaces, Interior Exposure

1. Interior exposed masonry and concrete surfaces of all new non-water retaining structures shall be painted as described below:

Surface Preparation: Surface shall be clean and dry. Allow concrete to cure for 28 days.

Application	No.	Description	DFT
Block Filler (*)	102	Water Based Epoxy	100 -150 SF/Gal
First - 1 coat	105	Hi-Build Epoxoline II	4.0 - 6.0
Finish - 1 coat	105	Hi-Build Epoxoline II	4.0 - 6.0
		Min. Total	10.0 Mils

(*) Block filler only to be used on new masonry CMU and formed concrete.

3.04 PAINTING

A. All paint shall be applied by experienced painters with brushes or other applicators acceptable to the Engineer. Spray application is not allowed.

B. Paint shall be applied without runs, sags, thin spots, or unacceptable marks. Paints shall be applied at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. Additional coats of paint shall be applied, if necessary, to obtain thickness specified.

C. Surfaces not accessible to brushes or rollers may be painted by dauber or sheepskins and paint mitt. If any of these methods is to be used, it shall be done in strict accordance with the manufacturer's instructions, as well as with the full knowledge of the Engineer.

D. Drying Time

1. A minimum of twenty-four hours drying time shall elapse between applications of any two coats of paint on a particular surface unless shorter time periods are a requirement of the manufacturer or specified herein. Longer drying times shall be required for abnormal conditions as defined by the manufacturer.

E. Weather Restrictions

1. No painting whatsoever shall be accomplished in rainy or excessively damp weather when the relative humidity exceeds 85 percent, or when the general air temperature cannot be maintained at 50 degrees Fahrenheit or above throughout the entire drying period. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 50 degrees Fahrenheit within 18 hours after the application of the paint.

2. Dew or moisture condensation should be anticipated; and if such conditions are prevalent, painting shall be delayed until midmorning to be certain the surfaces are dry. The day's painting shall be completed well in advance of the probable time-of-day when condensation will occur.

F. Inspection of Surfaces

1. Each and every field coat of priming and finishing paint shall be inspected by the Engineer or its authorized representative before the succeeding coat is applied. The Contractor shall follow a system of tinting successive paint coats so that no two coats for a given surface are exactly the same color. Areas to receive black protective coatings shall in such cases be tick marked with white or actually gauged as to thickness when finished.

G. Before application of the prime coat and each succeeding coat, any defects or deficiencies in the prime coat or succeeding coat shall be corrected by the Contractor before application of any subsequent coating.

H. Samples of surface preparation and of painting systems shall be furnished by the Contractor to be used as a standard throughout the job, unless omitted by the Engineer.

I. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the Engineer, and where, in its opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the Contractor's expense. Recoating times of manufacturer's printed instructions shall be adhered to.

J. Coating thickness shall be determined by the use of a properly calibrated "Nordson-Mikrotest" (or approved equal) dry mil thickness gauge.

K. The Contractor shall provide free of charge to the Engineer two new "Nordson-Mikrotest" dry film gauges to be used to inspect coating by Engineer and Contractor. One gauge may be used by Contractor and returned each day to the Engineer. Engineer will return gauges to Contractor at completion of job.

L. Special Areas

1. All surfaces which are to be installed against concrete, masonry etc., and will not be accessible for field priming and/or painting shall be back primed and painted as specified herein, before erection. Anchor bolts shall be painted before the erection of equipment and then the accessible surfaces repainted when the equipment is painted.

M. Special attention shall be given to insure that edges, corners, crevices, welds and rivets receive a film thickness equivalent to that of the adjacent painted surfaces.

N. Safety

1. The Contractor shall provide ventilating equipment and all necessary safety equipment for the protection of the workmen and the Work.

O. Quality Workmanship

1. The Contractor shall be responsible for the cleanliness of its painting operations and shall use covers and masking tape to protect the Work whenever such covering is necessary, or if so requested by the Owner. Any unwanted paint shall be carefully

removed without damage to any finished paint or surface. If damage does occur, the entire surface, adjacent to and including the damaged area, shall be repainted without visible lapmarks and without additional cost to the Owner.

P. Painting found defective shall be scraped or blast cleaned off and repainted as the Engineer may direct. Before final acceptance of the Work, damaged surfaces of paint shall be cleaned and repainted as directed by the Engineer.

Q. Any pipe scheduled to be painted and having received a coating of a tar or asphalt compound shall be painted with two coats or "Intertol Tar Stop", "Tnemec Tar Bar" or equal before successive coats are applied in accordance with the paint schedule.

3.05 SCHEDULE OF COLORS

A. All colors shall be as designated by the Engineer at the shop drawing review. The Contractor shall submit color samples including custom color choices as required to the Engineer as specified in Article 1.04 of this Section. The Contractor shall submit suitable samples of all colors and finishes for the surfaces to be painted, or on portable surfaces when required by the Engineer. The Engineer shall decide upon the choice of colors and other finishes when alternates exist. No variation shall be made in colors without the acceptance from the Owner. Color names and/or numbers shall be identified according to the appropriate color chart issued by the manufacturer of the particular product in question.

3.06 COLOR CODING AND LETTERING OF PIPING

A. In general, the pumps and equipment shall be painted the same color as the piping system to which it is connected unless otherwise directed by the Engineer. Where colors are not designated for piping and conduit systems they will be selected during the shop drawing review from the paint manufacturer's standard color charts.

B. Lettering of Piping: The Contractor shall apply identification titles and arrows indicating the direction of flow of liquids to all types and sections of all new and existing plant piping. Titles shall be as directed by the Engineer. Identification titles shall be located midway between color coding bands where possible. Identification lettering and arrows shall be placed as directed by the Engineer, but shall generally be located each fifteen feet in pipe length and shall be properly inclined to the pipe axis to facilitate easy reading. Titles shall also appear directly adjacent to each side of any wall or slab the pipeline passes through.

C. The titles shall be painted by use of stencils and shall identify the contents by complete names at least once in each area through which it passes and thereafter be abbreviated.

D. Title color shall be black or white as directed and shall have an overall height in inches in accordance with Table 09990-2. Letter type shall be Helvetica Medium upper case. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application. For piping less than 3/4-inch diameter, the Contractor shall furnish and attach corrosion resistant color tags with the required lettering.

TABLE 09990-2

HEIGHT OF PIPING LETTERING

DIAMETER OF PIPE OR PIPE COVERING	HEIGHT OF LETTERING
3/4 to 1-1/4 inches	1/2 inch
1-1/2 to 2 inches	3/4 inch
2-1/2 to 6 inches	1-1/4 inches
8 to 10 inches	2-1/2 inches
Over 10 inches	3-1/2 inches

Letter type shall be Helvetica Medium upper case. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application.

For piping less than ¾-inch diameter (as identified in Table 09990-2), the Contractor shall furnish and attach corrosion resistant color tags with the required lettering.

E. Banding: Where bands are required, the pipe is to be painted for its full circumference with a band of the color indicated. The bands shall be six inches wide, neatly made by masking, and spaced eight feet apart. The Contractor may substitute precut prefinished bands on piping subject to acceptance by the Engineer. Where banded pipes are running concurrently in a space, bands shall be located so that on adjacently located pipes, bands will be grouped beside each other.

F. The Contractor shall paint all piping, valves, equipment, exposed conduits and all appurtenances which are integral to a complete functional mechanical pipe and electrical conduit system. Colors for piping and conduit systems they will be selected during the shop drawing review from the paint manufacturer's standard color charts.

3.07 ANSI AND OSHA SAFETY COLORS

A. Items specified in the following subsections shall be safety color coated as specified. ANSI colors shall conform to (OSHA) ANSI Z53.1 and latest revisions. Materials shall be compatible with the system specified for the equipment, concrete, etc. Where a coating system is not specified and safety colors are required, the items shall be coated with a primer and two coats Glid-Guard Alkyd Industrial Enamel, or approved equal.

B. Red: Items listed in ANSI Z53.1, Section 2.1 shall be painted ANSI Red. In general, these items shall include fire protection equipment and apparatus; wall mounted breathing apparatus, danger signs and locations; and stop bars, buttons or switches. In addition, all hose valves and riser pipes, fire protection piping and sprinkler systems, and electrical stop switches shall be painted ANSI Red.

C. Orange: Items listed in ANSI Z53.1, Section 2.2 shall be painted ANSI Orange. ANSI Orange shall be used as a basic color for designating dangerous parts of machines or energized equipment which may cut, crush, shock, or otherwise injure and to emphasize such hazards when enclosure doors are open or when gear belt or other guards around moving equipment are open or removed, exposing unguarded hazards. In addition, moving machinery having a linear or peripheral speed in excess of 10 feet per minute, which is either inadequately guarded due to physical problems or may be operated with the guard removed, rims or sprockets, gears, pulleys, etc.; crossheads of large engines and compressors; and flywheels shall be coated ANSI Orange.

D. Yellow: Items listed in ANSI Z53.1, Section 2.3 shall be painted ANSI Yellow. Yellow shall be the basic color for designating caution and for marking physical hazards such as striking

against, stumbling, falling, tripping, and "caught in between". In addition, an 8-inch wide strip on the top and bottom tread of stairways shall be coated.

E. Green: Items listed in ANSI Z53.1, Section 2.4 shall be painted ANSI Green. Green shall be the basic color for designating safety and the location of first-aid equipment. In general, gas masks, first-aid kits, eye wash facilities, and safety deluge showers shall be coated with ANSI Green.

F. Blue: Blue shall be used for designating caution, limited to warning against the starting, the use of, or the movement of equipment under repair or being worked upon.

G. Purple: Items listed in ANSI Z53.1, Section 2.5 shall be painted ANSI Purple. In general, atomic sludge density meters shall be coated ANSI Purple.

3.08 WORK IN CONFINED SPACES

A. The Contractor shall provide and maintain safe working conditions for all employees. Fresh air shall be supplied continuously to confined spaces through the combined use of existing openings, forced-draft fans, or by direct air supply to individual workers. Paint fumes shall be exhausted to the outside from the lowest level in the contained space.

B. Electrical fan motors shall be explosion proof if in contact with fumes. No smoking or open fires will be permitted in, or near, confined spaces where painting is being done.

3.09 CLEANING

A. The buildings and all other Work area shall be at all times kept free from accumulation of waste material and rubbish caused by the Work. At the completion of the painting, all tools, equipment, scaffolding, surplus materials, and all rubbish around the inside the buildings shall be removed and the Work left broom clean unless otherwise specified.

- END OF SECTION –

SECTION 11380 – CHLORINATION EQUIPMENT

PART 1 -- GENERAL

1.01 WORK INCLUDED

A. Contractor shall furnish and install chlorination equipment as shown on the drawings and specified herein. Equipment is to be supplied by a single, approved, equipment supplier for installation by Contractor. The chlorination equipment shall include liquid chlorine filters, liquid chlorine expansion chambers, rupture discs, high pressure switches, chlorine liquid and gas pressure gauges, four chlorine evaporators, chlorine gas pressure relief valves, chlorine gas filters, and combination pressure reducing and vacuum regulator assemblies.

1.02 RELATED WORK

A. Section 09900 - Painting

B. Section 15030 - Piping and Equipment ID systems

C. Section 15100 - Valves and Appurtenances

D. Division 16 - Electrical

1.03 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture, assembly, and field performance of chlorination systems with a minimum of five years experience.

1.04 SUBMITTALS

A. Submittals shall be in accordance with the Supplementary General Provisions Section 2.2b – Submittals and shall include the following information:

1. Dimensional drawings for items to be installed.

2. Electrical wiring diagrams required for installation.

3. Installation instructions.

4. Sufficient information on each component to show that the equipment meets the specification.

5. Equipment shop drawings shall be submitted as a complete system. Partial submittals will be unacceptable.

6. Documentation demonstrating that the system Manufacturer is certified to the international quality standard ISO 9001 for design, assembly, and manufacture of chlorination systems.

1.05 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be supplied in accordance with General Provisions G-4.10 and Supplementary General Provisions Section 2.2b. As a minimum, operation and maintenance manuals shall include:

1. Principle of operation.

2. Installation instructions.

3. Description of unit and component parts.

4. Operating procedures.

5. Maintenance procedures.

6. Safety precautions.

7. Lubrication Instruction

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products under provisions of General Provisions Section 4.0.

1.07 SERVICES OF MANUFACTURER

A. The services of a qualified representative of the manufacturer shall be provided to inspect the installation of the equipment, make any necessary adjustments, test and place the equipment in satisfactory operating condition and supervise initial operation. The manufacturer's representative shall instruct the plant operating personnel in the operation and maintenance of the equipment.

1.08 TOOLS, SUPPLIES AND SPARE PARTS

A. The equipment manufacturer shall furnish all special tools necessary to disassemble, service, repair and adjust the equipment.

1.09 CHLORINATION EQUIPMENT PREQUALIFIED SUPPLIERS

A. Manufacturers:

1. Severn-Trent Services / Capital Controls

PART 2 -- PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The chlorination system shall be designed to draw liquid chlorine from 90-ton railcars. The

liquid chlorine shall be conveyed under pressure from the railcar to the evaporators. The evaporators shall heat the liquid chlorine and produce chlorine gas. The chlorine gas shall exit the evaporators under pressure. The chlorine gas shall go through a chlorine gas filter and then enter the pressure reducing and vacuum regulator assembly. The pressure reducing valve shall reduce the chlorine gas pressure from evaporator discharge pressure to atmospheric pressure before the gas enters the vacuum regulator. The vacuum regulator shall automatically convert the incoming chlorine gas from pressure to vacuum.

B. Major components of the chlorination system and services to be supplied under this section shall include, but not be limited to, the following:

1. The chlorination equipment system as listed below and as shown on the Contract Drawings.

2. Spare parts and materials.

3. Start-up and training services.

2.02 LIQUID CHLORINE EXPANSION CHAMBERS

A. Furnish and install liquid chlorine expansion chambers on the liquid chlorine piping in the locations shown on the drawings. The expansion chamber shall be constructed from a 2000 lbs. DOT cylinder and Schedule 80 seamless carbon steel pipe with WOG 3000 lbs. fittings. Each expansion chamber will have a 300 lbs. tantalum rupture disc, carbon steel rupture disc holder and companion mounting flange gaskets. Expansion chamber volume shall be a minimum of 816 cu-inches.

B. Furnish and install a high pressure switch with each expansion chamber. High pressure switch shall be located on the top of the expansion chamber or on the branch of a Tee in the piping between the rupture disc and the inlet to the expansion chamber. High pressure switch shall be diaphragm protected and set to alarm at 200 psig. The pressure switch will be mounted on either a 1" flanged Hastelloy C® chemical seal with welded tantalum diaphragm, or a 1" NPT nickel/chrome plated steel seal with tantalum diaphragm. The switch will be filled with inert halocarbon oil.

2.03 CHLORINE EVAPORATORS

A. Furnish and install four (4) chlorine evaporators arranged in two banks of two evaporators each as depicted on the Drawings. Evaporators shall have Tag Numbers M-14-5-1, M-14-5-2, M-14-5-3 and M-14-5-4. Evaporators M-14-5-1 and M-14-5-2 shall normally be associated with the East Railcar. Evaporators M-14-5-3 and M-14-5-4 shall normally be associated with the West Railcar.

B. The evaporator shall be of the electrically heated type, with the water chamber temperature controlled by an integral electronic temperature controller. The evaporator shall automatically vaporize and superheat liquid chlorine at a rate controlled by the using system and shall have a capacity of 10,000 pounds per 24 hours of chlorine. The electrically heated evaporator shall be Capital Controls Series 71V3000.

C. The evaporator shall be manufactured in a facility with a quality system that has been certified as complying with ISO 9001 International Quality Standard.

D. The vaporizing chamber shall be constructed of Schedule 80 welded steel pipe having a minimum wall thickness of ½-inch. All fittings and flanges shall be forged steel. The chamber shall be designed, constructed and tested to conform to the lethal substances section of the ASME Code, Section VIII, for unfired pressure vessels. The chamber shall be supplied with an "L" Certification which includes the following additional stamps: "W-L" welding meets lethal gas requirements; "S-L" fabricated using seamless pipe; "HT" whole vessel has been post-weld heat treated; and "RT-1" complete chamber satisfies the full radiography requirements (100%) of all welded joints for lethal substances. The vaporizing chamber shall be hydrostatically tested at 825 PSIG. A gas pressure relief valve complete with a safety head/rupture disc and pressure switch with diaphragm protector shall be provided for emergency pressure relief as specified below. No process connections shall be permitted at the bottom of the pressure vessel.

E. Each evaporator shall be furnished with a gas pressure relief system comprised of the following:

1. Safety Head Rupture Disc shall be non-fragmenting with burst pressure of 300 psig. The disc holder will be forged carbon or alloy steel (connection type and pressure rating of disc holder will conform to the class specification of the flanges and piping systems). The disc will be constructed from Monel alloys K500 and R405 (UNS N05500 and N04405), tantalum, armored impervious graphite, silver, or Hastelloy C and C-276 (UNS N1002 and UNS N10276).

2. High pressure switch shall be diaphragm protected and set to alarm at 200 psig. The pressure switch will be mounted on either a 1" flanged Hastelloy C® chemical seal with welded tantalum diaphragm, or a 1" NPT nickel/chrome plated steel seal with tantalum diaphragm. The switch will be filled with inert halocarbon oil.

3. Pressure relief valve shall be factory set to relieve pressure at 300 psig. The pressure relief valve will have a carbon steel body and spring with Hastelloy C or C 276 (UNS N10002 or UNS N10276) or Monel alloy 400 and R405 (UNS N04400 and UNS N04405) trim.

F. The water jacket shall be constructed of stainless steel. The water heater shall be of the three element, electric immersion type,18 kW maximum capacity, designed for 240 VAC, 3-phase automatic operation, as specified in the Functional Description. The electric heater shall be mounted in the lower portion of the water jacket to insure proper heat distribution by natural convection. No additional circulating apparatus shall be required. The water chamber shall include both an integral overflow and a vapor vent. A magnetic contactor shall be required for operating the heater and shall be furnished integral to the evaporator. The interior of the water chamber and the exterior of the vaporizing chamber shall be protected from corrosion by a system of four sacrificial magnesium anodes coupled with an electronic cathodic protection system.

G. The unit shall be equipped with a front panel-mounted electronic temperature controller, a water level sight gauge, and gas pressure and temperature gauges. A water level switch

shall be provided for low alarm and for shut down of the heater and closure of the electrically actuated gas pressure reducing valve in the event of low level in the water chamber. The temperature controller shall cause the closing of the gas pressure reducing and shut-off valve in the event of low water temperature. The temperature controller shall have a direct reading digital display and alarms for high and low water temperature. Dry contacts for alarms shall be provided for actuation of both local display and remote annunciation. The controller shall also provide automatic, self-adjusting, electronic cathodic protection with "on" and "failed" status lights. The controller shall be menu driven through a front panel mounted keypad. All control circuitry shall be 120 V, and shall be factory pre-wired to customer terminal strips. All controls and switches shall be rated NEMA 4X.

H. Additional controls and switches shall be optionally available and shall be furnished when specified in the Functional Description. These shall include:

1. Automatic fill system with water rate rotameter
2. Water level control switch with solenoid valve.
3. Magnetic contactor: integral or remote.A 10-inch scale glass tube rotameter

I. The evaporator shall be housed in a corrosion-resistant, high impact polystyrene cabinet that shall be completely removable for service. The cabinet design shall permit multiple evaporators to be mounted 1-inch apart in order to minimize floor space requirements. The unit shall be supplied with PVC closed-foam insulation for the water chamber in order to conserve energy.

2.04 CHLORINE GAS FILTERS

A. Furnish and install four (4) chlorine gas filters, one on each evaporator discharge pipe as indicated on the drawings. The chlorine gas filter shall be constructed from 25,000 lb. tensile strength grey iron castings and shall be rated at 560 lbs. per square inch working pressure. The filter shall have two chambers such that the filter acts as both a filter and a condensate trap. The lower portion shall trap liquid impurities (reliquefied gas and/or foam droplets from the evaporator). The upper portion shall have a removable filter cartridge. The filter element shall be impregnated to plate out ferric chloride as it passes through the element. The chlorine gas filter shall be Chlorine Specialties Model C-282, or approved equal.

2.05 COMBINATION PRESSURE REDUCING AND VACUUM REGULATOR ASSEMBLIES

A. Furnish and install four (4) combination pressure reducing and vacuum regulator assemblies, one on each evaporator discharge pipe.

B. The gas vacuum regulator/feeder shall have a maximum capacity of 10,000 pounds per day chlorine and sized to feed 10,000 pounds per day chlorine gas.

C. The gas pressure reducing valve shall be a diaphragm type pressure reducing and regulating valve combined with an electrically actuated valve operator. The gas pressure reducing valve shall normally be closed. The gas pressure reducing valve shall have a 120 volt, single phase, electric actuator that shall automatically open the valve when line power is applied to the electric actuator. When line power is applied to the electric actuator of the

normally closed pressure reducing valve, the actuator opens the valve and the valve regulates the pressure of the chlorine gas from supply pressure to a constant lower outlet pressure. When the electric circuit is de-energized, the valve closes and remains closed until power is applied. The valve body shall be ASTM A105 forged steel and shall meet the requirements of the Chlorine Institute for Class IV piping. The valve plug and seat shall be housed in a capsule that can easily be removed for cleaning or for changing the capacity of the valve. The valve shall be equipped with a vent outlet that will provide the means to vent chlorine gas should the diaphragm be ruptured. The valve actuator shall be a sealed unit, oil filled and completely isolated from the chlorine gas. The gas pressure reducing valve shall be equipped with a heated drip leg. Heated drip leg shall operate using 120 volt, single phase power. A low temperature switch shall be installed between the gas pressure reducing valve and the vacuum regulator. The low temperature switch shall be hard wired to automatically close the gas pressure reducing valve when low temperature is detected.

D. The combination pressure reducing and vacuum regulator assembly shall be installed downstream from the chlorine gas filter. The pressure reducing valve shall reduce the inlet chlorine gas pressure to less than 120 psig regardless of upstream pressure, and the vacuum regulator shall convert the pressure to vacuum.

2.06 PRESSURE GAUGES

A. Pressure gauges shall consist of a 2-1/2 or 4-inch dial 30/0/300 pressure gauge mounted on a welded design diaphragm seal. The gauge will have carbon steel upper housing with NPT instrument connection, tantalum diaphragm, nickel/chrome plated carbon steel lower housing on threaded seal, or welded Hastelloy C® lower housing on flanged seal. Gauge face will be filled with silicone oil and seal is filled with halocarbon oil. Gauge and seal will be vacuum rated to 30" mercury.

2.07 PRESSURE SWITCHES

A. Pressure Switch shall be mounted on either a 1" flanged Hastelloy C® chemical seal with welded tantalum diaphragm or a 1" NPT nickel/chrome plated steel seal with tantalum diaphragm. Pressure switches shall have an adjustable range from 25 to 240 psig. Pressure switch shall send a discrete alarm signal to the local PLC.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The chlorination equipment shall be installed by the Contractor in accordance with the manufacturer's instructions and checked by the manufacturer's representative, in conformity with the applicable sections of the General Provision & Supplemental General Provisions.

3.02 PIPE CLEANING AND PRESSURE TESTING

A. The chlorine piping system shall be free from oil and grease. All dirt and debris of any nature shall be blown out of the chlorine lines. Water shall not be put into any of the chlorine gas piping. Clean, dry and test chlorine gas piping in accordance with Section 15995 - Pipeline Testing.

3.03 TESTING

A. After all chlorination equipment, piping, diffusers, and other necessary incidental are installed complete, the system shall be tested for proper operation, efficiency, and capacity. All parts shall operate satisfactorily in all respects when the system is operated at rated capacity. If any part of the system shows evidence of improper operation during the test, correction or repair shall be made and the test shall be repeated. This procedure shall be repeated until the entire system operates satisfactorily.

3.04 MANUFACTURERS SERVICES

A. Manufacturer shall provide the following start-up services:

1. Certify proper installation.

2. Two person-days on site for start-up and testing.

3. One person-day on site for operator training.

- END OF SECTION -

SECTION 15000 - PIPING, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all piping systems shown and specified, in accordance with the requirements of the Contract Documents. Each system shall be complete with all necessary fittings, hangers, supports, anchors, expansion joints, flexible connectors, valves, accessories, lining and coating, testing, disinfection, to provide a functional installation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. General Provisions and Supplementary General Provisions

B. Section 03305 – Concrete and Grout

C. Section 09900 – Painting

D. Section 15030 – Piping and Equipment ID Systems

E. Section 15995 – Pipeline Testing

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

1.	CHLORINE INSTITUTE	Pamphlet 6, Piping Systems for Dry Chlorine Edition 15 May 2005
2.	ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 125.
3.	ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.
4.	ANSI/AWS D1.1	Structural Welding Code.
5.	ASTM A 307	Specification for Carbon Steel Externally Threaded Standard Fasteners.
6.	ASTM A 325	Specification for High Strength Bolts for Structural Steel Joints.
7.	ASTM D 792	Test Methods for Specific Gravity and Density of Plastics by Displacement.
8.	ANSI/AWS D1.1	Welder Qualifications

1.04 SUBMITTALS

A. The Contractor shall submit complete shop drawings and certificates, test reports, affidavits of compliance, of all piping systems, in accordance with the requirements in the General Provisions, and as specified in the individual piping sections.

B. Each shop drawing submittal shall be complete in all aspects incorporating all information and data listed herein and all additional information required to evaluate the proposed piping material's compliance with the Contract Documents. Partial or incomplete submissions will be returned to the Contractor without review.

C. Data to be submitted shall include, but not be limited to:

1. Catalog Data consisting of specifications, illustrations, and a parts schedule that identifies the materials to be used for the various piping components and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

2. Complete layout and installation drawings with clearly marked dimensions and elevations. Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked. Piping layout drawings shall indicate the following additional information; pipe supports, location, support type, hanger rod size, insert type and the load on the hanger in pounds.

3. Weight of all component parts.

4. Tabulated pipe layout schedule which shall include the following information for all pipe and fittings, service, pipe size, working pressure, wall thickness and piece number.

D. Certifications: Prior to installation, the Contractor shall furnish an Affidavit of Compliance certified by the pipe manufacturer that the pipe, fittings and specials furnished under this Contract comply with all applicable provisions of AWWA and these specifications. No pipe or fittings will be accepted for use in the Work on this project until the affidavits have been submitted and accepted in accordance with General Provisions.

E. All expenses incurred in making samples for certification of tests shall be borne by the Contractor.

1.05 QUALITY ASSURANCE

A. Tests: Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards.

B. Welding Requirements: All welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

C. Welder Qualifications: All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used for the

specific application. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, acceptable testing agency not more than 12 months prior to commencing work. Machines and electrodes similar to those used in the Work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders. Furnish welder's qualification papers to the Engineer.

1.06 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Where the assistance of a manufacturer's service representative is necessary to obtain correct pipe joints, supports, or special connections for a completely functioning project, the Contractor shall furnish such assistance at no additional cost to the Owner.

1.07 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and shall be stored off the ground to provide protection against oxidation caused by ground contact. Any materials susceptible to UV degradation shall be protected to eliminate exposure to sunlight. All defective or damaged materials shall be replaced with new materials. Storage shall conform with the General Provisions and the Manufacturer's requirements.

1.08 CLEANUP

A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

PART 2 -- PRODUCTS

2.01 GENERAL

A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Sections of Division 15 – Mechanical and furnished as specified herein.

B. Pipe Supports: All pipes shall be adequately supported in accordance with the requirements of section entitled "Pipe Supports" and as shown on the Contract Documents.

C. Lining: All requirements pertaining to thickness, application, and curing of pipe lining, shall be in accordance with the requirements of the applicable Sections of Division 15 – Mechanical, unless otherwise specified.

D. Coating: All requirements pertaining to thickness, application, and curing of pipe coating, are in accordance with the requirements of the applicable Sections of Division 15 – Mechanical, unless otherwise specified. Pipes above ground or in structures shall be field-painted in accordance with Section 09900 entitled "Painting".

E. Pressure Rating: All piping systems shall be designed for the rated working pressure, listed in the piping schedule.

2.02 PIPE FLANGES

A. Flanges

1. Flanges shall be ASTM A105, Class 300 forged steel raised-face or tongue and-groove, socket weld ASME B16.5.

B. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207, or with the standards for miscellaneous small pipes.

C. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

D. Flange Bolts

1. Flange bolts shall be ASTM A193 Grade B7 Alloy steel quenched and tempered, alloy steel stud bolts and cap screws ASME B18.2.1.

E. Flange Gaskets

1. Gaskets for flanged joints shall be of materials as specified in piping sections. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted.

F. Flange Gasket Suppliers shall be the following, or equal:

1. John Crane

2. Garlock

3. Or approved equal

2.04 UNIONS

A. For PVC and CPVC, unions shall be socket solvent weld type with Viton O-ring.

B. For steel chlorine pipe, unions shall be Ammonia Type with lead gasket joints, ASTM A105 Class 3000 forged steel lug nut unions, socket weld.

C. Flanged Unions shall be ASTM A105 Class 300 forged steel raised face or tongue and-groove, socket weld in accordance with ASME B16.5.

PART 3 -- EXECUTION

3.01 GENERAL

A. The Contractor shall furnish all labor, tools, materials, and equipment necessary for installation and jointing of the pipe. All piping shall be installed in accordance with the Drawings in a neat workmanlike manner and shall be set for accurate line and elevation. All

piping shall be thoroughly cleaned before installation, and care shall be taken to keep the piping clean throughout the installation.

B. Piping shall be attached to pumps, tanks, valves, equipment, etc., in accordance with the respective manufacturers' recommendations unless otherwise indicated in the Contract Documents. This includes the use of flexible connectors as required.

C. All changes in directions or elevations shall be made with fittings, unless otherwise shown.

3.02 SHIPPING, HANDLING AND STORAGE

A. Special care in handling shall be exercised during delivery, distribution and storage of pipe to avoid damage and setting up stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

B. No pipe shall be dropped from cars or trucks to the ground. All pipe shall be carefully lowered to the ground by mechanical means. In shipping, pipe and fittings shall be blocked in such manner as to prevent damage to castings or lining. Any broken or chipped lining shall be carefully patched. Where it is impossible to repair broken or damaged lining in pipe because of its size, the pipe shall be rejected as unfit for use.

C. Contractor shall protect all susceptible materials from UV degradation.

3.03 CONSTRUCTING PIPE

A. Proper and suitable tools and appliances for the safe convenient handling and constructing of pipe shall be used and shall, in general, agree with manufacturer's recommendations. At the time of installation, the pipe shall be examined carefully for defects, and should any pipe be discovered to be defective after being installed, it shall be removed and replaced with sound pipe by the Contractor at his expense.

B. All piping 3-inches and larger shall be provided with two 4-foot-lengths of pipe for the first two joints outside a building or tank wall unless a greater number of joints is shown on the Drawings.

C. Pipe shall be installed in accordance with the manufacturer's recommendation. Before being lowered into the trench, the pipes and accessories shall be carefully examined and the interior of the pipes shall be thoroughly cleaned of all foreign matter. At the close of each work day and during suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

D. Lines shall be laid straight and depth of pipe inside pipe trenches shall be maintained uniform. Where a grade or slope is shown on the Drawings, the Contractor shall use laser based surveying instruments to maintain alignment and grade. At least one elevation shot shall be taken on each length of pipe and recorded.

E. After pipe has been constructed, inspected and found satisfactory, pipe supports shall be tightened to hold the pipe securely in place during the conduction of the hydrostatic test.

3.04 FLANGED JOINTS

A. Flanged joints shall be made up with full face gaskets as specified in the piping paragraphs and suitable for the specified chemical. Flange faces shall have a uniform bearing on the gaskets. Flanges shall be drawn together uniformly until the joint is tight. No washers shall be permitted for the bolt and nut assemblies. The length of the bolts shall be uniform and in accordance with the standards specified herein. The bolt's maximum projection beyond the end of the nut shall be 0.25-inch nor shall the bolt fall short of the end of the nut.

3.05 WELDED JOINTS

A. Welded joints shall be shop fabricated in accordance with the standards and specifications contained herein.

B. Field welding will be permitted for black carbon steel pipe where it can be demonstrated that the interior of the pipe can be satisfactorily lined and inspected. Welding in the field shall be performed only when requested on the shop drawings and accepted by the Owner and Engineer in writing as specified herein.

C. All welding shall be performed in accordance with ANSI B31.1 and AWWA C 206 except as modified or supplemented herein. All welders shall be AWS certified in accordance with AWWA C206, and ANSI B31 requirements.

D. Pipe and fittings with wall thicknesses of 3/16-inch and larger shall have ends beveled for welding. Bevels shall be 30 degrees with a maximum of 37-1/2 degrees. The abutting pipe ends shall be separated before welding to permit complete fusion to the inside wall of the pipe without overlapping. Welding shall be continuous around the joint and shall be completed without interruption. Welds shall be of the single vee butt type, of sound weld metal thoroughly fused into the ends of the pipe and into the bottom of the vee. Welds shall be free from cold spots, pin-holes, oxide inclusions, burrs, snags, rough projections or other defects.

E. Filler metal for welding shall be of the same composition as the base metal. All welding of steel pipe flanges shall be in accordance with requirements of AWWA C207 and ANSI B31.1.

F. Field welds shall be "fixed position" type.

3.06 THREADED JOINTS

A. The use of threaded joints shall be limited to only those locations where other means of connecting pipe are unavoidable, such as at connections to pressure gauges.

B. All threads shall be clean, machine cut and all pipe shall be reamed before erection. Taps and dies shall be cleaned, sharpened and in good condition. All threaded joints shall be made tight with Teflon tape. Teflon tape shall meet Military Specification T-27730A.

C. After having been set up, a joint shall not be backed off unless the joint is broken; the threads cleaned and new tape is applied.

3.07 SOLVENT CEMENTED JOINTS

A. Joints shall be made up in accordance with ASTM D 2855 and the manufacturers' recommendations. The Contractor is advised to handle the solvent cements in accordance with ASTM F 402.

3.08 PIPING SCHEDULE

A. This section includes schedule of piping specified in other sections of Division 15 – Mechanical Construction.

B. The following abbreviations are used in the schedule:

1. Material

CS - Seamless Carbon Steel
PVC - Polyvinylchloride
CPVC - Chlorinated Polyvinylchloride
CU - Copper

2. Wall Thickness

CL - Class
DR - Diameter Ratio
Sch - Schedule
SDR - Standard Diameter Ratio

3. Joint Type

Grvd - Grooved
Flg - Flanged
SW - Socket Welded
Thd - Threaded
Wld - Welded
Comp - Compression Fitting
Sld - Soldered

4. Fitting Type

CS - Forged Carbon Steel
PVC - Polyvinylchloride
CPVC - Chlorinated Polyvinylchloride

5. Interior Surface Protection

Not Required

6. Exterior Surface Protective Coating

P - Painted

7. Pipe Designation Abbreviations utilized on Drawings for Services listed in Schedule:

Air	-AIR
CLL	-Chlorine Liquid
CLG	-Chlorine Gas
CLV	-Chlorine Gas Vacuum
N	-Nitrogen Gas
Potable Water	- PW

C. Piping Schedule

Service	Nominal Pipe Diameter (inches)	Material	Thickness Class or Schedule	Working Pressure (PSIG)	Type of Joints	Type of Fittings	Protective Coating		Remarks
							Interior	Exterior	
CHLORINE LIQUID	Less than 2”	CS	Sch 80	40-140	VARIES	CS	--	Section 09900	Note 1
CHLORINE GAS	Less than 2”	CS	Sch 80	40-140	VARIES	CS	--	Section 09900	Note 1
CHLORINE GAS VACUUM	All	CPVC	Sch 80	60	SW	Socket	--	_	Note 2
POTABLE WATER	All	PVC	Sch 80	60	SW	Socket	--	_	Note 2

Notes
1 Refer to Section 15010 – Mill Piping Exposed
2 Refer to Section 15009 – PVC/CPVC Pressure Pipe

- END OF SECTION

SECTION 15009 - PVC/CPVC PRESSURE PIPE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Reference Section 15000, Piping, General.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15000 – Piping, General

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Supplementary General Provisions Sections 2.2 b.

B. Submit materials list.

C. Submit manufacturer's recommended method of installing buried pipe. Show alignments and offsets for "snaking" buried pipe.

PART 2 -- PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS (3-INCH AND LESS)

A. PVC pipe and fittings shall be manufactured in accordance with ASTM D 1784, D 1785 and F 441, "normal impact" pipe, Schedule 80.

B. Fittings used with this pipe shall be socket type or flanged type as specified herein or indicated on the Drawings. Plastic piping shall be installed in full accordance with the manufacturer's recommendations for the specific installation. No field bending or distortion of the pipe will be permitted.

C. PVC pipe shall be Type 1 Grade 1 conforming to ASTM D 1784 and D 1785. Fittings shall conform to the following standard specifications:

Socket Type (Schedule 80); ASTM D 2467

D. Provide flanged fittings of the same material as the specified pipe and material conforming to ANSI B16.5 at connections to valves and equipment specified to have flanged end connections. Flanges are not required at true (double) union valves.

E. Solvent cement for socket type joints shall conform to ASTM D 2564 for PVC pipe and fittings. Pipe in chemical service shall use WELD-ON® 724™ solvent cement as manufactured by IPS corporation, or Oatey "Lo V.O.C. PVC Heavy Duty Gray, or approved equal.

F. Unions shall have socket-type ends, EPDM o-rings, and shall be Schedule 80. Material shall be Type 1, Grade 1 PVC, per ASTM D 1784.

G. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M for bolts, and ASTM a 194, Grade B8M for nuts. Washers shall be Type 316 stainless steel annealed per ASTM A240.

H. Provide washers for each nut. Washers shall be of the same material as the nut.

I. Gaskets for flanged joints shall be full faced, 1/8-inch thick, having a hardness of 50 to 70 durometer A. Gasket material shall be EPR.

2.02 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE AND FITTINGS (3-INCH AND LESS)

A. CPVC shall be manufactured in accordance with ASTM D 1785, D 1784 and F 441, "normal impact" pipe, Schedule 80.

B. Fittings used with this pipe shall be socket type or flanged type as specified herein or indicated on the Drawings. Plastic piping shall be installed in full accordance with the manufacturer's recommendations for the specific installation. No field bending or distortion of the pipe will be permitted.

C. CPVC pipe shall be Type 4, Grade 1, Schedule 80, conforming to ASTM D 1784 and ASTM F 441. CPVC fittings shall be socket type conforming to ASTM F 439.

D. Solvent cement for socket type joints shall conform to ASTM F 493 for CPVC pipe and fittings.

E. Primer: Primer shall be WELD-ON® P-70™ as manufactured by IPS corporation, or approved equal.

F. Cement: Cement shall be heavy bodied, medium setting, cement that is formulated for chemical resistance to caustics including sodium hypochlorite solutions when used in either PVC or CPVC piping systems for chemical applications. The cement shall be WELD-ON® 724™ as manufactured by IPS corporation, Oatey “Lo V.O.C. PVC Heavy Duty Gray, or approved equal.

G. Unions shall have socket-type ends, EPDM o-rings, and shall be Schedule 80. Material shall be Type 1, Grade 1 PVC, per ASTM D 1784.

H. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M for bolts, and ASTM a 194, Grade B8M for nuts. Washers shall be Type 316 stainless steel annealed per ASTM A240.

I. Provide washers for each nut.

J. Gaskets for flanged joints shall be full faced, 1/8-inch thick, having a hardness of 50 to 70 durometer A. Gasket material for other than sodium hydroxide service shall be EPR.

PART 3 -- EXECUTION

3.01 GENERAL

A. Do not install PVC or CPVC pipe when the temperature is below 40 F or above 90 F. Store loose pipes on racks with a minimum support spacing of 3 feet. Provide shade for pipe stored outdoors or installed outdoors until the pipe is filled with water.

B. Store fittings indoors in their original cartons.

C. Store solvent cement indoors or, if outdoors, shade from direct sunlight exposure. Do not use solvent cements which have exceeded the shelf life marked on the storage container.

D. Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting on pipe ends. Remove any pipe section containing defects by cutting out the damaged section as a complete cylinder.

3.02 INSTALLATION

A. Do not drag PVC or CPVC pipe over the ground, drop it onto the ground, or drop objects on it. Cut pipe ends square and remove all burrs, chips, and fillings before joining pipe or fittings. Bevel solvent welded pipe ends as recommended by the pipe manufacturer.

3.03 SOLVENT WELDED JOINTS

A. Prior to solvent welding, remove fittings and couplings from their cartons and expose them to the air for at least one hour to the same temperature conditions as the pipe.

B. Wipe away loose dirt and moisture from the ID and OD of the pipe end and the ID of the fitting before applying solvent cement. Do not apply solvent cement to wet surfaces.

C. Make up solvent welded joints per ASTM D 2855.

D. Allow at least eight hours of drying time before moving solvent welded joints or subjecting the joints to any internal or external loads or pressures.

3.04 FLANGED JOINTS

A. Lubricate bolt threads with MRO solution 1000 Food Grade Anti-seize, or equal before installation.

B. Tighten bolts on PVC or CPVC flanges by tightening the nuts diametrically opposite each other using a torque wrench. Complete tightening shall be accomplished in stages and the final torque values shall be as shown in the following table:

Pipe Size (inches)	**Final Torque (foot-pounds)**
1/2 to 1-1/2	10 to 15
2 to 4	20 to 30

3.05 THREADED JOINTS

A. Cut threaded ends on PVC or CPVC to the dimensions of ANSI B2.1. Ends shall be square cut. Follow the pipe manufacturer's recommendations regarding pipe holddown methods, saw cutting blade size, and saw cutting speed.

B. Pipe or tubing cutters shall be specifically designed for use on PVC and CPVC pipe. Use cutters manufactured by Reed Manufacturing Company, Ridge Tool Company, or equal.

C. If a holddown vise is used when the pipe is cut, insert a rubber sheet between the vise jaws and the pipe to protect from scratching the pipe.

D. Thread cutting dies shall be clean and sharp and shall not be used to cut materials other than plastic.

E. Apply Teflon thread compound or Teflon tape lubricant to threads before screwing on the fitting.

3.06 INSTALLING UNIONS

A. Provide unions on exposed piping 3 inches and smaller and maintenance in locations shown on the drawings or the minimum required to facilitate construction.

3.07 INSTALLING ABOVEGROUND PIPE

A. Install pipe on pipe hangers and supports as detailed on the drawings and as specified in Section 15020 entitled "Pipe Supports". Install pipe without springing, forcing, or stressing the pipe or the adjacent valves and equipment to which the pipe is connected.

3.08 PAINTING AND COATING

A. Coat piping per Section 09900 entitled "Painting".

3.10 PIPE IDENTIFICATION AND COLOR CODING

A. Label and color code piping per Section 15030 entitled "Piping and Equipment Identification Systems".

3.11 HYDROSTATIC TESTING

A. Perform hydrostatic testing for leakage in accordance with requirements set forth in Section 15995 entitled "Pipeline Testing".

– END OF SECTION –

SECTION 15010 – CHLORINE LIQUID AND GAS PIPING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, and test all chlorine liquid and gas piping as shown and specified, complete, including carbon steel pipe, fittings, gaskets, bolts, insulating connections, and such other specialties as required for a complete and operable piping system in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. General Provisions Section 4 – Materials and Equipment

B. Section 09900 – Painting

C. Section 15000 - Piping, General

D. Section 15020 – Pipe Supports

E. Section 15030 – Piping and Equipment Identification System

F. Section 15995 – Pipeline Testing

1.03 SUBMITTALS

A. For the materials and equipment items supplied under the provisions of this Section, the Contractor shall submit copies of the manufacturer's product specifications and performance details according to Supplementary General Provisions Sections 2.2 b and General Provisions Sections 4.

PART 2 – PRODUCTS

2.01 CARBON STEEL PIPE IN CHLORINE LIQUID OR CHLORINE GAS SERVICE

A. Carbon steel pipe and pipe components in chlorine liquid and/or gas service shall conform to The Chlorine Institute, Inc. Pamphlet 6*, Piping Systems for Dry Chlorine* Edition 15 May 2005.

B. Unless otherwise specified, sizes 6-inches in diameter and smaller shall conform to the requirements of ASTM A106 Grade B Schedule 80 carbon steel, seamless in accordance with ASME B36.10.

C. Painting of exposed piping shall be in accordance with the Section 09900 entitled “Painting”. Areas of pipe to be welded shall receive 1 mil (dry) of weldable inorganic zinc primer such as Carbo Weld 11, as manufactured by Carboline, or approved equal.

D. After pressure and leakage testing are completed, welded joints shall be thoroughly cleaned of all foreign matter and any scale or rust and primed as specified for the pipe. Finish coat shall be applied to each joint as specified for the pipe for continuous coating of all steel piping.

E. Grooved joints and/or flanged joint shall meet the requirements set forth in Section 15000 entitled “Piping, General”.

2.02 CARBON STEEL FITTINGS

A. Unless otherwise shown or specified, carbon steel pipe fittings shall be ASTM A105, Class 3000 forged steel, socket weld in accordance with ASME B16.11.

B. Flanged fittings shall be ASTM A105, Class 3000 forged steel raised-face or tongue and-groove, socket weld in accordance with ASME B16.5.

2.03 MECHANICAL-TYPE COUPLINGS

A. Mechanical-type couplings shall be furnished and installed in accordance with the requirements of Section 15000 entitled "Piping, General".

2.04 SLEEVE-TYPE COUPLINGS

A. Sleeve-type couplings shall be furnished and installed in accordance with the requirements of Section 15000 entitled "Piping, General."

2.05 GASKETS AND BOLTS

A. Except as otherwise noted, gaskets for flanged joints shall Teflon (PTFE) and one of the Chlorine Institute Pamphlet 95 listed gaskets.

B. Except as otherwise noted, bolts shall be ASTM A193 Grade B7 Alloy steel quenched and tempered, alloy steel stud bolts and cap screws ASME B18.2.1. Nuts shall be ASTM A194 Grade 2H carbon steel heavy hex nuts ASME B18.2.2.

2.06 INSULATING CONNECTIONS

A. Insulating bushings, unions, couplings or flanges, as appropriate, shall be used for joining pipes of dissimilar metals, and for piping systems where corrosion control and cathodic protection are involved, in accordance with the requirements of Section 15000 entitled "Piping, General."

B. Insulating connections shall be of nylon, Teflon, poly- carbonate, polyethylene or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.07 PIPE SUPPORTS

A. Pipe Supports, hangers, anchors, and guides shall be in accordance with the requirements of Section 15020 entitled “Pipe Supports”.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Gaskets for Flanged Joints: Gaskets shall be in accordance with the requirements of Section 15000 entitled “Piping, General”.

B. Insulating Connections: All insulating connections shall be installed in accordance with manufacturer's printed instructions. Care shall be exercised to prevent damage to insulating fittings, while making up the joints.

C. Welded Joints: Welded joints shall be in accordance with the requirements of Section 15000 entitled “Piping, General”.

D. Perform testing for leakage in accordance with requirements set forth in Section 15995 entitled “Pipeline Testing”.

- END OF SECTION –

SECTION 15020 – PIPE SUPPORTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, and installation of all pipe supports, hangers, guides, and anchors shown, specified, or required for a complete and operable piping system, in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15000 – Piping, General

B. Section 15009 – PVC/CPVC Pressure Pipe

C. Section 15010 – Chlorine Liquid and Gas Piping

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

ANSI / ASME B31.1 Power Piping

ANSI / ASME B31.3 Process Piping

1.04 CONTRACTOR SUBMITTALS

A. Shop Drawings: The Contractor shall furnish prior to fabrication or installation complete shop drawings of all pipe supports, hangers, anchors, and guides, as well as calculations for special supports and anchors, in accordance Supplementary General Provisions Sections 2.2 b. Provide line drawings of each piping system to the scale shown in the drawings, locating each support or hanger. Identify each type of hanger or support by the manufacturer's catalog number or figure.

B. Provide installation drawings and manufacturer's catalog information on each type of hanger and support used. Clearly indicate the actual pipe outside diameter (not just nominal pipe size) that is used for the hangers and supports.

PART 2 -- PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The Contractor shall note that all pipe support locations are not shown on the Drawings and shall follow the Specifications herein in locating supports. Where deviations and modifications are required, they shall be made subject to review by the Engineer.

B. Code Compliance: All piping systems and pipe connections to equipment shall be properly supported, to prevent undue deflection, vibration, and stresses on piping, equipment, and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1 and ANSI / ASME B31.3, except as supplemented or modified by these Specifications. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code, or local administration requirements.

C. All piping shall be rigidly supported from the building structure by approved hangers, inserts, or supports. No piping shall be supported from other piping or from metal stairs, ladders, and walkways unless specifically permitted by the Engineer.

D. Unless otherwise indicated on the Drawings, piping supports shall consist of concrete piers or fabricated 316 stainless steel supports as specified below. Materials and workmanship shall be in full compliance with Division 3 - Concrete.

E. Supporting appurtenances shall be arranged to prevent undue stress on equipment to which piping is connected. Supporting appurtenances shall provide the desired pitch as specified or required for proper drainage of the piping. The pipe suspension shall prevent excessive stress, excessive variation in supporting force, and possible resonance with imposed vibration while the system is in operation. All valves and valve operators shall be rigidly supported independently of the piping. Vertical runs of pipe shall be supported independently of the connected horizontal runs. All vertical pipes shall be supported at each floor or at intervals of at least 10 feet by approved pipe collars, clamps, brackets or wall rests. Supporting appurtenances, when used with copper piping, shall be copper, bronze or bronze plated. All piping shall be supported independently of the equipment to which it is connected. All in line devices (flowmeters, etc.) shall be removable without the need for temporary supports for adjacent and connecting piping.

F. In general, the type of pipe supports to be used shall be as follows unless otherwise shown on the Drawings:

Nominal Pipe Diameter (inches)	Height of Centerline of Pipe Above Floor (feet)	Type of Support
Less than 4	3 feet or less	Type 316L stainless steel channels and structural shapes
All	Greater than 3 feet	Type 316CSS Adjustable Pipe Saddle, Bracket Supports or Hangers

G. Wall bracket supports shall be used where shown for pipe to be installed adjacent to a wall. Where it is not feasible to install hanger supports, adjustable pipe saddle supports may be used upon review and acceptance by the Engineer. The Contractor shall install pipe supports in conformance with these Specifications unless otherwise shown on the Drawings. Where deviations and modifications are required, they shall be made only with the permission of the Engineer. A detailed layout of pipe supports for each building shall be submitted to the Engineer for review prior to pipe fabrication or installation.

H. For all couplings, supports shall be placed on each side and as close to the coupling as possible.

I. Structural Members: Wherever possible, pipes shall be attached to structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the Contractor at no additional cost to the Owner. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction. Stainless steel and non-metallic piping installed in tanks, channels or conduits shall be supported by hangers, hanger rods, hardware and inserts fabricated of Type 316 stainless steel.

J. Freestanding pipe connections to equipment shall be firmly attached to fabricated 316 stainless steel frames made of angles, channels, or I beams anchored to the structure. Exterior, freestanding overhead piping shall be supported on fabricated 316 stainless steel pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U bolts or clamps, securing the pipes. All materials shall be Type 316 stainless steel.

K. Point Loads: Any meters, valves, heavy equipment, and other point loads on PVC, fiber glass, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on plastic and fiber glass piping shall be equipped with extra wide pipe saddles or galvanized steel shields with minimum length equal to circumference of pipe.

L. Noise Reduction: To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2 inch wide strip of rubber fabric or similar, suitable material, at each pipe support, bracket, clip, or hanger.

M. Where a specific pipe support is called for on the Drawings, this support shall be used as and where indicated for the specific application. In general, spacing of supports shall be as specified herein unless specifically modified by the Engineer.

N. All supports, saddles, bearing plates, and hangers, shall support by direct contact the pipe a minimum of 120 degrees around, except as specified herein.

O. Where continuous concrete inserts are used, the maximum concentrated load on the end two (2) inches of inserts, with laying lengths of eight (8) inches or longer, shall not be more than 50 percent of the maximum recommended loading of the channel. All pipe

supports shall be positioned such that they will not interfere with the use of hoisting equipment, where provided.

P. Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints. They shall permit the piping to expand and contract freely in directions away from the anchored points and shall be structurally suitable to withstand all loads imposed. Pipes subject to thermal expansion shall be installed perfectly aligned and concentrically guided. These piping support systems shall be submitted to the Engineer for review prior to erection and installation. The submittal shall show location of anchors, concentric pipe guides and expansion couplings (single or double).

2.02 TYPE 316 STAINLESS STEEL CHANNEL SUPPORTS

A. Pipe supports shall be wall or slab mounted 1 5/8 X 1 5/8 UNISTRUT (or equal) 316 stainless steel channels with Type 316 stainless steel straps, and 316 stainless steel lock nuts. Supports shall be attached to walls and slabs by 3/8-inch diameter, 6-inch long Type 316 stainless steel anchor bolts with lock nuts. Bolt support spacing shall be maximum 12-inch O.C.

	Longitudinal Direction
Ultimate Tensile (psi)	37,500 minimum
Ultimate Compressive (psi)	35,000 minimum
Ultimate Flexural (psi)	37,500 minimum
Tensile Modulus (psi) x 10**6	3.00 minimum
Flexural Modulus (psi) x 10**6	2.00 minimum
Ultimate Shear Strength (psi)	6,000 minimum
Ultimate Bearing Stress (psi)	35,000 minimum
Izod Impact (ASTM D 256) ft-lb/inch notch	30 minimum

	Transverse Direction
Ultimate Tensile (psi)	10,000 minimum
Ultimate Compressive (psi)	20,000 minimum
Ultimate Flexural (psi)	14,000 minimum
Tensile Modulus (psi) x 10**6	1.0 minimum
Compressive Modulus (psi) x 10**6	1.4 minimum
Flexural Modulus (psi) x 10**6	1.0 minimum
Ultimate Shear Strength (psi)	5,500 minimum
Ultimate Bearing Stress (psi)	35,000 minimum
Izod Impact, ft-lb notch	5 minimum

	Hardness
Barcol Test	50 minimum

B. Glass fiber reinforced composites and plastic products shall have a flame spread rating of 25 or less when tested per ASTM E 84.

C. Channel framing shall be 1-5/8 inches deep by 1-5/8 inches wide and shall be made using vinylester resin equal to Kopper's 9300 MPQ. It shall have a nexus polyester surfacing veil over 100% of the surface which, along with a filler system, will protect against degradation from ultraviolet light. Channel shall be supplied with integral notches 1 inch on center. Notches shall be located on the interior flange to prevent slippage of pipe clamps and fittings after installation. In place of notched channel, unnotched channel may be used if the vertical channel sections supporting the horizontal piping are provided with stop lock hardware at each pipe clamp to prevent slippage. Channel framing shall be Aickinstrut G.R.P. Type V 2000 series, Strut Tech Series 200, or approved equal.

D. Channel framing connections shall be made with vinylester glass fiber composite nuts, bolts, all threaded rods, channel fittings, bases, and hanger assemblies. Nut, bolts, and rods shall be Aickinstrut 4200 series, Strut Tech PVCG, or equal. Channel fittings shall be Aickinstrut 2800 style, Strut Tech PVCG, or approved equal.

E. Load bearing pipe clamps and nonload bearing pipe straps shall be nonmetallic and nonconductive and shall be made by the injection molding process using polyurethane base resin. Pipe clamps and straps shall be Aickinstrut 3100 series, Strut Tech AC or FC, or approved equal.

F. Clevis hangers shall be made with vinylester glass fiber and be Aickinstrut 1500 series, Strut Tech CH series, or approved equal.

G. Hanger rods for trapezes shall be carbon steel (ASTM A 36, A 575, or A 576) unless stainless steel or FRP is indicated in the drawings. Stainless steel hanger rod material shall comply with ASTM A 276, Type 304. FRP hanger rod shall be by Aickinstrut, StrutTech, or approved equal.

2.03 PIPE SUPPORT SPACING

A. The distance between supports for each size of pipe shall not exceed those listed in the attached schedule. However, if the pipe size to be supported is not listed in the schedule, the next smaller nominal pipe size spacing shall be used. In all cases, there shall be a minimum of one support per laying length of pipe on uninterrupted horizontal runs. This support shall be placed within one (1) foot of the joint. If the pipe manufacturer recommends a smaller spacing interval than specified herein, then the manufacturer's spacing shall be used.

B. The distance between supports shall not exceed that listed in the following schedule unless otherwise indicated on the Drawings:

Nominal Pipe Size (in.)	Metallic Piping (ft.)	Plastic, Fiberglass and Copper Piping (ft.)
½	5	3
3/4 to 1-1/2	6	3
2 to 3	6	4
4	10	5

2.04 PIPE HANGERS AND HANGER RODS

A. Where pipe hangers are used, they shall be of the clevis or friction clamp type except where there is longitudinal movement due to temperature changes. Where longitudinal movement occurs, the adjustable yoke roller type hanger shall be used. See the hanger schedule below for location/type of hangers to be used. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

B. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed so that they cannot become disengaged by any movement of the supported pipe. Hangers subject to shock, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors.

C. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe. Lock nuts shall be used on all hangers. All piping systems shall be supported by means of hangers having an individual means of vertical adjustment for leveling of lines after piping is in place.

D. Spacing and arrangements shall conform to the requirements of Section 6, Chapter 1 of ANSI B31-1 code for pressure piping. Spacing indicated shall be the maximum spacing.

E. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing. Stainless steel hangers required in the pipe hanger schedule shall be supported by hanger rods, hardware and inserts fabricated of Type 316 stainless steel.

F. All other rods, hardware and inserts shall be fabricated of hot-dip galvanized steel. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than 1/2 inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

G. All concrete inserts and/or expansion bolts shall be capable of supporting the maximum working load of the rod which is attached to it.

H. Sheet metal insulation protector saddle shall be used for all hot water piping, refrigerant piping, etc.

I. A neoprene isolation pad shall be provided between galvanized clevis and stainless steel piping. For hot air applications, a Teflon pad shall be provided.

2.05 SUPPORTS FOR THERMOPLASTIC PIPE APPLICATIONS

A. All pipe supports that will be used with plastic pipe shall be provided with a bearing plate where the width of hanger is less one-half (½) of the supported pipe's diameter. The bearing plate must provide bearing 180 degrees around and shall have a minimum laying length of ½ the pipe diameter or three (3) inches minimum. The bearing plates shall be rigid, corrosion resistant and not subject to long term plastic flow properties. To assure one hundred (100) percent bearing, the pipe shall be seated on a filler. This material shall be compatible for use with the pipe. Clamps to be used with plastic pipe shall be fitted snug and shall not exert clamp pressure on the pipe.

2.06 MANUFACTURED SUPPORTS

A. Stock Parts: Where not specifically shown or detailed, designs, generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.

B. Suppliers:

1. Basic Engineers, Pittsburgh, PA;

2. Bergen Paterson Corp., Boston, MA;

3. Elcen Metal Products Company, Franklin Park, IL;

4. Anvil International, Inc., Portsmouth, NH;

5. NPS Industries, Inc., Secaucus, NJ;

6. Unistrut Corp., Itasca, IL.

7. Or approved equal

2.07 ANCHOR BOLTS AND SCREWS

A. Anchor bolts and screws for attaching pipe supports and hangers to walls, floors, ceilings, and roof beams shall be Type 316 stainless steel, ASTM A 276. Nuts shall be Type 316 stainless steel, ASTM A 194, Grade 8M, or ASTM F 594, Type 316 stainless steel.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. General: All pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1 and ANSI / ASME B31.3. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

B. Appearance: Pipe supports and hangers shall be positioned in such a way as to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other Work.

C. Pipe Support Spacing: The distance between supports for each size of pipe shall not exceed those specified in Paragraph 2.04.

D. Chemical Systems: Support chemical piping and other piping inside chemical buildings and chemical rooms using Type 316 stainless steel channels and structural shapes unless otherwise noted on the Drawings.

E. Provide separate hangers or supports at each valve. Provide one hanger or support around each end of the valve body or on the adjacent connecting pipe within one pipe diameter of the valve end. Provide additional hangers or supports to relieve eccentric loadings imposed by offset actuators.

F. Provide separate hangers or supports at each pipe elbow, tee, or fitting. Provide separate hangers or supports on both sides of each non-rigid joint or flexible pipe coupling.

G. Install piping without springing, forcing, or stressing the pipe or any connecting valves, pumps, and other equipment to which the pipe is connected.

H. Use 1-5/8-inch-high channel frames unless 3-1/4-inch is needed to provide clearance from walls. Use multiple back-to-back channels if additional clearance is needed.

3.02 FABRICATION

A. Quality Control: Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Welding shall conform with Section 05500 entitled “Metal Fabrications”. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

- END OF SECTION -

SECTION 15030 – PIPING AND EQUIPMENT IDENTIFICATION SYSTEMS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all components of the system for identification of piping and equipment as specified hereinafter and shall coordinate with the requirements in Section 09900. The system shall include the application of color coding and labeling to all new and altered plant piping. The Contractor shall color code and label equipment and piping using the color codes specified herein. Color coding and labeling shall be one of the commercially available industrial equipment and pipe identification systems.

B. In addition to the identification systems specified herein the Engineer or Owner may order the Contractor to furnish and install additional identification legends and arrows at no additional cost to the Owner. Such additional signs may be requested near completion of the work and shall be limited to no more than five (5) signs for each type specified herein. The lettering and color combinations for additional signs shall conform to the requirements specified herein.

1.02 RELATED WORK

A. Section 09900 - Painting

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings and manufacturer's product literature in accordance with the Supplementary General Provisions Section 2.2 (b) and this Section. In addition, the Contractor shall submit, with the shop drawings, a schedule of the colors proposed for each service.

PART 2 -- PRODUCTS

2.01 PIPING BANDS AND STRIPES

A. All new and altered piping shall receive identification bands. Bands shall be made using unprinted, vinyl pipe identification banding tape as supplied by Seton, Lab Safety Supply or approved equal. Banding colors shall be as indicated in Section 2.03.

2.02 PIPING IDENTIFICATION LETTERING AND ARROWS

A. The Contractor shall apply identification lettering in the form of plain upper-case block lettering giving the name of the pipe contents and arrows indicating the direction of flow of liquids to all types and sections of piping.

B. All lettering and arrows shall be of the ultra-high performance vinyl, plastic snap-on/strap-on type with self gripping fasteners. Pipe-marking devices (i.e., tape or snap-on/strap-on type) shall be suitable for a 5 to 8 year outdoor life without discoloration. Pipe marking devices shall be as manufactured by Seton, Lab Safety Supply, or approved equal.

C. Identification lettering and arrows shall be placed as directed by the Owner or Engineer, but shall generally be located every ten feet and shall be properly inclined to the pipe axis to

facilitate easy reading. Lettering shall also appear directly adjacent to each side of any wall or slab the pipeline passes through, with a minimum of two titles on each pipe in one structure. Identification lettering shall be located midway between color coding bands where possible.

D. Lettering, background and arrow colors shall be as designated in Part 2.03.

E. All lettering and arrows shall have an overall height in inches in accordance with Table 15030-1.

Table 15030-1
Height of Pipe Lettering

Diameter of Pipe or Pipe Covering	Height of Lettering
3/4 to 1 1/4 inches	1/2 inch
1 1/2 to 2 inches	3/4 inches

F. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application.

G. For piping less than ¾ inch diameter, the Contractor shall furnish and attach corrosion resistant color tags with the required lettering.

H. Pipe lettering shall for each service type shall be as indicated in Section 2.03.

2.03 PIPING AND EQUIPMENT IDENTIFICATION SCHEDULE

A. Pipe lettering, pipe base color and band color shall be as indicated in Table 15030-02. The colors referenced in this table are for convenience only. The Contractor shall provide the colors selected by the Owner from the painting manufacturer's color charts during shop drawing review.

Table 15030-2
Piping and Equipment Identification Schedule

Service Type	Lettering or Tag Number	Band Color	Label and Letter Color
Chlorine Liquid	CL2-LIQ	Yellow	Yellow with Black Letters
Chlorine Gas	CL2-GAS	Yellow	Yellow with Black Letters
Chlorine Gas Vacuum	CL2-VAC	Yellow	Yellow with Black Letters
Potable Water	PW	Safety Blue	Blue with White Letters

- END OF SECTION -

SECTION 15100 – VALVES AND APPURTENANCES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install and test, all valves complete with accessories, and special equipment as shown on the Drawings and specified herein.

B. The equipment covered by these specifications is intended to be standard equipment of proven performance as manufacturer by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practice of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Supplementary General Provisions Section 2.2 (b)

B. Section 09900 – Painting

C. Division 15 – Mechanical

D. Division 16 – Electrical

1.03 SUBMITTALS

A. Each submittal shall be complete in all aspects incorporating all information and data listed herein and all additional information required to evaluate the proposed valve's or hydrant's compliance with the Documents. Partial or incomplete submissions shall be returned to the Contractor disapproved without review.

B. Data to be submitted shall include but not be limited to:

1. Certification of compliance with Chlorine Institute Pamphlet 6, *Piping Systems for Dry Chlorine* for valves in dry chlorine service (chlorine liquid and gas under pressure).

2. Catalog Data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various parts and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

3. Complete assembly and installation drawings with clearly marked dimensions. This information shall be in sufficient detail to serve as a guide for assembly and disassembly and for ordering parts.

4. Weight of all component parts and assembled weight.

5. Design calculations.

6. Listing of all lubricants required for the equipment with a minimum of two equivalent and compatible natural and/or synthetic lubricants produced by different manufacturers. The listing shall include the estimated quality of lubricant required for one year of operation.

7. Sample data sheet of equipment nameplate(s) including information contained thereon.

8. Spare parts list

9. Special tools list

C. Valve Labeling: The Contractor shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label.

D. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of the results of all certified shop tests.

E. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of certified letters of compliance.

PART 2 -- PRODUCTS

2.01 GENERAL

A. The valves and accessories shall be in the quantity, quality, types and sizes as indicated on the Drawings and specified herein.

B. All valves shall have a minimum design pressure rating of 150 psi unless otherwise scheduled. For service applications with pressures in excess of 150 psi, valves shall have a minimum pressure rating in excess of the service application working pressure. All above grade, interior valves with a nominal pipe size of 3 inches and larger shall have flanged ends unless otherwise scheduled. All above grade, interior valves less than 3 inch size shall be socket welded ends unless otherwise scheduled. Extended valve stems, stem guides and operating nuts shall be provided as indicated or required.

C. All valves of one type shall be the product of one manufacturer.

D. All valves shall have applied to them the same coatings as the adjacent piping.

E. All valves which are dead ends for active pipelines shall be provided with blind flanges or plugs to prevent leakage.

F. Raised face flanges in conformance with ANSI B16.5 class 150 will not be acceptable unless otherwise specified. All raised faces shall be milled flat.

G. Valve Labeling: A label shall be provided on all shut off valves exclusive of hose bibbs. The label shall be of 1/16 inch stainless steel, minimum 2 inches by 4 inches in size, and

shall be permanently attached to the valve or on the wall adjacent to the valve or as indicated by the Engineer.

H. Provide required spare parts, special tools and one year supply of lubricants for all valves.

2.02 VALVE OPERATORS

A. GENERAL

1. Valves and gates shall be furnished with operators, provided by the valve or gate manufacturer. All operators of a given type shall be furnished by the same manufacturer. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant. Operator orientation shall be verified with the Engineer prior to installation. If this requirement is not met, changes to orientation shall be made at no additional cost.

2. All operators, unless otherwise specified, shall turn counterclockwise to open. Operators shall have the open direction clearly and permanently marked. All valve operators, manual, motorized and pneumatic, shall be provided with the valve by the valve manufacturer. The Contractor, through the valve manufacturer, shall be solely responsible for the selection of the proper operator to meet the operating conditions specified herein. Field calibration and testing of the operators and valves to ensure a proper installation and an operating system shall be the responsibility of the Contractor.

B. MANUAL OPERATORS

1. All manual operators shall have levers unless otherwise shown.

2. Operation of valves and gates shall be designed so that the effort required to operate the handwheel, lever or chain shall not exceed 40 pounds applied at the extremity of the wheel or lever.

2.03 MANUAL BALL VALVES IN DRY CHLORINE SERVICE

A. Manually operated ball valves in dry chlorine service (liquid and gas chlorine) shall be certified for use in dry chlorine service as both Class I and Class IV by The Chlorine Institute, Inc. as specified in the Chlorine Institute Pamphlet 6, *Piping Systems for Dry Chlorine*.

B. Valves shall be rated for vacuum service and to a pressure of 300 psig over a temperature range of -20°F to 300°F.

C. Valve bodies and ends shall be carbon steel A216-WCB.

D. End connections shall be socket-weld.

E. Valve ball shall be Hastelloy C, ASTM B574-N10276 and shall have a hole in the stem slot and upstream vent hole. The stem slot enables expanding chlorine to exhaust from the body cavity into the main flow while the valve is open to prevent seat deformation and extend the service life. The upstream vent hole provides the means for expanding chlorine to relieve harmlessly upstream while the valve is closed.

F. The valve stems shall be Hastelloy C, ASTM B574-N10276. Stem seals shall be externally adjustable and live loaded with the use of Belleville washers.

G. Stem packing, seats and body seals shall be RTFE or TFM1600.

H. The valve bolts shall be A193-B7 / A194-2H.

I. Valves shall be cleaned and prepared in accordance with the Chlorine Institute Pamphlet 6.

J. Valves shall be marked with permanent indicator of flow direction.

K. Manufacturer:

1. Jamesbury, “The Eliminator” Model. No substitutions shall be allowed.

2.04 ELECTRIC MOTOR ACTUATED BALL VALVES IN LIQUID CHLORINE SERVICE

A. Electric motor actuated ball valves for OPEN/CLOSE liquid chlorine service shall be certified for use in dry chlorine service as both Class I and Class IV by The Chlorine Institute, Inc. as specified in the Chlorine Institute Pamphlet 6, *Piping Systems for Dry Chlorine*. B. Valves shall be rated for vacuum service and to a pressure of 300 psig over a temperature range of -20°F to 300°F. Valve body shall be carbon steel ASTM A105 or A216 WCB. Valves shall have socket weld end connections. Stem shall be one piece bottom entry and material shall be Monel ASTM 164 or Hastelloy C ASTM B574-N10276. Seat and seal shall be TFE Polyfill one-piece seat/seal that allows flow in both directions. Ball shall be Monel ASTM 164 or Hastelloy C ASTM B574-N10276 with hole in ball and stem slot. Hole in ball shall face upstream. Valves shall be cleaned and prepared in accordance with the Chlorine Institute Pamphlet 6. Valves shall be Flowserve Worcester Model CL44 equipped with a paired electric motor actuator.

B. Valves shall be equipped with an electric motor actuator. Motorized actuator shall be designed for OPEN/CLOSED service from the plant control system. The valve manufacturer shall be responsible for pairing the motorized actuator with the valve. The motorized actuator shall provide position feedback indication output to the plant control system. Actuator shall have separate OPEN and CLOSED contacts to provide remote indication when the valve is in OPEN or CLOSED positions. Motorized actuator shall operate using a 120 volt, single phase power supply. The motorized actuator shall have a manual override feature with handwheel for manual control. Motorized actuator shall be Flowserve Worcester Series 75 Electric Actuator.

2.05 THERMOPLASTIC BALL VALVES

A. Thermoplastic ball valves shall be made of chlorinated polyvinyl chloride (CPVC). Valves shall have manual operators. CPVC ball valves shall have socket solvent welded true union ends. The balls shall have full size ports and Teflon seats. Body seals, union O-rings, stem seals shall be EPDM. Valves shall be suitable for a maximum working non-shock pressure of 150 psig at 73°F.

B. Thermoplastic valves shall be Hayward Flow Control. No substitutions shall be allowed.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. The procedures regarding unloading, inspection, storage and where applicable installation, described in the Appendix of AWWA C500 entitled "Installation, Operation and Maintenance of Gate Valves" shall be used for all valves.

B. All valves shall be manually opened and closed before installation to check their operation, and the interior of the valves shall be cleaned. Valves shall be placed in the positions shown on the Drawings. Joints shall be made as directed under the piping specifications.

C. Access: All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.

D. Valve Accessories: Where combinations of valves, sensors, switches, and controls are specified or shown on the Drawings, it shall be the responsibility of the Contractor to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals.

3.02 VALVE SUPPORTS

A. Valves shall be supported as integral components of the piping systems.

B. All horizontally mounted valve operators, manual, pneumatic or electric, whose weight exceeds 25 pounds shall be supported independently of the valve and piping system.

C. All vertically mounted valve operators, manual, pneumatic or electric, whose weight exceeds 100 pounds shall be supported independently of the valve and piping system.

D. Valve supports shall anchor the valves against an unbalanced force in either direction. The magnitude of the force shall be based on a pressure equal to twice the maximum working pressure with a maximum allowable stress of 1/2 of the support's yield strength.

3.03 TESTING

A. Shop and field testing of valves shall be as follows:

1. Shop Testing: Certified factory testing shall be provided for all components of the valve and operator system. Valves and operators shall be shop tested in accordance with the requirements in the latest revision of AWWA C500, including performance tests, leakage test, hydrostatic tests, and proof of design tests. Test seat and seal tightness per API 598 prior to shipment. The manufacturer through the Contractor shall submit certified copies of the reports covering the test for acceptance by the Engineer.

2. Field Testing: All valves shall be hydrostatically field tested at the specified pipeline test pressures specified in the piping sections. Any leakage or “sweating” of joints shall be stopped and all joints shall be tight. All valves shall be operated at the pressures specified in the piping schedules for the connected pipe. Valves shall be tested for bi-directional shut-off where required by conditions of service.

B. The Owner may at its discretion visit and inspect the manufacturer's facilities. During the inspection visit, a witness shop test shall be performed for all standard tests listed in applicable standards.

C. The Contractor shall obtain and submit certified statements that the valves and hydrants comply with the requirements of the standards specified herein.

3.04 PAINTING AND COATINGS

A. Valves shall be shop primed for interior and exposed piping service in accordance with Division 9.

3.05 VALVE SCHEDULE

A. This section includes schedule of valves specified in other sections of Division 15 – Mechanical. Also refer to the Valve Schedule on the drawings.

B. The following abbreviations are used in the schedule:

Pipe System	
AIR	Compressed Air
CLL	Chlorine Liquid
CLG	Chlorine Gas
CLV	Chlorine Gas Vacuum
PW	Potable Water

Pipe Material	
CS	Carbon steel
CPVC	Chlorinated Polyvinyl Chloride
PVC	Polyvinyl Chloride

Valve Type	
BV	Ball Valve
DV	Diaphragm Valve
PRV	Pressure Relief Valve

Valve Body	
CS	Carbon Steel
CPVC	Chlorinated Polyvinyl Chloride
PVC	Polyvinyl Chloride
NRS	Non-rising stem
RS	Rising stem

Valve End Connections	
BW	Butt Welded
FW	Fusion Welded
FLG	Flanged
SW	Socket Welded
THD	Threaded

Manual Valve Schedule

System	Service/Piping	Valve Type	Body Type	Ends	Size (inches)	Cold Pressure Rating (psi)	Spec No.	Notes
CLL	Above Grade	Ball	CS	SW	3/4 - 1-1/2	300	15100	
CLG	Above Grade	Ball	CS	SW	3/4 - 1-1/2	300	15100	
CLV	Above Grade	Ball	CPVC	Solvent Welded Double Union	1/2 - 2	150	15100	
PW	Above Grade	Ball	PVC	Solvent Welded Double Union	1/2 - 2	150	15100	

-END OF SECTION-

SECTION 15995 - PIPELINE TESTING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall perform flushing and testing of all pipelines and appurtenant piping, complete, including conveyance of test water from Owner designated source to point of use and all disposal thereof, all in accordance with the requirements of the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

1. ANSI/AWWA B300 Hypochlorites

2. ANSI/AWWA B301 Liquid Chlorine

3. ANSI/AWWA C651 Disinfecting Water Mains

1.03 SUBMITTALS

A. Proposed plans shall be submitted in writing for approval a minimum of 48 hours before commencing any testing.

PART 2 -- PRODUCTS

2.01 MATERIALS REQUIREMENTS

A. All test equipment, temporary valves or bulkheads, or other water control equipment and materials shall be determined and furnished by the Contractor subject to the Engineer's review. No materials shall be used which would be injurious to the construction or its future function.

PART 3 -- EXECUTION

3.01 GENERAL

A. Unless otherwise provided herein, water for testing pipelines will be from a Owner furnished source; however, the Contractor shall make all necessary provisions for conveying the water from the Owner designated source to the points of use.

B. All pressure and gravity pipelines shall be tested. All testing operations shall be performed in the presence of the Engineer.

3.02 HYDROSTATIC TESTING OF PIPELINES

A. All equipment, including, but not limited to, pumps, gauges, and special fittings required to perform the testing shall be provided by the Contractor. The Contractor shall perform all

excavation and other work required to locate and repair leaks and correct other defects which may be disclosed or develop under tests. The Contractor shall replace all coating, painting, backfill, or other permanent work removed in locating or repairing leaks and correcting defective piping. All gauges and control devices connected to lines being tested must be disconnected for the duration of the test. Water shall not be used in testing air lines, chlorine gas lines, or other gas carrying pipes. High pressure air testing of PVC or FRP pipe in exposed or above ground installations is not permitted. All tests shall be witnessed by the Engineer.

B. Prior to hydrostatic testing, all pipelines shall be flushed or blown out as appropriate. The Contractor shall test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar have attained an age of fourteen days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Care shall be taken to see that all air vents are open during filling.

C. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least twenty-four hours. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the Engineer shall be taken.

D. Hydrostatic test pipelines at 1.5 the maximum working pressures designated on the pipe schedule in Section 15000 Piping General unless otherwise indicated.

3.03 CLEANING AND TESTING CHLORINE PIPING

A. All equipment, including, but not limited to, pumps, gauges, and special fittings required to perform the testing shall be provided by the Contractor. The Contractor shall perform all excavation and other work required to locate and repair leaks and correct other defects which may be disclosed or develop under tests. The Contractor shall replace all coating, painting, backfill, or other permanent work removed in locating or repairing leaks and correcting defective piping. All gauges and control devices connected to lines being tested must be disconnected for the duration of the test. Water shall not be used in testing air lines, chlorine gas lines, or other gas carrying pipes. High pressure air testing of CPVC or FRP pipe in exposed or above ground installations is not permitted. All tests shall be witnessed by the Engineer.

B. Chlorine piping shall be dried using dry air or nitrogen gas prior to leak testing. The Contractor shall be responsible for drying the complete new chlorination system to a -40 degree F dew point. The Contractor shall supply compressors, air dryers, and dew point equipment necessary to dry and test for dryness the new chlorination system piping. The new chlorination system shall be dried to -40 degree F dew point before introducing chlorine into the system and shall be redried to a -40 degree F dew point in the event subsequent work by the Contractor opens any part of the system to the atmosphere.

C. Seamless carbon steel chlorine piping shall be pressure tested using dry air or nitrogen. Slowly pressurize the seamless carbon steel piping system to 25 psig and stop. Check that the pressure gauges are maintaining 25 psig after 10 minutes. If gauges are not holding, search for leaks at joints and fittings using soapy water and make repairs before retesting the pipe system. If gauges hold 25 psig pressure for 10 minutes, continue slowly increasing the gas pressure in the piping system in increments of 25 psig and waiting 10 minutes to make sure gauges are holding pressure before continuing with next increment. Continue increasing the gas pressure in increments of 25 psig and checking the gauges after 10 minutes until the system reaches 150 psig. At 150 psig, mark pressure gauges and wait 24 hours before rechecking gauges. After 24 hours, If there has been any pressure loss, check for leaks at joints using soapy water. Repair leaks and retest from the beginning. The pressure test shall be considered acceptable when the piping system holds the dry air or nitrogen gas pressure at 150 psig for 24 hours without loss of pressure. Seamless carbon steel chlorine piping shall be pressure tested using dry air or nitrogen. Slowly pressurize the seamless carbon steel piping system to 25 psig and stop. Check that the pressure gauges are maintaining 25 psig after 10 minutes. If gauges are not holding, search for leaks at joints and fittings using soapy water and make repairs before retesting the pipe system. If gauges hold 25 psig pressure for 10 minutes, continue slowly increasing the gas pressure in the piping system in increments of 25 psig and waiting 10 minutes to make sure gauges are holding pressure before continuing with next increment. Continue increasing the gas pressure in increments of 25 psig and checking the gauges after 10 minutes until the system reaches 150 psig. At 150 psig, mark pressure gauges and wait 24 hours before rechecking gauges. After 24 hours, If there has been any pressure loss, check for leaks at joints using soapy water. Repair leaks and retest from the beginning. The pressure test shall be considered acceptable when the piping system holds the dry air or nitrogen gas pressure at 150 psig for 24 hours without loss of pressure.

D. Prior to start-up of chlorine vacuum piping, perform a vacuum test on the system as follows:

1. With chlorine supply valves CLOSED, turn on the supply water for a remote chlorine ejector.

2. The associated chlorinator rotameter ball should drop to the bottom of the rotameter and should cease to bounce within approximately one minute. If the ball continues to bounce, there is a leak in the vacuum system that needs to be repaired. Turn off the supply water to the remote chlorine ejector and repair leaks. Retest until the ball settles to the bottom of the rotameter and remains there without bouncing after one minute.

3. Repeat the test for each of the seven remote ejectors/chlorinators.

E. During start-up, after chlorine has been introduced into the piping but before the system is put into continuous use, check each pipe connection (joints, unions, threaded connections, flanges, etc.) using ammonia vapor. Repair any leaks and retest prior to placing the system into continuous use. The Contractor shall perform all testing and shall bear all expenses of testing.

-END OF SECTION-

SECTION 16050 – BASIC ELECTRICAL

PART 1 -- GENERAL

1.01 REQUIREMENT

A. Electrical work as noted on the Drawings shall be installed by a State of Florida licensed electrician. All electrical work shall comply with Florida Building Code and the National Electric Code. Electrical subcontractor shall:

1. Provide and install conduit and cable as needed to supply power to the equipment and lighting as noted on the Drawings.

2. Remove and reroute power and control conduit to replaced and relocated devices as noted on the Drawings. Provide new conduit to extend existing conduit runs to replaced and relocated devices.

3. Pull back existing power and control cables within conduits to be re-routed as noted on the Drawings. Re-pull and re-use existing power and control cables within re-routed conduit to connect to replaced and relocated devices as noted on the Drawings. Power and control cabling connections are identical to existing connections.

4. Provide new terminal junction boxes in re-routed conduit as necessary to extend existing wiring to replaced or relocated devices.

5. Furnish and install temporary construction power as needed to meet the needs of the General Contractor, other subcontractors, and their own work.

1.02 QUALITY ASSURANCE

A. UL Compliance: Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

B. Corrosive Areas: Materials and devices shall be specifically approved for corrosive areas and of a construction that will ensure safe performance when properly used and maintained.

1.03 SUBMITTALS

A. Quality Control Submittals to include, but not necessarily limited to, the following:

1. Results of all cable and wire tests as specified herein.

B. Submit Shop Drawings, including catalog for:

1. Conduit, cable, and all other proposed electrical components as specified herein.

1.04 INSPECTION OF THE SITE AND EXISTING CONDITIONS

A. The Drawings were developed from past record drawings and other information available during design.

B. The Drawings show the general location of feeders, panels, outlets, conduits, and circuit arrangements. Because of the small scale of the Drawings, it is not possible to indicate all of the details involved. The Contractor shall refer to the entire Drawing set to verify openings, special surfaces, and location of other equipment, or other special equipment prior to roughing-in for panels, switches, and other outlets. The Contractor shall verify all equipment dimensions to insure that proposed equipment will fit properly in spaces indicated.

C. The Contractor shall examine the site and become familiar with conditions affecting the work. The Contractor shall relocate all receptacles, switches, boxes, and other electrical equipment as necessary to facilitate the Work included in this project. Costs for such work shall be included in the Bid.

1.05 SEQUENCING AND SCHEDULING

A. Perform inspection and electrical tests after equipment has been installed.

B. Perform tests with apparatus de-energized whenever feasible.

C. Notify Engineer at least 24 hours prior to performing tests on energized electrical equipment.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 SUPPORT AND FRAMING CHANNELS

A. Material: ASTM A167, Type 316 stainless steel or aluminum Alloy 6061-T6

B. Finish: smooth polished finish for stainless, clear anodized for aluminum

C. Inserts: Continuous.

D. Beam Clamps: stainless steel

E. Manufacturers: B-Line, Unistrut or approved equal.

2.03 WIRING AND CABLE

A. Conductors, include grounding conductors, shall be copper wire. Aluminum conductor wire and cable will not be permitted. Insulation shall bear UL label, the manufacturer's trademark, and identify the type, voltage, and conductor size. All conductors shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity.

B. Power and Control Wire:

1. Wire shall be rated for 600 volts and shall be Class B Type THHN/THWN. All conductors/cable shall conform to UL-44 - UL Standard for Thermoset-Insulated Wires and Cables. All conductors/cables shall be rated for 75 deg C suitable for wet locations.

2. Wiring shall be as manufactured by General Cable, Okonite, or Rome Cable or approved equal.

3. Minimum size power wire shall be No. 12 AWG. Minimum control wire size shall be No. 14 AWG.

C. Instrumentation cable

1. Instrumentation cable for analog signals shall be single, shielded, twisted, pairs or triads, meeting NEMA WC 55 requirements.

2. Conductors shall be tin or alloy coated (if available), bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8. Minimum size wire shall be No. 16 AWG.

3. Insulation shall be 600 volt, 15-mil nominal PVC, and shall have and a 90°C insulation rating.

4. Manufacturers:
   a. Okonite Co.
   b. Alpha Wire Corp.
   c. Approved equal

D. Cable Terminations:

1. Compression connectors shall be Burndy "Hi Lug", Thomas & Betts "Sta-Kon,", or approved equal.

2. General purpose insulating tape shall be Scotch No. 33, Plymouth "Slip-knot", or approved equal. High temperature tape shall be polyvinyl as manufactured by Plymouth, 3M, or approved equal.

3. Labels for coding 600 volt wiring shall be computer printable or pre-printed, self-laminating, self-sticking, as manufactured by W.H. Brady, 3M, or approved equal.

4. Stress cone material for make-up of medium voltage shielded cable shall be as manufactured by Raychem, 3M, or approved equal.

E. Grounding Conductors:

1. Direct buried: bare stranded tinned copper.

2. Equipment: Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.

F. Pulling Compound: Nontoxic, non-corrosive, noncombustible, nonflammable, wax-based lubricant; UL listed. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable. Suitable for PVC-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways. Manufacturers and Products: Ideal Co. Yellow 77, Polywater, Inc., Cable Grip Co.

G. Wire Markers: All cables extended or relocated shall have wire markers at the re-connection end to match existing identification system. Markers shall be permanent, white plastic heat-shrink sleeves, with legible machine-printed black markings.

2.04 CONDUIT

A. Rigid Non-Metallic Conduit

1. Rigid non-metallic conduit shall be Schedule 80 PVC, sunlight resistant.

2. Rigid non-metallic conduit shall be manufactured in accordance with NEMA TC-2 - Electrical Plastic Tubing and Conduit, and UL-651 - Standard for Rigid Non-metallic Conduit.

3. UL listed for concrete encasement, underground direct burial, concealed or direct sunlight exposure, and 90 degrees C insulated conductors

4. Fittings to meet requirements of NEMA TC-3, PVC, slip-on.

5. Manufacturers:
   a. Carlon
   b. Condux
   c. Approved equal

B. Liquid-tight Flexible Non-Metallic Conduit

1. Liquidtight flexible nonmetallic conduit shall have a smooth inner surface with integral reinforcement within the conduit wall, circular cross section, and be designated as a Type LFNC-B (for FNMC-B). Conduit shall be listed to UL standard UL1660.

2. Liquidtight flexible nonmetallic conduit shall be flame resistant and when used with listed fittings, approved for the installation of electrical conductors.

3. Install flexible conduit in accordance with Article 351, Part B of the National Electrical Code (NEC) and other applicable sections of the NEC and/or local electrical codes.

4. Flexible cconduit shall be resistant to oil, water, heat, sunlight, corrosion, most acids, ozone, alkali, strains, abrasions, and crushing. Flexible conduit shall be rated for continuous use at 140 degrees F. 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.

C. Aluminum Metal Conduit:

1. Aluminum conduits shall be rigid type, heavy wall, hot-dipped galvanized inside and outside and as manufactured by Allied Tube and Conduit Corporation, Wheatland Tube Company, Jones & Laughlin Steel Company, or approved equal.

D. Conduit fittings

1. Aluminum fittings shall be used with aluminum conduits, All conduit nipples, elbows, couplings, boxes, fittings, unisons, expansion joints connectors, bushings and other components of the raceway system shall be aluminum to match the material of the conduit system. The aluminum conduit and its respective components shall be provided by the same manufacturer.

E. Non-Metallic Conduit Junction Boxes: Terminal junction boxes required to extend existing conduit shall match the material used for and be suitable for use with the non-metallic conduit supplied. Provide gasketed covers with stainless steel hardware fasteners.

PART 3 -- EXECUTION

3.01 GENERAL

A. Install equipment in accordance with NECA 5055.

3.02 SUPPORT AND FRAMING CHANNEL

A. Furnish epoxy coating for aluminum surfaces in contact with concrete.

B. Install supports where required for mounting and supporting electrical equipment and raceway systems and as shown on the Drawings.

3.03 INSTALLATION OF WIRING AND CABLE

A. Install cable per manufacturer’s recommendations.

B. Conductors shall not be pulled into raceway until raceway has been cleared of moisture and debris.

C. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL approved.

D. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals. Tighten screws and terminal bolts in accordance with UL 486A for copper conductors. Ream, remove burrs, and clear interior of installed conduit before pulling wires or cables.

E. Installation of new power wire in existing conduit shall be installed after pulling existing cable out of the existing raceway with attached pull chord installed to pull in new cable. If existing raceway appears to be damaged in any way, bring to the attention of the Engineer before proceeding with pulling of new cable.

F. Terminations: Conductors shall be terminated directly on device compression lugs making sure that all conductor strands are confined within lug. Provide new forked-tongue connectors for all new and existing wiring requiring termination.

3.04 INSTALLATION OF CONDUIT

A. All wiring shall be run in raceway unless indicated otherwise.

B. Raceways shall be installed between equipment as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for this purpose. Factory elbows shall be utilized wherever possible. Crushed or deformed raceways are not permitted. Maintain raceway entirely free of obstructions and moisture. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.

C. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.

D. Where raceway routings are indicated on plan views, follow those routings to the extent possible. Group raceways together installed in same area.

E. Where raceways are indicated but routing is not shown, such as home runs or on conduit developments and schedules, raceway routings shall be the Contractor's choice and in strict accordance with the NEC and customary installation practice. Raceway shall be exposed.

F. Routings shall be adjusted to avoid obstructions. Coordinate between trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be by the Contractor as part of the WORK. Maintain a minimum of 12 inches separation between raceways and heated piping.

G. Exposed raceways shall be installed parallel or perpendicular to structural beams. Follow contours of when running exposed raceways, avoid obstruction of passageways.

H. Install expansion fittings with bonding jumpers wherever raceways cross building expansion joints.

I. Exposed raceways shall be installed at least 1/2-inch from walls or ceilings except that at locations above finished grade where damp conditions do not prevail, exposed

raceways shall be installed 1/4-inch minimum from the face of walls or ceilings by the use of clamp backs or struts.

J. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.

K. For motors and electrically operated valves, flexible conduit connection is required to minimize vibration.

L. Make bends and offsets of longest practical radius. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.

M. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

3.05 PVC CONDUIT

A. Solvent Welding:

1. Provide manufacturer recommended solvent; apply to all joints.
2. Install such that joint is watertight.

B. Adapters:

1. PVC to Metallic Fittings: PVC terminal type.
2. PVC to Rigid Metal Conduit or IMC: PVC female adapter.

C. Belled-End Conduit: Bevel the un-belled end of the joint prior to joining.

3.06 CONDUIT USES

A. Schedule 80 PVC conduit shall be installed where conduit is exposed in chlorine evaporator, chlorinator and rail car rooms. No PVC conduit shall be installed exposed in any other area unless specifically accepted in writing by the Engineer.

B. Aluminum conduit shall be furnished and installed in all other areas. Aluminum conduit shall be supported in 6 foot intervals to prevent sagging of the conduit.

3.07 PROTECTION OF INSTALLED WORK

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

B. Provide and maintain manufactured watertight and dust-tight seals over all conduit openings during construction.

C. Touch up painted surfaces to cover nicks or scars resulting from installation activities.

-END OF SECTION

SECTION 16123 - BUILDING WIRE AND CABLE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, connect, test, and place in satisfactory operating condition, ready for service, all cables and wires indicated on the Drawings and as specified herein or required for proper operation of the installation, with the exception of internal wiring provided by electrical equipment manufacturers. The work of connecting cables to equipment, machinery, and devices shall be considered a part of this Section. All hardware, junction boxes, bolts, clamps, insulators, and fittings required for the installation of cable and wire systems shall be furnished and installed by the Contractor.

B. The wire and cable to be furnished and installed for this project shall be the product of manufacturers who have been in the business of manufacturing wire and cable for a minimum of ten (10) years.

C. Reference Section 16050, Basic Electrical Requirements.

1.02 TESTING

A. All testing shall be performed in accordance with the requirements of the General Provisions and Supplementary General Provisions. The following tests are required:

1. Witness Shop Tests

   a. Not required.

2. Shop Test

   a. Cable and wiring shall be tested in accordance with the applicable ICEA Standards. Wire and cable shall be physically and electrically tested in accordance with the manufacturer's standards.

3. Field Tests

   a. Field testing shall be done in accordance with the requirements specified in the General Provisions and NETA acceptance testing specifications referenced in Section 16050, Basic Electrical Requirements.

   b. After installation, all wires and cables shall be tested for continuity. Testing for continuity shall be "test light" or "buzzer" style.

   c. After installation, all wires and cables shall be tested for insulation levels. Insulation resistance between conductors of the same circuit and between conductor and ground shall be tested. Testing for insulation levels shall be as follows:

      (1) For 600V power and control cable, apply 1,000 VDC from a Megaohmeter for one (1) minute for <u>all</u> 600V wires and cables

installed in lighting, control, power, indication, alarm and motor feeder circuits. Resistance shall be no less than 100 Megaohms.

(2) 600V instrumentation signal cable shall be tested from conductor to conductor, conductor to shield, and conductor to ground using a Simpson No. 260 volt-ohmmeter, or approved equal. The resistance value shall be 200 Megaohms or greater.

B. Low voltage wires and cables shall be tested before being connected to motors, devices or terminal blocks.

C. Voltage tests shall be made successively between each conductor of a circuit and all other conductors of the circuit grounded.

D. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.

E. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment. Test reports shall be submitted to the Engineer.

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the Supplementary General Provisions Section 2.2 (b), the Contractor shall obtain from the wire and cable manufacturer and submit the following:

1. Shop Drawings

2. Reports of Field Tests

3. Wiring Identification Methods

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed material's compliance with the Contract Documents.

B. Partial, incomplete, or illegible Submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Cable pulling calculations (if required).

3. Wiring identification methods and materials.

1.05 IDENTIFICATION

A. Each cable shall be identified as specified in Part 3, Execution, of this Specification.

1.06 CABLE PULLING CALCULATIONS

A. The Contractor shall submit cable pulling calculations. These calculations, to be performed by a currently registered professional engineer in the State of Florida, shall define pulling tension and sidewall loading (sidewall bearing pressure values) for all installations of 600VAC, #1/0 conductors and larger greater than 200 feet in length. Calculations for straight horizontal installations of 600VAC, #1/0 conductors and larger greater than 200 feet are not required.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The wire and cable covered by this Specification is intended to be standard equipment of proven performance. Wire and cable shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and indicated on the Drawings. Only one (1) manufacturer for each wire and cable type shall be permitted.

B. The wire and cable manufacturer shall be ISO 9000 registered.

2.02 600 VOLT POWER WIRE AND CABLE

A. 600 volt cable and wire shall consist of stranded, copper conductor with insulation rated THHN, 90°C for dry locations and THWN, 75°C for wet locations.

B. Conductors shall be stranded copper per ASTM-B8 and B-33, and Class B or C stranding contingent on the size unless otherwise specified. Minimum size wire shall be No. 12 AWG.

C. 600 volt individual power wire and cable shall be Okoseal-N as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent with SIMPull jacket, or equal. Multi-conductor power cables shall be Okoseal-N Type TC Cable as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent, or approved equal.

2.03 600 VOLT CONTROL CABLE

A. 600 volt control cable shall consist of stranded, copper conductor with insulation rated THHN, 90°C for dry locations and THWN, 75°C for wet locations. The individual conductors of the multiple conductor cable shall be color coded for proper identification. Color coding shall be equal to ICEA S-68-514, Method 1, E2. Cables shall meet requirements of IEEE-383.

B. Conductors shall be stranded copper per ASTM B-8 and B-33, and Class B or C stranding contingent on the size unless otherwise specified. Minimum wire size shall be No. 14 AWG.

C. 600 volt individual conductor control wire shall be Okoseal-N as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent with SIMPull jacket, or equal. Multi-conductor control cable shall be Okoseal-N Type TC Cable as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent, or approved equal.

2.04 LIGHTING AND RECEPTACLE WIRE AND CABLE

A. The lighting and receptacle branch circuit wire shall consist of solid, copper conductors with insulation rated THHN, 90°C for dry locations and THWN, 75°C for wet locations.

B. Conductors shall be solid copper per ASTM- B-33. Minimum size wire shall be No. 12 AWG.

C. Lighting and receptacle cables and wire shall be Okoseal-N as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent with SIMPull jacket, or approved equal.

2.05 INSTRUMENTATION CABLE

A. The instrumentation cable for analog signals shall be single, shielded, twisted pairs or triads with 600 volt insulation and shall have a 90°C insulation rating.

B. Conductors shall be tin or alloy coated (if available), soft, annealed copper, stranded per ASTM-B8, Class B stranding unless otherwise specified. Minimum size wire shall be No. 16 AWG.

C. The instrumentation cable shall be Okoseal-N Type P-OS for single pair or triad applications and Okoseal-N Type SP-OS for multiple pair or triad applications as manufactured by the Okonite Company, Cerro Wire and Cable equivalent, Southwire Company equivalent, or approved equal.

2.06 CABLE PULLING LUBRICANTS

A. Cable pulling lubricants shall be non-hardening type and approved for use on the type of cable installed. Lubricant shall be Yellow #77 by Ideal, Cable Gel by Greenlee, Poly-Gel by Gardner Bender, or approved equal.

PART 3 -- EXECUTION

3.01 600V CABLE INSTALLATION

A. The cable and wires shall be installed as specified herein and indicated on the Drawings.

B. The cables shall be terminated in accordance with the cable and/or termination product manufacturer's instructions for the particular type of cable.

C. To minimize oxidation and corrosion, wire and cable shall be terminated using an oxide-inhibiting joint compound recommended for "copper-to-copper" connections. The compound shall be Penetrox E as manufactured by Burndy Electrical, or approved equal.

D. Splices shall not be allowed in the underground manhole and handhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing. Splicing materials shall be barrel type butt splice connectors and heat shrink tubing as manufactured by 3M, Ideal, or equal. No splicing of instrumentation cable is allowed. The use of screw-on wire connectors (wire nuts) shall only be permitted for lighting and receptacle circuits.

E. Wire and Cable Sizes

1. The sizes of wire and cable shall be as indicated on the Drawings, or if not shown, as approved by the Engineer. If required due to field routing, the size of conductors and respective conduit shall be increased so that the voltage drop measured at the load does not exceed 2-1/2%.

2. Minimum wire size within control panels, motor control centers, switchboards and similar equipment shall be No. 12 AWG for power and No. 14 AWG for control.

F. Number of Wires

1. The number of wires indicated on the Drawings for the various control, indication, and metering circuits were determined for general schemes of control and for particular indication and metering systems.

2. The actual number of wires installed for each circuit shall, in no case, be less than the number required; however, the Contractor shall add as many wires as may be required for control and indication of the actual equipment selected for installation at no additional cost to the Owner. The addition of conductors shall be coordinated with and approved by the Engineer to avoid violations of the NEC regarding conduit fill.

3. All spare conductors shall be terminated on the terminal blocks mounted within the equipment.

G. Wiring Identification

1. In addition to color coding, all wiring shall be identified at each point of termination. This includes but is not limited to identification at the source, load, and in any intermediate junction boxes where a termination is made. The Contractor shall meet with the Owner and Engineer to come to an agreement regarding a wire identification system prior to installation of any wiring. Wire numbers shall not be duplicated.

2. Wire identification shall be by means of a heat shrinkable sleeve. Sleeves shall have a white background with black text. Wire sizes #14 AWG through #10 AWG shall have a minimum text size of 7 points. Wire sizes #8 AWG and larger shall have a minimum text size of 10 points. Sleeves shall be of appropriate length to fit the required text. The use of handwritten text for wire identification shall not be permitted.

3. Sleeves shall be suitable for the size of wire on which they are installed. When installation is complete, sleeves shall be tightly affixed to the wire and shall not move. Sleeves shall be heat shrunk onto wiring with a heat gun approved for the application. Sleeves shall not be heated by any means which employs the use of an open flame. The Contractor shall take special care to ensure that the wiring insulation is not damaged during the heating process.

4. Sleeves shall be installed prior to the completion of the wiring terminations and shall be oriented so that they can be easily read.

5. Sleeves shall be white polyolefin as manufactured by Brady, Seton equivalent, Panduit equivalent, or approved equal.

6. Where sleeves are not available in the size required for the wire, the Contractor shall use an adhesive label with a white background and black text. Text size shall be in accordance with the requirements listed above.

7. Adhesive labels, for the case when sleeves are not suitable for the wire size, shall be white permanent vinyl as manufactured by Brady, Seton equivalent, Panduit equivalent, or approved equal.

8. Wire identification in manholes, handholes, pull boxes, and other accessible components in the raceway system where the wiring is continuous shall be accomplished by means of a tag installed around the bundled group of conductors. Identification shall utilize a FROM-TO system. Each group of conductors shall consist of all of the individual conductors in a single conduit or duct. The tag shall have text that identifies the bundle in accordance with the 'FROM' and 'TO' column for that particular conduit number in the conduit and wire schedule. Minimum text size shall be 10 point. The tag shall be affixed to the wire bundle by the use of nylon wire ties, and shall be made of polyethylene as manufactured by Brady, Seton equivalent, Panduit equivalent, or equal.

H. Cable Installation

1. All interior cable not protected by a compartment enclosure shall be installed in conduit.

I. Wiring Supplies

1. Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used.

2. Rubber insulating tape shall be in accordance with ASTM Des. D119. Friction tape shall be in accordance with ASTM Des. D69.

J. Training of Cable

1. The Contractor shall furnish all labor and material required to train cables around cable vaults within buildings and in manholes and handholes in the outdoor underground duct system. Sufficient length of cable shall be provided in each handhole, manhole, and vault so that the cable can be trained and racked in an approved manner. Instrumentation cable shall be racked separate from all other AC and DC wiring to maintain the required separation specified herein. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. The training shall be done in such a manner as to minimize chaffing.

K. Connections at Control Panels, Limit Switches, and Similar Devices

1. Where stranded wires are terminated at panels, and/or devices, connections shall be made by solderless lug, crimp type ferrule, or solder dipped.

2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size complete with terminal strips and shall install No. 14 AWG stranded wires from the device to the junction

box in a conduit. The #12 AWG field wiring shall also be terminated in the same junction box to complete the circuit.

L. Pulling Temperature

1. Cable shall not be flexed or pulled when the temperature of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature of 40°F or less within a three (3) day period prior to pulling the cable reels shall be stored three (3) days prior to pulling in a protected storage area with an ambient temperature of 55°F or more. Cable pulling shall be completed during the work day for which the cable is removed from the protected storage. Any remaining cable reels shall be returned to storage at the completion of the workday.

M. Color Coding

1. Conductor insulation shall be color coded as follows:

a. 480/277V AC Power

Phase A - BROWN
Phase B - ORANGE
Phase C - YELLOW
Neutral - GREY

b. 120/208V or 120/240V AC Power

Phase A - BLACK
Phase B - RED
Phase C - BLUE
Neutral - WHITE

c. DC Power

Positive Lead - RED
Negative Lead - BLACK

d. DC Control

All wiring - BLUE

e. 120VAC Control

Single conductor 120 VAC control wire shall be RED except for a wire entering a motor control center compartment or control panel which is an interlock. This conductor shall be color coded YELLOW.

f. 24VAC Control

All wiring - ORANGE

g. Equipment Grounding Conductor

All wiring - GREEN

2. Conductors No. 2 AWG and smaller shall be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables shall be coded by the use of colored tape in accordance with the requirements listed above.

3. Low voltage feeder and branch circuit conductors shall be identified in accordance with the NEC. The method utilized for conductor identification for each nominal voltage system shall be permanently posted at each feeder or branch circuit distribution equipment assembly. Reference Articles 200, 210, and 215 of the NEC.

3.02 INSTRUMENTATION CABLE INSTALLATION

A. The Contractor shall install all cable or conductors used for instrumentation wiring (4-20 mA DC, etc.) in aluminum conduit. The use of asbestos cement or PVC conduit shall not be permitted. Analog signal wires shall exclusively occupy these conduits. No other wiring for AC or discrete DC circuits shall be installed in these conduits.

B. All shielding shall be continuous and shall be grounded at one point only, or in accordance with the instrumentation equipment manufacturer's recommendations.

C. Where instrumentation cables are installed in panels, manholes, handholes, and other locations, the Contractor shall arrange wiring to provide maximum clearance between these cables and other conductors. Instrumentation cables shall not be installed in same bundle with conductors of other circuits.

D. Additional pullboxes shall be furnished and installed for ease of cable pulling and the cable manufacturer's recommended conduit fill factor shall be followed. Where required or specifically directed by the Engineer, the Contractor shall moisture seal the cables at all connections with OZ Gedney Type "CSB", or approved equal, sealing bushings.

E. Special instrument cable shall be as specified or recommended by the manufacturer of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc., shall be per manufacturer's recommendations.

F. All cable insulation and jackets shall have adequate strength for it to be pulled through the conduit systems. All conductors shall be color coded and all wires shall be suitably tagged with permanent markers as specified herein.

3.03 FIBER OPTIC CABLE INSTALLATION

A. The Contractor shall install the fiber optic cable furnished by the General Contractor and/or the Instrumentation and Control Subcontractor. The cable shall be installed in its respective raceway system(s) as specified herein, indicated on the Drawings, and in accordance with the cable manufacturer's instructions.

- END OF SECTION –

SECTION 16141 - WIRING DEVICES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all switches and receptacles for lighting and miscellaneous power applications of the type and at the locations as specified herein and as shown on the Drawings.

B. Reference Section 16050, Basic Electrical Requirements.

1.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Provisions. The following tests are required:

1. Witnessed Shop Tests

   a. None required.

2. Field Tests

   a. None required.

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the Supplementary General Provisions Section 2.2 (b), the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable specification Section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include, but not be limited to:

1. Product data sheets.

1.05 SUPPLIES AND SPARE PARTS

A. The Contractor shall furnish 10% (minimum of 1) spare of each receptacle, switch, and plug furnished and installed for this project.

B. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size shall have the same parts number.

1.06 IDENTIFICATION

A. Each switch and receptacle shall be identified with the equipment item number, manufacturer's name or trademark, and such other information as the manufacturer may consider necessary, or as specified, for complete identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by these Specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. The Contractor shall use the products of a single manufacturer for each type of wiring device.

C. The Contractor shall use the products of a single manufacturer for all device plates. Plate variations are allowed for the following devices:

1. Where the selected plate manufacturer does not manufacture a suitable finish plate.

2. For heavy-duty receptacles rated at more than 30A.

3. Where non-standard plates are required, specified, or shown.

D. The Contractor shall furnish and install all wiring devices and device plates. Wiring devices as listed herein are intended to indicate type, function, and quality of the products.

E. The receptacles, switches, device plates, and other appurtenances shall comply with the requirements of these Specifications. Receptacles installed in toilet, locker, and bathrooms shall be of ground fault interrupter type to meet the minimum NEC requirements. Ground fault circuit interrupter receptacles shall also be furnished and installed as specified herein, indicated on the Drawings, and required by the NEC.

F. Wiring devices shall be approved for use with stranded conductors, if stranded conductors are to be used with the device. Reference Section 16123, Building Wire and Cable.

G. The Contractor shall provide specification grade devices which shall be as manufactured by Appleton, Crouse-Hinds, Leviton, Harvey Hubbell Co., Bryant Electric Company, Pass & Seymour, or approved equal

2.02 WIRING DEVICES

A. Wiring devices shall be in accordance with the following for nonhazardous areas:

1. Wall Switches, Single Pole, 20 A, 120-277V equivalent to Hubbell No. 1221, Pass & Seymour No. 20AC1, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3031, Hubbell equivalent, Pass & Seymour equivalent, or approved equal.

2. Wall Switches, Double Pole, 20 A, 120-277V equivalent to Hubbell No. 1222, Pass & Seymour No. 20AC2, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3032, Hubbell equivalent, Pass & Seymour equivalent, or approved equal.

3. Wall Switches, Three-Way, 20 A, 120-277V equivalent to Hubbell No. 1223, Pass & Seymour No. 20AC3, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3033, Hubbell equivalent, Pass & Seymour equivalent, or approved equal.

4. Wall Switches, Four-Way, 20 A, 120-277V equivalent to Hubbell No. 1224, Pass & Seymour No. 20AC4, Leviton equivalent, or approved equal.

5. Convenience Receptacles 20 A, 125V, duplex polarized with grounding connection equivalent to Hubbell No. 5362, Pass & Seymour equivalent, Leviton equivalent, or approved equal.

6. Hubbell Cat. No. GF-5362, Pass & Seymour equivalent, Leviton equivalent, or equal, for 20A, 120V, duplex, ground fault circuit interrupting type.

B. Special Purpose Receptacles shall be rated to carry, at least where required the full load amperes and voltage of the unit connected thereto. These receptacles shall be provided with grounding poles and shall be equivalent to the following:

1. Hubbell Cat. No. HBL-5661, Pass & Seymour No. 5871, Leviton equivalent, or approved equal, for 20A, 250VAC, 1-phase service.

2. Hubbell Cat. No. HBL-9330, Pass & Seymour No.3801, Leviton equivalent, or approved equal, for 30A, 250VAC, 1-phase service.

3. Hubbell Cat. No. 9430, Pass & Seymour No. 5740, Leviton equivalent, or approved equal, for 30A, 208/120V, 3-phase service.

4. Hubbell Cat. No. 9450, Pass & Seymour No. 5750, Leviton equivalent, or approved equal, for 50A, 208/120V, 3-phase service.

5. Hubbell Cat. No. 9460, Pass & Seymour No. 5760, Leviton equivalent, or approved equal, for 60A, 208/120V, 3-phase service.

6. Hubbell Cat. No. 9330, Pass & Seymour No. 5930, Leviton equivalent, or approved equal, for 30A, 208V, single-phase service.

7. Hubbell Cat. No. 9315, Pass & Seymour equivalent, Leviton equivalent, or approved equal, for 30A, 277V, single-phase service.

8. Hubbell Cat. No. 23CM10, Pass & Seymour equivalent, Leviton equivalent, or equal, for 20A, single, 125V, polarized with grounding connection, twist lock type. Matching plug shall be Hubbell Cat. No. 23CM11, Pass & Seymour equivalent, Leviton equivalent, or approved equal.

9. Crouse-Hinds "Arktite" Series, Appleton equivalent, Killark equivalent, or approved equal, 30A, 3P, 600 Volt, twist lock, weatherproof, power receptacle and box with matching plug.

C. For hazardous areas the following shall be provided:

1. Wall Switches, single pole, 20 A, 120 V equivalent to Crouse Hinds Cat. No. EFD3591 or EFDC3591 (as required); Appleton No. EDS175F1 or EDSC175F1, Killark equivalent, or approved equal.

2. Convenience Receptacles 20 A, 120-250 VAC, 2 wire, 3 pole equivalent to Crouse Hinds Cat. No. CPS152-201, Appleton No. CPE1-2375, Killark equivalent, or approved equal.

D. Plugs for hazardous and non-hazardous receptacles shall be provided:

1. Plugs and respective cable shall be provided for equipment furnished under other Divisions (steam cleaners, welders, etc.) as necessary.

2.03 DEVICE PLATES

A. Wall plates with gaskets for flush-mounted receptacles and switches shall be made of Type 304 stainless steel, not less than 0.032 of an inch thick, with beveled edges and milled on the rear so as to lie flat against the wall. Wall plates shall be equivalent to Hubbell Series 9600, Pass & Seymour series 93000, Leviton equivalent, or approved equal.

B. Device plates for outdoor installations and indoor wet process area installations shall be Appleton Type FSK, Crouse-Hinds #DS185, or equal for wall switches. Device plates for receptacles shall be “in-use” style. “In-use” weatherproof covers shall be rugged, minimum 3 ¼” depth, die-cast aluminum as manufactured by Thomas & Betts "Red Dot," or approved equal.

C. Device plates for indoor dry process areas with surface mounted boxes shall be Crouse-Hinds DS32, or equal for switches, and Crouse-Hinds DS23 or approved equal for receptacles.

2.04 PLUGS

A. The Contractor shall furnish suitable plugs with equipment furnished under the respective Contract. Plugs shall be black rubber or plastic. For waterproof receptacles, the plugs shall be similar in construction to the receptacles and shall be encased in corrosion resistant yellow housing provided with clamping nuts and stuffing gland cable outlets.

2.05 PROCESS INSTRUMENTS

A. The Contractor shall furnish and install a local disconnect switch at each process instrument (e.g., level transmitter, flow transmitter, analytical instrument etc.,) to disconnect the 120VAC

power supply to the instrument. The device shall be a NSSC series manual motor starting switch without overload protection as manufactured by Crouse-Hinds, Appleton equivalent, or approved equal. For hazardous locations, the device shall be a front operated general use snap switch mounted in an EFS enclosure as manufactured by Crouse-Hinds, Appleton equivalent, or approved equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Switch boxes shall be of unit construction and of sizes as required to adequately house the number of switches required. No sectional type switch boxes shall be permitted.

B. Where more than one (1) switch occurs at one (1) point, gang plates shall be used.

C. All device plates shall be set true and plumb, and shall fit tightly against the finished wall surfaces and outlet boxes.

D. All devices shall be flush-mounted in finished areas, unless otherwise noted. The Contractor shall determine the proper position of every outlet, and relocate any outlet without additional cost to the Owner if same is incorrectly or improperly located. The Engineer reserves the right to change the location of any outlet or connecting equipment up to the time of roughing in without additional cost to the Owner, provided conduit runs are not increased by more than ten (10) feet.

E. In all areas where thermal or acoustic insulation is applied to the ceiling or walls, outlet boxes shall be set to finish flush with the finished surface of the insulation.

F. When indicated height would place any of the equipment at an unsuitable location such as at a molding or break in wall finish, the contractor shall bring it to the attention of the Engineer for a decision.

G. For the below-named items, mounting heights from finish floor, or finish grade to top is applicable. Mounting heights shall be as follows, unless otherwise specified herein, indicated on the Drawings, or required by the Americans with Disability Act (ADA):

1. Single-pole light switches, 48 inches.

2. Duplex receptacles in dry areas, 16 inches

3. Duplex receptacles in pump rooms, 48 inches

H. All receptacles shall have a self-adhesive label installed on the top at the respective device plate that indicates which panel and which circuit number the receptacle is supplied from. Labels shall have a white background and black lettering in 14 point font.

3.02 CIRCUITING

A. Convenience receptacles shall be grouped on circuits separate from the lighting circuits. A maximum of eight (8) convenience receptacles are permitted per 20A, 120V circuit.

- END OF SECTION -

SECTION 16440 - DISCONNECT SWITCHES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install separately mounted, individual disconnect switches as specified herein and indicated on the Drawings.

B. Reference Section 16050, Basic Electrical Requirements.

1.02 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Witnessed Shop Tests

   a. None required.

2. Field Tests

   a. Field testing shall be done in accordance with the requirements specified in the General Provisions and Supplementary General Provisions, and NETA acceptance testing specifications referenced in Section 16040, Basic Electrical Requirements.

1.03 SUBMITTALS

A. The Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Spare Parts List t

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

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2. Complete layout and installation drawings with clearly marked dimensions for each type/size/rating of disconnect switch.

3. Assembled weight of each unit.

D. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items that the Contractor intends to provide are acceptable and shall be submitted.

1.05 TOOLS, SUPPLIES, AND SPARE PARTS

A. The equipment shall be furnished with all special tools necessary to disassemble, service, repair, and adjust the equipment, and with all spare parts as recommended by the equipment manufacturer.

B. One (1) complete set of spare fuses for each ampere rating installed shall be furnished and delivered to the Owner at the time of final inspection.

C. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

D. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.06 IDENTIFICATION

A. Each equipment item shall be identified with a nameplate. The nameplate shall be engraved indicating the circuit number and equipment name with which it is associated. Equipment identification shall match existing plant identification.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. Switches shall be manufactured by the Square D Company, Cutler-Hammer, the General Electric Company, or Siemens Energy and Automation, Inc.

2.02 DISCONNECT SWITCHES

A. Disconnect switches shall be heavy-duty type and/or as specified in these Specifications. Switches shall be furnished and installed as shown on the Drawings and as required by the NEC. Handles shall be lockable.

B. Switches shall be NEMA Type HD, single-throw, externally operated, fused or non-fused as required. Switches of the poles, voltage, and ampere ratings shown shall be furnished in NEMA 1A (gasketed) enclosures in indoor dry areas, and in NEMA 4X Type 304 stainless steel enclosures for damp/wet indoor process areas. Enclosures for outdoor applications shall be NEMA 4X Type 304 stainless steel. Switches located in hazardous areas shall be suitable for the Class, Division, and Group to suit the application. Enclosures for switches located in chlorine system storage and transfer areas shall be NEMA 4X non-metallic.

C. Disconnect switches shall be quick-make, quick-break and with an interlocked cover which cannot be opened when switch is in the "ON" position and capable of being locked in the "OPEN" position.

D. A complete set of fuses for all switches shall be furnished and installed as required. Time-current characteristic curves of fuses serving motors or connected in series with circuit breakers shall be coordinated for proper operation. Fuses shall have voltage rating not less than the circuit voltage.

E. Disconnect switches shall be furnished with a factory installed internal barrier kit that helps prevent accidental contact with live parts and provides “finger-safe” protection when the door of the enclosed switch is open.

F. Fused disconnect switches shall be furnished for motor operated valve and gate actuators where shown on the Drawings. The Contractor shall coordinate the supply of these fused switches with the specific requirements of the actuator. Fuses with fast fault clearing times may be required for modulating valve actuators.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. All disconnect switches shall be mounted five (5) feet above the floor, at the equipment height where appropriate, or where shown otherwise.

B. The Contractor shall furnish and install fuses of various types as required with the continuous ampere ratings as required or shown on the Drawings.

- END OF SECTION –

SECTION 16500 - LIGHTING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all lighting fixtures, labor, and material, in accordance with the preceding Specifications, the requirements of this Section, and as shown on the Drawings.

B. Lighting shall be in accordance with the latest requirements of the Illuminating Engineering Society, and all lighting fixtures shall have the Underwriters Laboratories, Inc. label of approval.

C. All wiring shall be placed in conduit and shall comply with the Specifications for conduit, outlet boxes, pull and junction boxes, wires and cables, grounding, and other Sections as set forth in these Specifications and as noted herein.

D. Reference Section 16050, Basic Electrical Requirements.

1.02 CODES AND STANDARDS

A. The equipment specified herein shall comply with the following codes and standards.

1. Underwriter's Laboratories, Inc. (UL):

   a. UL 924 – Emergency Lighting and Power Equipment

   d. UL 1598 – Luminaires

2. American National Standards Institute (ANSI):

   a. ANSI C62.41 – Guide for Surge Voltages in Low-Voltage AC Power Circuits

3. National Electrical Code (NEC), latest edition.

1.03 TESTING

A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:

1. Witnessed Shop Tests: None required.

2. Certified Shop Tests: The lighting fixtures shall be given routine factory tests in accordance with the requirement of ANSI, NEMA and Underwriters Laboratories standards.

3. Field Tests: Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the Supplementary General Provision Section 2.2 (b), the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Operation and Maintenance Manuals

3. Spare Parts Lists

4. Special Tools List

B. Each submittal shall be identified by the applicable specification section.

1.05 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible submittals will be returned to the Contractor for resubmittal without review.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.

2. Catalog cuts for each fixture type showing performance and construction details of standard fixtures, and complete working drawings showing all proposed construction details of special or modified standard fixtures.

3. Photometric curves.

4. LED data including efficiency (Efficacy lumens/watt) information.

5. LED Driver information

6. Catalog data including applicable coefficients of utilization tables, isolux chart of illumination on a horizontal plane, beam efficiency, horizontal and vertical beam spread, and beam lumens.

7. Custom wiring diagrams for each individual lighting contactor. Standard wiring diagrams that are not custom created by the manufacturer for the individual lighting contactors for this project are not acceptable. One wiring diagram which is typical for all lighting contactors is not acceptable. Each wiring diagram shall include wire identification and terminal numbers. Indicate <u>all</u> devices, regardless of their physical location, on the diagrams. Identify on each respective wiring diagram specific equipment names and equipment numbers consistent with those indicated on the Drawings.

8. System (entire fixture assembly) efficiency data.

D. Shop drawings shall be submitted to the Engineer for review and acceptance for all fixtures before fixtures and poles are manufactured. Substitutions will be permitted only if acceptable to the Engineer.

E. Manufacturer's catalog number and description in the fixture schedule on the Contract Documents establishes a level of quality, style, finish, etc. The use of a catalog number describing the various types of fixtures shall be used as a guide only, and does not exclude all the required accessories or hardware that may be required for a complete installation.

1.06 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall submit Operation and Maintenance Manuals in accordance with the procedures and requirements set forth in the General Provisions and Supplementary General Provisions.

1.07 TOOLS, SUPPLIES AND SPARE PARTS

A. The light fixtures shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment. All spare parts as recommended by the equipment manufacturer shall be furnished to the Owner by the Contractor. The following minimum spare parts shall be furnished:

1. A minimum of one (1) LED driver.

2. A minimum of one (1) LED light bar/light array.

B. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

C. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to the Owner.

D. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size shall have the same parts number.

1.08 LIGHTING CONTROLS

A. The lighting systems shall be controlled as specified herein and indicated on the Drawings.

B. Wall Switches, Three-Way, 20 A, 120-277V equivalent to Hubbell No. 1223, Pass & Seymour No. 20AC3, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3033, Hubbell equivalent, Pass & Seymour equivalent, or approved equal.

C. Device plates for outdoor installations and indoor wet process area installations shall be Appleton Type FSK, Crouse-Hinds #DS185, or approved equal for wall switches. Device plates for receptacles shall be “in-use” style. “In-use” weatherproof covers shall be rugged, minimum 3 ¼” depth, die-cast aluminum as manufactured by Thomas & Betts "Red Dot," or approved equal.

PART 2 -- PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 FIXTURES

A. Each fixture shall bear the Underwriters Laboratories, Inc. label. All lighting fixtures shall be furnished complete with LED of number and type as indicated on the Drawings and all fittings and hardware necessary for a complete installation. Lighting fixtures shall have all parts and fittings necessary to completely and properly install the fixtures.

B. Fixture leads shall be as required by NEC and shall be grounded by the equipment grounding conductor in the conduit.

C. All glassware shall be high quality, homogeneous in texture, uniform in quality, free from defects, of uniform thickness throughout, and properly annealed. Edges shall be well rounded and free from chips or rough edges.

D. Emergency fixtures shall be UL 924 listed and have a minimum 90 minutes battery back-up.

E. Fixtures specified to be damp or wet locations rated shall be UL 1598 listed.

F. Fixtures shall be as specified below.

TYPE	WATTS	TYPE LUMINAIRE	MANUFACTURER
LE4	220	Pendant mounted, High Bay LED light fixture, Multivolt 120VAC, Neutral White high brightness LEDs (4000K nominal). Provide with a 430mA to 700mA driver, not less than 16000lm output and efficacy not less than 78 lm/W. Provide with medium distribution, white cast aluminum housing and prismatic borosilicate glass, damp locations listed. Provide with minimum of 5-year warranty.	Holophane Phuzion 18L, LSI Industries Crossover High bay (XHB3) 176 series, Philips Day Brite HBL series (HB-20020).

TYPE	WATTS	TYPE LUMINAIRE	MANUFACTURER
EW1	50	Wall mounted, emergency fixture, 120VAC with 12 VDC nickel cadmium battery, gray corrosion and impact resistant molded fiberglass housing, time delay shutoff, surge and brown-out protection, and low voltage battery cut-off. Two 25W high intensity tungsten lamp heads, wet location listed.	Holophane Desoto M50, Crouse Hinds N2LPS or Lithonia Z Series.
XW2	10	Wall mounted, red LED exit sign, 120VAC, gray corrosion and impact resistant fiberglass housing, clear polycarbonate face cover, single face, 12V nickel cadmium battery, brownout and surge protected, low voltage battery cut-off, wet location listed.	Holophane LNTL Series, Chloride Hz Series or Emergilite IL Series.

2.03 LED DRIVERS

A. Drivers shall be rated for 120VAC +/- 10% at a frequency 60Hz.

B. All drivers shall be designed to a power factor >90% with a total harmonic distortion THD <20% at full load.

C. Case temperature shall be rated for -40°C through +80°C.

D. Drivers shall have overheat protection, self-limited short circuit protection and overload protected.

E. Drivers shall be furnished with a fused primary.

F. Drivers shall have an output ripple <10%

G. Drivers shall have a five year (50,000 hour) warranty.

H. Drivers shall be manufactured by Advance, Universal or equal.

I. Drivers shall be UL Listed for wet location, UL879, UL1012, UL935, IEC61347-2-2, EN61558-1, EN61558-2-17, EN60065 (cRUs, CE, ENEC), ROHS.

J. Drivers shall meet FCC 47 Sub Part 15; CISPR15, CISPR22 Class A (120V min.), EN61000-3-2, -3-3, -4-4, -4-5 for EMI.

2.04 LEDs

A. Luminaires provided with LED technology shall utilize high brightness LEDs with a group binning code of P and/or Q.

B. Color Temperature: Natural White, 4000°K or higher.

C. Junction point shall be designed and manufactured to allow adequate heat dissipation.

D. LEDs shall be rated for 50,000 hours of life (based on IESNA L70).

E. LEDs shall be as manufactured by Cree or Philips.

2.05 LIGHTING CONTROLS

A. Lighting contactors shall be as manufactured by Cutler-Hammer,[The Square D Company, General Electric Company, or Siemens Energy and Automation, Inc. Lighting contactors shall be heavy duty industrial type with 30A minimum rating and shall have the number of contacts required. Contactor ampere rating shall be increased as required to suit the application. Contactor coil voltage shall be as indicated on the Drawings. Contactors shall be the electrically or mechanically held type as indicated on the Drawings. Contactors shall include fused integral control power transformers. Any auxiliary relays, or other devices required for proper operation shall be included. Lighting contactor enclosures shall be as follows:

Area	**Enclosure**
Indoor Wet Process Area	NEMA 4X SST
Indoor Dry Process Area	NEMA 12
Indoor Dry Non-Process Area	NEMA 1
Indoor Chemical Area	NEMA 4X SST/FRP
All Outdoor Areas	NEMA 4X SST

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Lighting fixtures shall be located symmetrically with building lines as shown on the Drawings. The Contractor shall furnish and install the lighting fixtures to allow "convenient" access for maintenance such as cleaning, relamping, and other activities. The fixtures shall be installed to be accessed by a 12 ft. (max.) ladder for emergency lights only. Where fixtures are shown in locations on the Drawings where maintenance would be difficult, the Contractor shall notify the Engineer for direction.

B. The Contractor shall provide and install all inserts, conduit, structural supports as required, lamps, ballasts, poles, wiring, and any other items required for a complete system. Contractor shall properly adjust and test, to the satisfaction of the Engineer, the entire lighting system. The Contractor shall provide pigtails and flexible conduit connected to an outlet box where necessary or required resulting in a neat and complete installation.

C. The Contractor shall protect all fixtures at all times from damage, dirt, dust, and the like. Before final acceptance, all fixtures and devices shall be cleaned of all dust, dirt or other material, be fully re-lamped (except LED fixtures) and in operating condition to the satisfaction of the Engineer.

D. Circuiting shall be as shown on the Drawings and as follows:

1. Bus loads in all panelboards shall be balanced between phases to within a tolerance of one (1) KVA. Convenience receptacles shall be distributed evenly among all phase buses as much as practical.

2. Voltage drop to the most remote lighting fixture shall be limited to 2 percent.

E. The Contractor shall furnish and install all pendant trapezes and pendant stem hangers with durable swivel or equivalent trapeze hanger permitting normal fixture motion and self-alignment. Fixture pendants shall be Appleton Type UNJ ball type flexible hanger at the fixture and supports from an Appleton JBLX junction box with JBLX hub cover, or equal. Pendant lengths shall be adequate and adjusted to provide uniformity of installation heights above the reference datum. Stems shall be one-piece, with matching canopies and fittings.

F. Fixtures located on the exterior of the building shall be provided with neoprene gasket and non-ferrous metal screws finished to match the fixtures.

G. The finish or exposed metal parts of lighting fixtures and finish trims of all recessed lighting fixtures shall be as directed by the Engineer.

H. The Contractor shall furnish and install recessed fixtures with a separate junction box concealed and located as to be accessible when fixture is removed.

I. The Contractor shall furnish and install all boxes for lighting fixtures such that the box is not the sole support of the fixture. The boxes shall be offset to allow maintenance such that access to wiring within the box can be attained without having to consider supporting (holding) the fixture.

J. All lighting units, when installed, shall be set true and be free of light leaks, warps, dents, and other irregularities. All hangers, cables, supports, channels, and brackets of all kinds for safely erecting this equipment in place, shall be furnished and erected in place by the Contractor.

K. The Contractor shall install fixtures at mounting heights indicated on the Drawings or as instructed by the Engineer. In areas with exposed ducts and/or piping, installation of lighting fixtures shall be adapted to field conditions as determined by the Engineer.

L. The Contractor shall support each fixture securely. Each fluorescent fixture shall be secured to the building structure. The Contractor shall not secure fixtures to the work of other trades, unless specified or noted otherwise, and shall not support fixtures from plaster. The Contractor shall furnish and install all steel members and supports as required to fasten and suspend fixtures from the structure.

M. In all mechanical equipment areas, the Contractor shall install lighting fixtures on the ceiling after all piping and equipment therein has been installed. Exact locations for such fixtures may be determined by the Engineer on the site during the course of the work.

N. Upon completion of work, and after the building area is broom clean, all fixtures shall be made clean and free of dust and all other foreign matter both on visible surfaces, and on surfaces that affect the lighting performance of the fixture including diffusers, lenses, louvers, reflectors, and lamps.

O. All fixtures that require physical adjustment shall be so adjusted in accordance with the directions of the Engineer. The Contractor shall also adjust angular direction of fixtures and/or lamps, as directed.

P. Relamping access of fixtures including LED fixtures shall require no special tools. All optical control surfaces such as lenses and reflectors shall be safely and securely attached to fixtures and shall be easily and quickly removed and replaced for cleaning without the use of tools. No fixture part that may be removed, for maintenance, shall be held in place by metal tabs that must be bent to remove said part.

Q. The Contractor shall furnish and install switches as indicated on the Drawings. Switches shall be single pole, double pole, 3-way, or 4-way as indicated on the Drawings and as required. Switches located outdoors or in wet indoor locations shall be installed in cast boxes complete with yellow, fiberglass weatherproof covers. Reference Section 16141, Wiring Devices.

R. The Contractor shall furnish and install time switches and photocells as specified herein or indicated on the Drawings. Time switches shall be provided with a manual bypass switch controlling the lights locally and remotely. Time switches shall control contactors, relays, or direct controlling of one, two, or three lighting circuits, as indicated. The Contractor shall furnish and install photocells as specified herein or indicated on the Drawings for automatic "ON/OFF" switching of outdoor lighting.

- END OF SECTION -