The Enclosed Document Is Provided For Your Convenience.

Please Email ALL Questions:

MailTo:ContractAdministration@TampaGov.net

Please Let Us Know If You Plan To Bid

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

CITY OF
TAMPA, FLORIDA

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

FOR

Contract 13-C-00046

DAVID L. TIPPIN WATER TREATMENT FACILITY LABORATORY BUILDING HVAC REPLACEMENT

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

FEBRUARY 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.: 13-C-00046; David L. Tippin Water Treatment Facility Laboratory Building HVAC Replacement
BID DATE: April 1, 2014 ESTIMATE: $1,590,000 SCOPE: removal and replacement of the existing HVAC building control system with all new KMC controls to improve the temperature management, and so that the system can be monitored from a central location, or via the internet; interior painting; replacement of mechanical room doors and installation of new fencing with all associated work required for a complete project in accordance with the Contract Documents. PRE-BID CONFERENCE: Monday, March 17, 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 13-C-00046; David L. Tippin Water Treatment Facility Laboratory Building HVAC Replacement

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., April 1, 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, removal and replacement of the existing HVAC building control system with all new KMC controls to improve the temperature management, and so that the system can be monitored from a central location, or via the internet; interior painting; replacement of mechanical room doors and installation of new fencing 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 Performance and Payment Bonds within twenty (20) days after receipt of Notice of Award of Contract.

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

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

Communication with City Staff

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

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

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

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.01 GENERAL:

The proposed work is the David L. Tippin Water Treatment Facility Laboratory Building HVAC Replacement 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 270 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 14.3% 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-1.10 DISADVANTAGED BUSINESS ENTERPRISES (DBE): *FOR FDOT CONTRACTS ONLY*

The State's Disadvantaged Business Enterprises applicable rules and regulations are by reference made a part hereof and bidders must comply therewith. The overall DBE program goal is 14.3%, which the FDOT believes may be achieved entirely through race neutral means. The City supports the utilization of small and disadvantaged businesses on construction projects, and encourages bidders to make all reasonable efforts to obtain participation of these businesses on this project.

The City's Equal Business Opportunity Program forms are provided for data collection purposes only. The FDOT Disadvantaged Business Enterprises rules and regulations apply.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.11 BID SECURITY:

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

I-1.12 PUBLIC CONSTRUCTION BOND:

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

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

2/25/14

CARPENTRY, FINISHING (MOLDING, CABINETRY)

Zinc Ink, LLC **Federal**
26-4295391
13104 Early Run Ln.
Riverview, FL 33578
Phone (813) 334-7654
Fax (813) 741-2540
Minority African American
Contact Sharatina Worthy
E-mail worthy2@yahoo.com

Cecil Jackson Trim Co., LLC **Federal**
20-8387378
14128 Arbor Hills Rd.
Tampa, FL 33625
Phone (813) 960-7406
Fax (813) 960-7406
Minority African American
Contact Cecil Jackson
E-mail ceciljacksonsr@verizon.net

CONCRETE (REINFORCED)

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

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

PAINTING AND OTHER SERVICES, INTERIOR & EXTERIOR

USAMA Specialty Finishes, Inc. **Federal**
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**
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

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 2/25/2014

CARPENTRY, FINISHING (MOLDING, CABINETRY)

George G. Solar & Company, Inc. **Federal Number** 59-1314899

4407 W. South Ave.
Tampa, FL 33614

Phone (813) 875-9148
Fax (813) 879-2315

Minority Small Business
Contact George Solar

E-mail georgesolarcompany@verizon.net

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

18449 Lake Iola Rd
Dade City, FL 33523

Phone (813) 482-2581
Fax (352) 588-2073

Minority Small Business
Contact Jeffrey Andras

E-mail jeffandras@gmail.com

Zinc Ink, LLC **Federal Number** 26-4295391

13104 Early Run Ln.
Riverview, FL 33578

Phone (813) 334-7654
Fax (813) 741-2540

Minority Small Business
Contact Sharatina Worthy

E-mail worthy2@yahoo.com

Cecil Jackson Trim Co., LLC **Federal Number** 20-8387378

14128 Arbor Hills Rd.
Tampa, FL 33625

Phone (813) 960-7406
Fax (813) 960-7406

Minority Small Business
Contact Cecil Jackson

E-mail ceciljacksonsr@verizon.net

Bevel Express & Tops, LLC **Federal Number** 20-2660535

6026 Benjamin Rd
Tampa, FL 33634

Phone (813) 887-3174
Fax (813) 882-0272

Minority Small Business
Contact Yamileth Sanchez

E-mail bevelexpress@verizon.net

CONCRETE (REINFORCED)

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

9001 126th Ave. North
Largo, FL 33773

Phone (727) 585-4714
Fax (727) 585-5091

Minority Small Business
Contact Israel Castro

E-mail cconstr@tampabay.rr.com

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 2/25/2014

CONCRETE (REINFORCED)

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

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

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

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

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

Minority Small Business
Contact Richard Coyer

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 2/25/2014

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

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

1717 Virginia Ave.
Palm Harbor, FL 34683

Phone (727) 253-4637
Fax (727) 772-7417
E-mail weststarpainting@aol.com

Minority Small Business
Contact Flora Giannas

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

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

8372 Standish Bend Dr.
Tampa, FL 33615

Phone (813) 886-7100
Fax (813) 886-7102
E-mail carlos@ccpainting.com

Minority Small Business
Contact Carlos Cubas

City of Tampa MBD Office

SLBE Goal Setting Firms Report

as of 2/25/2014

PAINTING AND OTHER SERVICES, INTERIOR & EXTERIOR

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

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

3435 Chessington Drive
Land O' Lakes, FL 34638

Phone (813) 949-1750
Fax (813) 948-0451
E-mail edkimszal@msn.com

Minority Small Business
Contact Edward Kimszal

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

1320 Illinois Ave.
Palm Harbor, FL 34683

Phone (727) 858-0266
Fax
E-mail LeosConstructionInc@yahoo.com

Minority Small Business
Contact Travis Smudde

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

55 Dodecanese Blvd
Tarpon Springs, FL 34689

Phone (727) 487-3636
Fax (727) 940-5224
E-mail Thmanglis@yahoo.com

Minority Small Business
Contact Theofilos Manglis

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

11311 Hollyglen Drive
Tampa, FL 33624

Phone (813) 966-1508
Fax
E-mail ucs@email.com

Minority Small Business
Contact Hadeel Eishesbaiy

SLBE Contract Goal

Goal
14.3%

Procurement Guidelines To Implement Minority & Small Business Participation

Underutilized WMBE Primes by Industry Category

FORMAL PROCUREMENT

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

Underutilized WMBE Sub-Contractors / Sub-Consultants

SUB WORK

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

Policy

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

Index

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

Industry Categories

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

MBD Form-70

Instructions Regarding Use of the SLBE Goal Setting List

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

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

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

SOLICITATION FOR SUBCONTRACTOR QUOTES

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

To Subcontractor:

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

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

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

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

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

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

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 existing system contains three units that are corroded due to exposure to the outdoor elements. A recent evaluation recommended a complete replacement of the 10-year old system with a more energy efficient system. Each unit's load and location will be evaluated. The new system will also integrate the fume hood exhaust with the overall HVAC system, more efficient ductwork routing and upgrade the controls; interior painting; replacement of laboratory cabinets, countertops and sinks; replacement of mechanical room doors and new fencing. _____ _____ 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 13-C-00046; David L. Tippin Water Treatment Facility Laboratory Building HVAC Replacement

KNOW ALL MEN BY THESE PRESENTS, that we, _____

_____

(hereinafter called the Principal) and _____

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

WHEREAS, the Principal is about to submit, or has submitted to the City of Tampa, Florida, a Proposal for the construction of certain facilities for the City designated Contract 13-C-00046, David L. Tippin Water Treatment Facility Laboratory Building HVAC Replacement.

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

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

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed this _____ day of _____, 2014.

Principal _____

BY _____

TITLE _____

BY _____

TITLE _____

(SEAL)

_____
Producing Agent

_____
Producing Agent's Address

_____
Name of Agency

_____

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

AGREEMENT

For furnishing all labor, materials and equipment, together with all work incidental thereto, necessary and required for the performance of the work for the construction of Contract 13-C-00046 in accordance with your Proposal dated _____, amounting to a total of $_____ as completed in accordance with subsections I-2.09 and I-2.10 of the Instruction to Bidders.

THIS AGREEMENT, made and entered into in triplicate, this ____ day of _____, 2014, between the City of Tampa, Florida, hereinafter called the City, and hereinafter called the Contractor.

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

Contract 13-C-00046; David L. Tippin Water Treatment Facility Laboratory Building HVAC Replacement, shall include, but not be limited to, the removal and replacement of associated ductwork, piping, valves, testing and balance of a new HVAC system, a new HVAC control system, electrical work, roof insulation, cabinet replacement, minor plumbing work, interior painting and all associated work required for a complete project in accordance with the Contract Documents.

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

TAMPA AGREEMENT

SECTION 1
GENERAL

ARTICLE 1.01 THE CONTRACT

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

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

ARTICLE 1.02 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 2
POWERS OF THE CITY'S REPRESENTATIVES

ARTICLE 2.01 THE ENGINEER

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

(a)To monitor the performance of the work.

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

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

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

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

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

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

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

ARTICLE 2.02 DIRECTOR

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

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

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

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

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

ARTICLE 2.03 NO ESTOPPEL

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

ARTICLE 2.04 NO WAIVER OF RIGHTS

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

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

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

SECTION 3
PERFORMANCE OF WORK

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 3.05 PRESERVATION OF PROPERTY

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

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

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

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

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

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

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

SECTION 4
TIME PROVISIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 5
SUBCONTRACTS AND ASSIGNMENTS

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

Before making any subcontract, the Contractor must submit a

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

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

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

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

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

SECTION 6
SECURITY AND GUARANTY

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

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

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

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

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

SECTION 7
CHANGES

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

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

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

ARTICLE 7.02 EXTRA WORK

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

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

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

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

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

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

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

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

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

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

ARTICLE 7.03 DISPUTED WORK

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

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

ARTICLE 7.04 OMITTED WORK

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

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

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

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

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

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

SECTION 8
CONTRACTOR'S EMPLOYEES

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

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

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

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

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

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

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

SECTION 9
CONTRACTOR'S DEFAULT

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

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

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

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

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

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

SECTION 10
PAYMENTS

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

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

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

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

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

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

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

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

FOR CONTRACT AMOUNTS UNDER $250,000

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

FOR CONTRACT AMOUNTS OVER $250,000

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

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

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

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

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

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

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

ARTICLE 10.06 FINAL PAYMENT

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

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

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

ARTICLE 10.07 ACCEPTANCE OF FINAL PAYMENT

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

SECTION 11
MISCELLANEOUS PROVISIONS

ARTICLE 11.01 CONTRACTOR'S WARRANTIES

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

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

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

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

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

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

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

ARTICLE 11.02 PATENTED DEVICES, MATERIAL AND PROCESSES

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

ARTICLE 11.03 SUITS AT LAW

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

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

ARTICLE 11.04 CLAIMS FOR DAMAGES

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

ARTICLE 11.05 NO CLAIMS AGAINST INDIVIDUALS

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

ARTICLE 11.06 LIABILITY UNAFFECTED

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

ARTICLE 11.07 INDEMNIFICATION PROVISIONS

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

ARTICLE 11.08 UNLAWFUL PROVISIONS DEEMED STRICKEN

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

ARTICLE 11.09 LEGAL PROVISIONS DEEMED INCLUDED

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

ARTICLE 11.10 DEATH OR INCOMPETENCY OF CONTRACTOR

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

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

ARTICLE 11.11 NUMBER AND GENDER OF WORDS

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

ARTICLE 11.12 ACCESS TO RECORDS

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

SECTION 12
LABOR STANDARDS

ARTICLE 12.01 LABOR STANDARDS

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

ARTICLE 12.02 NOTICE TO LABOR UNIONS

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

ARTICLE 12.03 SAFETY AND HEALTH REGULATIONS

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

ARTICLE 12.04 EEO AFFIRMATIVE ACTION REQUIREMENTS

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

ARTICLE 12.05 PREVAILING RATES OF WAGES

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

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

* * * * * * *

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

CITY OF TAMPA, FLORIDA

_____
Bob Buckhorn, Mayor
(SEAL)

ATTEST:

_____
City Clerk

Approved as to Form:

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

_____
Justin R. Vaske, Assistant City Attorney

Contractor

By:_____
(SEAL)

Title:

ATTEST:

_____
Secretary

STATE OF)
) SS:
COUNTY OF)

For a Corporation:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2014 by _____ of _____, a _____ corporation, on behalf of the corporation. He/she is ___ personally known or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

For an Individual:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2014 by _____ who is ___ personally known to me or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

For a Firm:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 2014 by _____ who signed on behalf of the said firm. He/she is ___ personally known or has ___ produced _____ as identification.

_____
Notary

My Commission Expires:

_____

_____

PUBLIC CONSTRUCTION BOND

Bond No. (enter bond number)_____

Name of Contractor:_____

Principal Business Address of Contractor:_____

_____

Telephone Number of Contractor:_____

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

_____

Principal Business Address of Surety:_____

_____

Telephone Number of Surety:_____

Owner is The City of Tampa, Florida

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

Contract Administration Department (280A4N)

Telephone Number of Owner: 813/274-8456

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

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

_____

_____

_____

General Description of Work and Services:_____

_____

_____

_____

KNOW ALL MEN BY THESE PRESENTS That we, _____

_____
(Name of Contractor)

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

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

THE CONDITION OF THIS BOND is that if Principal:

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

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

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

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

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

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

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

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

DATED ON _____, 20___

_____
(Name of Principal)

_____
(Principal Business Address)

By _____

Title _____

_____
Telephone Number of Principal

Countersignature:

_____
(Name of Local Agency)

_____
(Address of Resident Agent)

By _____

Title _____

_____
Telephone Number of Local Agency

_____
(Name of Surety)

_____
(Surety Address)

By _____
(As Attorney in Fact)*

_____
Telephone Number of Surety

Accepted by City of Tampa:

By _____
Bob Buckhorn, Mayor

Date: _____ 20____

Approved as to legal sufficiency:

By _____
Assistant City Attorney

Date: _____, 20____

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

SPECIFICATIONS
GENERAL PROVISIONS

SECTION 1
SCOPE AND INTENT

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 2
PLANS AND SPECIFICATIONS

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

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

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

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

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

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

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

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

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

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

SECTION 3
WORKING DRAWINGS

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

These drawings shall accurately and distinctly present the following:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 4
MATERIALS AND EQUIPMENT

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

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

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

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

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

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

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

G-4.02 MANUFACTURER

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

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

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

G-4.03 REFERENCE TO STANDARDS

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

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

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

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

G-4.04 SAMPLES

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

G-4.05 EQUIVALENT QUALITY

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

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

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

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

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

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

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

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

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

Spare parts shall be furnished as specified.

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

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

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

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

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

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

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

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

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

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

SECTION 5
INSPECTION AND TESTING

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 6

TEMPORARY STRUCTURES

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

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

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

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

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

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

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

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

SECTION 7
TEMPORARY SERVICES

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

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

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

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

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

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

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

SECTION 8
LINES AND GRADES

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

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

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

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

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

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

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

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

Corps of Engineers.

SECTION 9
ADJACENT STRUCTURES AND LANDSCAPING

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

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

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

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

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

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

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

SECTION 10
PROTECTION OF WORK AND PUBLIC

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

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

No open fires will be permitted.

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

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

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

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

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

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

SECTION 11
SLEEVES AND INSERTS

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

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

SECTION 12
CUTTING AND PATCHING

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

SECTION 13
CLEANING

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

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

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

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

SECTION 14
MISCELLANEOUS

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

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

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

* * * * * * *

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. 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 of Tampa shall provide, at no cost to the Contractor, water and electricity for installation of this project. All water and electricity shall be applied and/or connected by the Contractor.

G-7.07 TELEPHONE

The Contractor shall furnish the Engineer with a telephone number(s) by which the Engineer may contact 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 as required shall be performed in a careful manner to permit salvaging of as much material, as practical for use in repair and maintenance of City-owned facilities.

The paving material, such as vitrified brick, asphalt block and other paving materials removed from the excavated areas and suitable for reuse but not reused in the work, shall also be considered the property of the City. The handling of such materials shall be as set forth elsewhere in the Specifications or Special Provisions.

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:

The Contractor shall provide and maintain an adequate field office, which shall be a structure completely separated from the Contractor's field office, for the exclusive use of the Construction Engineer and/or Architect and engineering technicians within the project limits. No additional payment shall be made for this item. Location of said field office shall be as directed by the Engineer and/or Architect.

Contractor shall provide one (1) desk with chair, one (1) four-drawer metal file cabinet with lock, plan rack to hold a minimum of eight (8) separate sets of plans and one (1) plan table, top shall be minimum of 3'-0" wide x 6'-8" long; also adequate heating, air conditioning, lighting and one (1) window, 36"x36" minimum size, in each of four (4) walls.

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 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, Sate, 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 Contractor shall coordinate with the Parks Department and shall identify each and every tree to remain prior to the start of work. The specific trees to remain shall be approved by the Parks Department.

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.

The Contractor shall take particular precautions to protect existing trees and plant material. All trees and other plant material to remain shall be marked by the City prior to start of work.

Excavation, earthwork or sitework within the drip line of existing trees shall be done either manually or by methods approved by the City of Tampa Parks Department.

If the Contractor damages any tree or plant material in any way he shall be required to replace the damaged tree or plant material as follows:

1. Trees

   a. Replace a 6" caliper or less with a 6" caliper of the same species.

   b. Replace a 7"-10" caliper with two (2) 6" caliper of the same species.

c. Replace a 10"-15" caliper with three 6" caliper of the same species.

d. Replace a 16"-20" caliper with five (5) 6" caliper of the same species.

e. Replace a 21"-36" caliper with ten (10) 6" caliper of the same species.

2. Plant Material

Replace any damaged plant material with an equal size and quantity of the same material.

The replaced trees and plant material shall be guaranteed by the Contractor for a period of six (6) months.

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:

The Contractor shall verify and coordinate the service location with the local power company and the Engineer and/or Architect.

The Contractor shall coordinate with the local power company and shall include in his bid all costs for electrical service to work area(s) under this Contract, including but not limited to new service, connections from existing and/or new service and all required labor, equipment, materials etc. and all other associated electrical work.

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, including but not limited to:

1. Sewer, water, stormwater and irrigation fabrication drawings showing to scale all manholes, all distances and angles between manholes, line dimension, grid co-ordinates, trunk lines, inverts and cleanouts,

2. Fencing, roadway, parking and sleeving,

3. Electrical service, and

4. General building location, and/or foundations, structures, etc.

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

scale: 3" = 3"

Sign Information

Building a Better Tampa

Downtown Riverwalk

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

$1.5 Million investment
Scheduled for completion in October 2012

Orion Marine
Construction, Inc.

Colors

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

Font

Franklin Gothic

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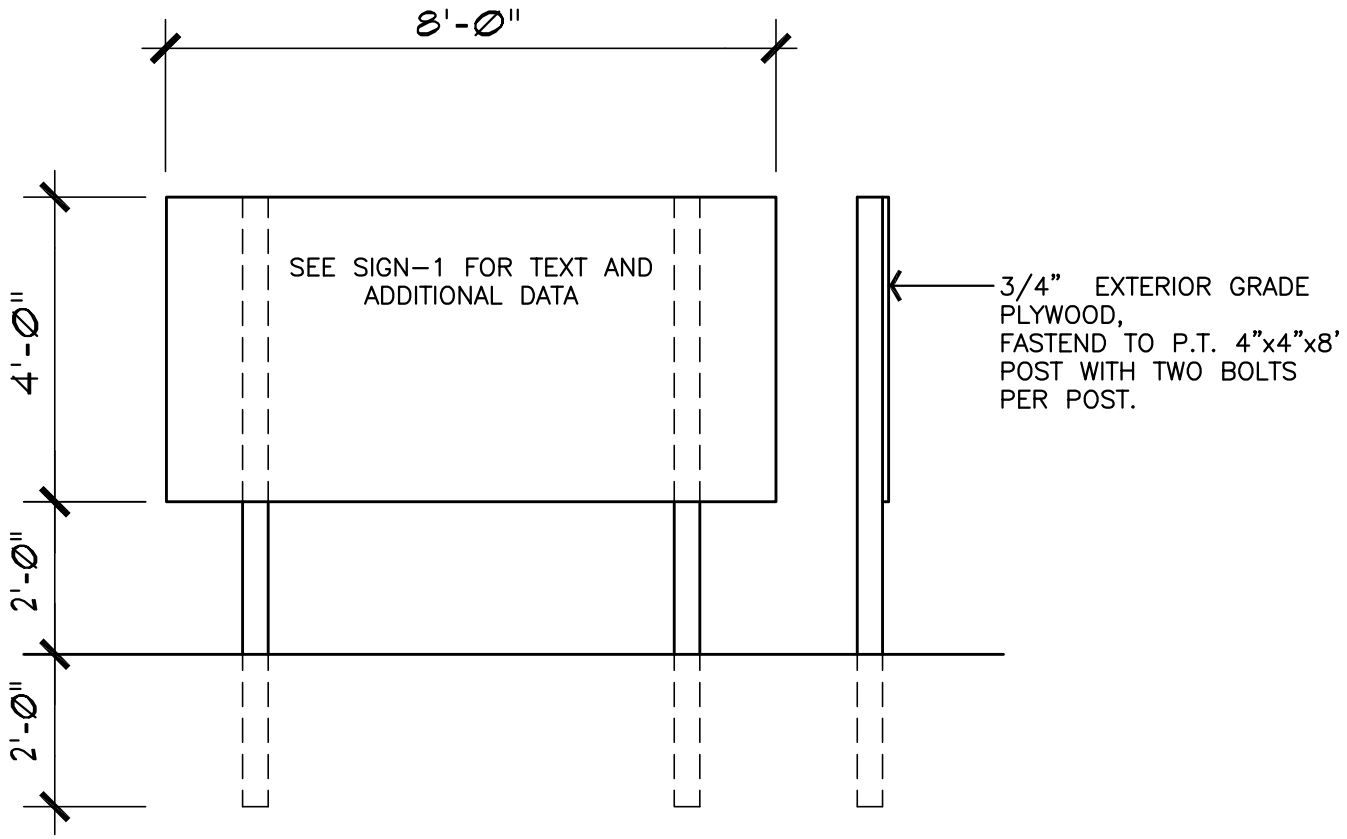

SECTION 01010 - SUMMARY OF WORK

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:

David L. Tippin Water Treatment Facility
Laboratory Building HVAC Replacement
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, the removal and replacement of associated ductwork, piping, valves, testing and balance of a new HVAC system, a new HVAC control system, electrical work, roof insulation, cabinet replacement, minor plumbing work, interior painting and 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

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

6.0 SPECIFICATIONS: (DATED: JANUARY, 2014)

Divisions: 0, 1, 2, 3, 4, 5, 6, 7, 15, and 16.

7.0 DRAWINGS: (DATED: JANUARY, 2014)

Sheets: X1, A11, 1110, A111, A112, A121, A122, A123, A124, A131, A132, A141, A142, A144, A15, A20, P001, P100, M001, M010, M011, M101, M102, M201, M300, M400, M401, M500, M501, M502, E001, E010, E011, E100, E101, E200, E201, E-300, E400, E500, E501, E600, E600, E601, S2.1 AND S3.1.

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

Allowance No. 1: Include a contingency allowance of $150,000 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.

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.

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. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

Pre-Bid Site Access Requirements – Prior to the Pre-Bid meeting, Bidders shall contact the DLTWTF Facility Security by e-mail. Send emails to WPSecurity@tampagov.net and Israel.Vigier@tampagov.net. You will then receive an approved reply. Badges will be available at the Facility's security gate on the day of the Pre-Bid meeting.

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 Division-15 Section "Basic Mechanical Requirements," and Division-16 Section "Basic Electrical Requirements" for specific coordination Drawing requirements for mechanical and electrical installations.

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.

Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

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. Work hours are 7:00 a.m. to 3:30 p.m. daily. Please note the following:

After the Contract is awarded plant staff will conducts 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.

Contractor shall not be allowed to use the plant's break room, bathrooms, or any other areas not a part of the limited construction area.

Contractor shall coordinate with alarm monitoring company as required to isolate work zones during dust generating activities that might activate fire alarm system.

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. Radios or similar devices shall not be played during regular work hours (7 a.m. – 3:30 p.m., Monday through Friday).

Contractor shall coordinate with the facility in advance of operations producing excessive noise and/or vibration and the use of non-designated areas to avoid disruption or interference with facility operations.

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 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 provide temporary fencing to secure areas accessible to the public. City of Tampa inspector shall be issued a key to these areas for emergency purposes.

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

END OF SECTION 01040

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

Requirements of this Section apply to mechanical and electrical installations. Refer to Division-15 and Division-16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

C. Definition:

1. Cutting and Patching includes cutting into new and/or existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

2. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1.03 BUILDING MODIFICATIONS

A. Modifications to the new and/or existing structure, and its mechanical and electrical parts, shall be provided as indicated and as necessary to accomplish the work of these Contract Documents.

B. Modifications shall include the removal of parts, relocation of parts, termination and relocation of utilities, cutting, patching, cleaning, adjusting and refinishing, and all incidental work related to these tasks.

1.04 ACOUSTICAL AND RATED ASSEMBLY PENETRATIONS

A. Where structural members and/or other construction elements penetrate smoke and fire rated assemblies, and sound barriers, including walls around and floor below mechanical equipment rooms; provide acoustical fire rated sealant between such work and barrier to maintain acoustical attenuation, and smoke and fire integrity of the barrier.

B. All penetrations through fire rated construction shall be fire stopped as per NEC 300-21 using a through penetration fire stop system (XHEZ) listed in the Underwriters Laboratory Fire Resistance Directory.

1.05 SUBMITTALS

Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

List products to be used and firms or entities that will perform Work.

Indicate dates when cutting and patching is to be performed.

List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.06 QUALITY ASSURANCE

Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

Foundation construction.
Bearing and retaining walls.
Lintels.
Structural decking.
Miscellaneous structural metals.
Equipment supports.
Piping, ductwork, vessels and equipment.

Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

If possible retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:

Processed concrete finishes.
Stucco plaster.
Acoustical ceilings.
HVAC enclosures, cabinets or covers.

PART 2 - PRODUCTS

2.01 MATERIALS

Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

All penetrations through fire rated construction shall be fire stopped as per NEC 300-21 using a through penetration fire stop system (XHEZ) listed in the Underwriters Laboratory Fire Resistance Directory.

PART 3 - EXECUTION

3.01 INSPECTION

Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

Before proceeding, met at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

Temporary Support: Provide temporary support of Work to be cut.

Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.

Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.

By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.
Patch, repair or rehang existing ceilings as necessary to provide an even plan surface of uniform appearance.

3.04 CLEANING

Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to it is original condition.

END OF SECTION 01045

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01100 -SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: The Project consists of HVAC Replacement at the City of Tampa David L. Tippin Water Treatment Facility, Laboratory Building.

1. Project Location: 7125 North 30TH Street, Tampa, Florida 33610.

1.3 PROJECT TEAM

A. Engineer:

1. Identification: The Contract Documents, dated January 10, 2014, were prepared for Project by Anston-Greenlees, Inc.

B. Owner: City of Tampa

1. City Project Manager: Janice Davis, P.E.

1.4 SCOPE OF WORK

A. The Work is indicated on the drawings and includes, but is not limited to, the following:

1. Pre-Construction Meeting
2. Demolition and Phasing, including moving and storage
3. Cutting and patching
4. Fencing
5. Trenching
6. Concrete work
7. New ceilings

8. Chilled water piping
9. HVAC ductwork
10. Air handling equipment
11. Fume hood exhaust systems
12. General exhaust systems
13. Air cooled chillers
14. Pumps
15. Testing, Balance and Commissioning
16. New electrical service, feeders, and power distribution equipment
17. Renovations to existing feeders and power distribution equipment
18. Power for mechanical equipment
19. Replacement of interior lighting
20. Replacement of exterior lighting
21. New fire alarm system
22. Some selective plumbing work

1.5 CONTRACTS

A. Project will be constructed under a single general construction contract with one Contractor with the Owner. See Section 01420 – References, for the definitions of Contractor and Owner.

B. The Contractor may enter into contracts with sub-contractors or trade contractors for various portions of the work, where necessary.

1.6 TOTAL PROJECT TIME PERIOD

The time period from notice to proceed to substantial completion of the final phase shall be 345 days.

a. 51 days = shop drawing review and mobilization

b. 84 days = equipment delivery

c. 210 days = construction

Total = 345 days

60 days = final completion and project closeout.

Total project time period from notice to proceed to final completion shall be 405 days. See phasing plan below for a detailed breakdown of the allowable time period or each phase of construction.

1.7 PHASING OF WORK

A. THIS WILL BE AN OCCUPIED, OPERATIONAL BUILDING DURING CONSTRUCTION. PLAN ACCORDINGLY:

The construction shall be required to be implemented in a phased manner that allows the owner to continue to occupy the building and perform operations. The following proposed phasing approach is intended to outline the general requirements of the phased work, the general demarcation of the phasing zones, the number of phases, the time period allowed, and other restrictions and requirements. This phasing outline is not intended to dictate the contractor's means and methods for implementing the work. Refer to the drawings for the phasing demarcation lines and other requirements. This will be an occupied, operational building during construction. Plan accordingly.

B. Phase 1

1. All items except as noted below with utility services, such as water, electrical, telecommunications, di water, gases, etc., shall be disconnected by the contractor and prepared for moving. The following items and equipment shall be disconnected and prepared for moving by the owner.

A. Balances, ph meters, turbid meter, ovens: various locations

B. Perkin elmer fims 100: metals lab 115

C. Dionex ics 3000: general chemistry 123

D. Dionex ics 5000: general chemistry 123

E. Dionex ics 2500: organics laboratory 124

F. Agilent (Varian) lC/MS/MS: organics laboratory 124

G. Agilent (Varian) lC/MS: organics laboratory 124

H. Aquamate spec: general chemistry 123

I. Jar test apparatus: general chemistry 123

J. Fusion TOC instrument: general chemistry 123

The contractor shall move all items and equipment out of the spaces into other areas for their use or to storage container as required. Contractor shall notify the lab manager 30 days prior to commencement of phase work.

2. The contractor shall provide an on-site storage container. Location will be determined by the owner. The contractor shall move and store all of the owner's packed and boxed items and other equipment into an on-site storage container. The moving and storing shall be performed by a professional certified, licensed, and bonded moving company. The storage container will not be required to be air conditioned.

3. The contractor shall put up noise and dust barriers to separate the owner's occupied areas from the construction zone.

4. The Contractor will commence demolition of the ceilings, lighting, ductwork, HVAC equipment, cabinets (where applicable), etc. Care and caution shall be taken during demolition to ensure the following:

    a. Means of egress is maintained for the occupied areas.

    b. Electrical power shall remain in operation in occupied areas, except for any required prior approved and scheduled outages. A scheduled outage will be required to provide the new service and new Panel MDP. This outage will be required to be performed over a weekend.

    c. Power will be required to remain on for lighting and all branch circuits to the areas outside the construction zone. Provide temporary re-routing of electrical circuits as necessary. Emergency lighting shall remain operational. Refer to Section 16050 for more requirements.

    d. Telecommunications services shall remain in operation in occupied areas. All voice and data cabling shall be protected. Refer to Section 16050 for more requirements.

e. The new fire alarm control panel shall be installed during Phase 1 and connected to the existing fire alarm control panel for monitoring. See Section 16721 for more requirements. There shall be an operational and functional fire alarm system in all occupied areas at all times.

f. All existing HVAC systems, including air handlers, fume hood exhaust, general exhaust, and controls, shall remain operational in the Phase 2, 3, and 4 areas.

g. All existing water and sanitary sewer systems shall remain operational and protected during construction in the Phase 2, 3, and 4 areas.

5. Install all new work scheduled and indicated in the contract documents, and as required for the completion of this phase, including test and balance of all areas, other required testing, painting, and clean-up.

6. Schedule and pass a substantial completion inspection prior to starting to the next phase of work.

7. Move all boxes from storage back into this area. The Owner will un-pack and move back into the space.

8. Warranty periods will not commence until all phases are complete.

9. This phase shall be complete in 60 days.

Phase 2

1. Repeat steps 1 through 8, as noted in Phase 1, except the existing water and sewer systems in phase 1, 3 & 4 will remain operational and protected during construction. The existing HVAC systems in phase 1 & 4 will remain operational and protected during construction.

2. Provide temporary air conditioning for the Phase 3 area.

3. Provide for electrical circuits that will need to extend from Phase 2 into Phase 3 and 4 such that the disruption to the Phase 2 area is minimal during the construction of Phase 3 and 4.

4. Provide for HVAC systems extension into Phase 3 and 4 such that the disruption to the Phase 2 area is minimal during the construction of Phase 3 and 4.

5. This phase shall be completed in 60 days.

Phase 3

1. Repeat steps 1 through 8, as noted in Phase 1, except the existing HVAC, water and sewer systems in phase 1, 2 & 4 will remain operational and protected during construction.

2. This phase shall be completed in 30 days.

Phase 4

1. Repeat steps 1 through 8, as noted in Phase 1, except the existing HVAC, water and sewer systems in phase 1, 2 & 3 will remain operational and protected during construction..

2. This phase shall be completed in 60 days.

C. Air conditioning, data network, power and telephone service must remain operational in occupied areas for the duration of the project. Any outages of utilities as may be necessary to perform the work of this project must occur on weekends only and services must be restored by 7:00 am Monday morning.

D. Some of the Owner's furniture, equipment will remain in the area of construction. The Contractor is responsible to cover and protect it from damage and theft, and to move it as needed to accomplish the work. The Contractor is required to return all items to the room of origin prior to requesting a substantial completion inspection.

E. The contractor’s hours for work access to the building are as follows:
Between Month XX – Month XX: Weekdays 24 hours per day, 7 days per week

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC1s "MasterFormat" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is

incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. Conventions: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01100

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01230 – ALTERNATES AND UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.

2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

B. Unit Price: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Unit Prices described in this Section are part of the Work only if enumerated in the Agreement.

2. The cost or credit for each unit price is the net addition to or deduction from the Contract Sum to incorporate the unit into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate or unit item into Project.

1. Include as part of each alternate and unit, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate or unit.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates and any unit items under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates and unit prices are included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: CONDUIT SUPPORT

1. Identify a unit price and enter the total cost for **50** additional supports (conduit strap, threaded rod, bracket) to support existing conduit in accordance with NEC.

2. When actual conditions are exposed, the quantity will be adjusted by change order. The final cost to the Owner will be based on the actual quantity provided and installed.

B. Unit Price No. 2: CABLE SUPPORT

1. Identify a unit price and enter the total cost for **100** additional supports (j-hook with threaded rod, j-hook with strap, Velcro wrap with support to structure) to support existing free-wired cabling (i.e. voice, data, security, etc.) in accordance with NEC, BICSI, and EIA/TIA standards.

2. When actual conditions are exposed, the quantity will be adjusted by change order. The final cost to the Owner will be based on the actual quantity provided and installed.

C. Unit Price No. 3: JUNCTION BOX COVER

1. Identify a unit price and enter the total cost for **100** additional cover plates to cover an existing 4”x4” open junction box located above the ceiling, exposed in open ceilings or discovered elsewhere.

2. When actual conditions are exposed, the quantity will be adjusted by change order. The final cost to the Owner will be based on the actual quantity provided and installed.

C. Unit Price No. 4: FIRE WALL PENETRATION SEAL

1. Identify a unit price and enter the total cost for **25** additional seals of existing fire wall penetrations that have been breached and need to be corrected. The unit price shall assume a maximum 6 inch diameter opening and shall be corrected using an approved UL listed method.

END OF SECTION 01230

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Coordination Drawings.
3. Administrative and supervisory personnel.
4. Project meetings.
5. Work on premises.

B. Each sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific sub-contractor.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
2. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

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

1. Preparation of Contractor's Construction Schedule.

2. Preparation of the Schedule of Values.

3. Installation and removal of temporary facilities and controls, and phasing controls.

4. Delivery and processing of submittals.

5. Progress meetings.

6. Preinstallation conferences.

7. Project closeout activities.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.

2. Indicate required installation sequences.

3. Refer to Division 15 Section "Mechanical Requirements" and Division 16 Section "Basic Methods and Requirements" for specific Coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list telephone numbers including email addresses and cell phone numbers

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within 3 days of the meeting.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Contractor, sub-contractors, and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer and Owner, of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.

b. Options.

c. Deliveries.

d. Submittals.

e. Review of mockups. If applicable.

f. Review of phasing and possible conflicts.

g. Compatibility problems.

h. Time schedules.

i. Weather limitations.

j. Manufacturer's written recommendations.

k. Warranty requirements.

l. Compatibility of materials.

m. Temporary facilities and controls.

n. Space and access limitations.

o. Regulations of authorities having jurisdiction.

p. Testing and inspecting requirements.

q. Required performance results.

r. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements.

4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01310

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Preliminary Network Diagrams.
5. CPM reports.
6. Field condition reports.
7. Special reports.

B. Related Sections include the following:

1. Division I Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division I Section "Submittal Procedures" for submitting schedules and reports.
4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.

2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.

2. Specification Section number and title.

3. Submittal category (action or informational).

4. Name of subcontractor.

5. Description of the Work covered.

6. Scheduled date for Engineerls final release or approval.

B. Preliminary Construction Schedule: Submit two printed copies.

C. Preliminary Network Diagram: Submit two printed copies; large enough to show entire network for entire construction period.

D. Contractor's Construction Schedule: Submit two printed copies of initial schedule, large enough to show entire schedule for entire construction period.

E. CPM Reports: Concurrent with CPM schedule, submit two printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of all activities sorted in ascending order of total float.

F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

G. Special Reports: Submit two copies at time of unusual event.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from construction commencement date to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 21 days, unless specifically allowed by Engineer.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Startup and Testing Time: Include not less than 14 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.

b. Seasonal variations.

c. Environmental control.

3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.

b. Submittals.

c. Fabrication.

d. Installation.

e. Tests and inspections.

f. Startup and placement into final use and operation.

4. Area Separations: Identify each major area of construction for each major portion of the Work.

Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.

b. Permanent space enclosure.

c. Completion of mechanical installation.

d. Completion of electrical installation.

e. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress.

3. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

   a. Preparation and processing of submittals.

   b. Purchase of materials.

   c. Delivery.

   d. Fabrication.

   e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network.

   Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.

2. Description of activity.

3. Principal events of activity.

4. Immediate preceding and succeeding activities.

5. Early and late start dates.

6. Early and late finish dates.

7. Activity duration in workdays.

8. Total float or slack time.

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.

2. Changes in early and late start dates.

3. Changes in early and late finish dates.

4. Changes in activity durations in workdays.

5. Changes in the critical path.

6. Changes in total float or slack time.

7. Changes in the Contract Time.

2.4 REPORTS

A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent

information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01320

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, Approved Products List, and other miscellaneous submittals.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.

2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.

3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.

4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals and for erecting mockups.

5. Division 1 Section "Closeout Procedures" for submitting warranties, Project Record Documents and operation and maintenance manuals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Engineer's responsive action.

B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Submit submittals in Adobe Portable Document Format (PDF) minimum version 4.0 with Submittal Transmittal in Word for Windows version 2007 (Word) to Engineer for review.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Engineer and Contractor reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows.

Time for review shall commence on Engineer’s receipt of submittal.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.

2. If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Allow 15 days for processing each resubmittal.

4. Contractor shall keep a submittal log of to track progress of submittals.

5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, product delivery time or product substitutions.

E. Identification: Place a permanent label or title block on each submittal for identification. Provide in PDF for electronic submittals.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space beside title block to record Contractor's review and approval markings and action taken by Engineer and Contractor.

3. Include the following information on label for processing and recording action taken:

    a. Project name.

    b. Date.

    c. Name and address of Engineer.

    d. Name and address of Contractor.

    e. Name and address of subcontractor.

    f. Name and address of supplier.

    g. Name of manufacturer.

    h. Number and title of appropriate Specification Section.

    i. Drawing number and detail references, as appropriate.

    j. Other necessary identification.

4. Electronic PDF submittal files shall be named utilizing the specification number followed by a sequential number for the submittal made under the given specification number followed by "r#" if it is a resubmittal, and then followed by a brief description of the submitted item.

    a. The description shall indicate the actual item submitted, shall not be general in nature, and does not have to be that of the specification section heading.

    b. Using the example, "15135-4r2 Differential Pressure Gauge"; 15135 - Meters and Gauges is the relevant specification, the " 4 shows it was the fourth submittal for specification section 15135, "1-2" shows it was the second resubmittal, and the description indicates what item is submitted.

    c. Each specification item shall be submitted in a separate PDF file. PDF files with multiple specification items will be returned without review.

d. Each file shall have sufficient space allowance for the Engineers review stamp(s).

e. Each file shall have the Contractor’s review stamp(s) and indicate information required by specification 01330-1.4.E.3 above.

5. All marks made by the Contractor shall be in green pen the will be visible when copied.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer or Contractor observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling.

Transmit each submittal using a transmittal form. Engineer will discard submittals received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations.

   Include the same label information as the related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

END OF SECTION 01330

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-control services required by Architect, Owner, Contractor, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.

2. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.

2. Description of test and inspection.

3. Identification of applicable standards.

4. Identification of test and inspection methods.

5. Number of tests and inspections required.

6. Time schedule or time span for tests and inspections.

7. Entity responsible for performing tests and inspections.

8. Requirements for obtaining samples.

9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.

2. Project title and number.

3. Name, address, and telephone number of testing agency.

4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.

7. Identification of product and Specification Section.

8. Complete test or inspection data.

9. Test and inspection results and an interpretation of test results.

10. Ambient conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.

5. Do not perform any duties of Contractor.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field-curing of test samples.

5. Preliminary design mix proposed for use for material mixes that require control by testing agency.

6. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01410 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Provide such other testing and inspecting as are specified to be furnished by the Contractor in this Section and/or elsewhere in the Contract Documents.

2. Concrete and soil compaction testing.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Requirements for testing may be described in various Sections of these Specifications.

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

4. Cost of additional testing requested by Owner found to be in non-compliance with the specifications shall be borne by the Contractor.

C. Work Not Included:

1. Payment for testing shall be by the Contractor.

1.02 QUALITY ASSURANCE

A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E329.

B. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.

1.03 PRODUCT HANDLING

A. Comply with pertinent provisions in Section 01600.

B. Promptly process and distribute required copies of the test reports and related instructions to insure necessary retesting and replacement of materials with the least possible delay in progress of the Work.

PART 2: PRODUCTS

2.01 PAYMENT FOR TESTING

A. Initial Services:

1. The Contractor will pay for the materials testing services as required by the Specifications.

B. Retesting: When initial tests indicate non-compliance with the Contract Documents, subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency, and costs thereof will be borne by the Contractor.

2.02 CODE COMPLIANCE TESTING

A. Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

2.03 CONTRACTOR'S CONVENIENCE TESTING

A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

PART 3: EXECUTION

3.01 COOPERATION WITH TESTING LABORATORY

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

3.02 TAKING SPECIMENS

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

3.03 SCHEDULES FOR TESTING

A. Established Schedule:

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.

2. Provide all required time within the construction schedule.

3. Contractor shall be responsible to coordinate with and give Owner's testing laboratory 24 hours notice prior to testing. Charges due to untimely cancellation of any tests shall be the responsibility of the Contractor.

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

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

END OF SECTION

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01420 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. “Architect”: Architect, Engineer, Architect/Engineer, and A/E are used interchangeably, and refer to the Prime Professional on the project, Anston-Greenlees, Inc.

C. “A/E”: Architect, Engineer, and A/E can be used interchangeably, and refer to the Prime Professional on the project, Anston-Greenlees, Inc.

D. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. “Contractor”: The project contractor directly under contract for the project with the Owner.

F. “Sub-contractor”: A contractor under contract directly with the project Contractor.

G. “Owner”: The City of Tampa, and specifically the Water Department, is the Owner.

H. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

I. “Engineer”: Architect, Engineer, and A/E can be used interchangeably, and refer to the Prime Professional on the project, Anston-Greenlees, Inc.

J. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled”, and "specified" have the same meaning as "indicated."

K. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

L. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

M. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

N. "Provide": Furnish and install, complete and ready for the intended use.

O. "Installer": Contractor or another entity engaged by the project Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular and specific construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

P. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

Q. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc.	(202) 862-5100	www.aluminum.org
AABC	Associated Air Balance Council	(202) 737-0202	www.aabchq.com
AAMA	American Architectural Manufacturers	(847) 303-5664	www.aamanet.org
ACI	American Concrete Institute/ACI International	(248) 848-3700	www.aci-int.org
ADC	Air Diffusion Council	(312) 201-0101	www.flexibleduct.org
AGC	Associated General Contractors of America	(703) 548-31 18	www.agc.org

AIA	American Institute of Architects	(202) 626-7300	www.e-architect.com
ANSI	American National Standards Institute	(202) 293-8020	www.ansi.org
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	(800) 527-4723	www.ashrae.org
ASTM	American Society for Testing and Materials	(61 0) 832-9585	www.astm.org
AWI	Architectural Woodwork Institute	(800) 449-8811	www.awinet.org
CLFMI	Chain Link Fence Manufacturers Institute	(301) 596-2583	www.chainlinkinfo.org
CRSI	Concrete Reinforcing Steel Institute	(847) 517-1200	www.crsi.org
CSI	Construction Specifications Institute	(800) 689-2900	www.csinet.org
NAAMM	National Association of Architectural Metal Manufacturers	(312) 332-0405	www.naamm.org
NECA	National Electrical Contractors Association	(301) 657-3110	www.necanet.org
NEMA	National Electrical Manufacturers Association	(703) 841-3200	www.nema.org
NFPA	National Fire Protection Association	(800) 344-3555	www.nfpa.org
NHLA	National Hardwood Lumber Association	(800) 933-0218	www.nathardwood .org
NRCA	National Roofing Contractors Association	(800) 323-9545	www.nrca.net
SMACNA	Sheet Metal and Air Conditioning Contractors National Association	(703) 803-2980	www.smacna.org

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are

subject to change and are believed to be accurate and up-to-date as of the date of the 2013 Contract Documents.

1. FBC: Florida Building Code

    a. http:llwww.floridabuilding.orglc/default.aspx

    b. (850) 487-1 824

END OF SECTION 01420

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:

1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Electric power service.
5. Lighting.
6. Data and telephone service.

C. Support facilities include, but are not limited to, the following:

1. Project identification and temporary signs.
2. Waste disposal facilities.
3. Field office.
4. Storage and fabrication sheds.
7. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Stormwater control.
3. Tree and plant protection.

4. Pest control.

5. Site construction zone enclosure fence.

6. Security enclosure and lockup.

7. Barricades, warning signs, and lights.

8. Temporary enclosures.

9. Fire protection.

10. Maintaining Life Safety and Means of Egress.

E. Related Sections include the following:

1. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.

2. Division 1 Section "Execution Requirements" for progress cleaning requirements.

3. Divisions 16 for temporary electrical and phasing requirements.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. Owner's construction forces.

2. Architect.

3. Testing agencies.

4. Personnel of authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.

2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.

2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-318-inch OD line posts and 2-718-inch OD corner and pull posts.

C. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

1. Field Offices: Prefabricated or Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Drinking-Water Fixtures: Drinking-water fountains, or containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

E. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

F. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

2. Toilets: Use of facility in Job Trailer.

3. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.

4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.

    a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

C. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

D. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

E. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period, Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.

F. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.

1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. If necessary, locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access. Contractor shall provide all required utilities for support facilities.

2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

C. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.

2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.

D. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and

persons seeking entrance to Project. Do not permit installation of unauthorized signs.

1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.

2. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.

3. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.

4. Architect to provide a template for the sign.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

F. (Optional) Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 8 persons at Project site. Keep office clean and orderly.

1. Furnish and equip offices as follows:

a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.

b. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.

c. Coffee machine and supplies, including regular and decaffeinated coffee, filters, cups, stirring sticks, creamer, sugar, and sugar substitute.

d. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot square tack board.

2. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.

G. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

H. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Restrooms: Contractor to provide all temporary restroom facilities for construction personnel.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

C. Tree and Plant Protection: Install temporary fencing located outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

D. Site Enclosure Fence: Before construction operations begin install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.

1. Set fence posts in compacted mixture of gravel and earth or in concrete bases.

2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.

3. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

E. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

F. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.

   a. Field Offices: Class A stored-pressure water-type extinguishers.

   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.

   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.

4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

5. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

6. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.

2. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns.

3. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

4. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION 01500

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 1 Section "References" for applicable industry standards for products specified.

2. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.

3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Item’s purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.

2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.

b. Generic name used in the Contract Documents.

c. Proprietary name, model number, and similar designations.

d. Manufacturer's name and address.

e. Supplier's name and address.

f. Installer's name and address.

g. Projected delivery date or time span of delivery period.

h. Identification of items that require early submittal approval for scheduled delivery date.

i. Refer to specific specification sections for more submittal and shop drawing requirements.

3. Submittal: Within 30 days after date of commencement of the Work, submit 5 copies of product list and shop drawings. Include a written explanation for omissions of data and for variations from Contract requirements.

4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of complete submittal. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration at least 15 days prior to the bid due date. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 calendar days of receipt of a request for substitution. Architect will notify Contractor of acceptance of proposed substitution by addendum, within the allowable addendum period, prior to bid date. Any substitution request that is not accepted by an official addendum shall be deemed un-acceptable.

a. Form of Acceptance: Addendum.

b. Use product specified if Architect does not make a decision on use of a proposed substitution within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products to allow for inspection and measurement of quantity or counting of units.

6. Store materials in a manner that will not endanger Project structure.

7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

9. Protect stored products from damage.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.

3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.

   a. Substitutions may be considered, unless otherwise indicated.

2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.

   a. Substitutions may be considered, unless otherwise indicated.

3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

5. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 15 days prior to bid date. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect may reject requests without action:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.

3. Requested substitution is consistent with the Contract Documents and will produce indicated results.

4. Substitution request is fully documented and properly submitted.

5. Requested substitution will not adversely affect Contractor's Construction Schedule.

6. Requested substitution has received necessary approvals of authorities having jurisdiction.

7. Requested substitution is compatible with other portions of the Work.

8. Requested substitution has been coordinated with other portions of the Work.

9. Requested substitution provides specified warranty.

10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

11. Requested substitution specifically identifies any deviations from the requirements of the specifications and how that deviation is addressed, deleted, or modified.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION

NOT USED

END OF SECTION 01600

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

1.3 SUBMITTALS

A. Certificates: Submit documentation of coordination with any required inspections, testing, and approvals from the authority having jurisdiction, and evidence of the execution of any required easements.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services, and also utility services that cross the various phasing lines of demarcation.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1 Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site, if applicable.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.

b. List of detrimental conditions, including substrates.

c. List of unacceptable installation tolerances.

d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling. Six feet, 6 inches will be permitted in spaces dedicated to mechanical and electrical systems.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

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

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

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division I Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Comply with requirements in Division 1 Section "Cutting and Patching."

2. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Close Out Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.
7. Spare parts list summary.
8. City’s CMMS Asset form for each major component and support equipment and return to the City for processing. (Form is attached)
7. Related Sections include the following:
    a. Refer to Contract for requirements for Applications for Payment for Substantial and Final Completion.
    b. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
    c. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. If applicable, prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

3. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

4. Complete startup testing of systems.

5. Submit test/adjust/balance records.

7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

8. Complete final cleaning requirements, including floor waxing and touchup painting.

9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

10. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

    a. Multiple Inspections: The Architect's Agreement with the Owner includes one Substantial Completion Inspection for the entire project.

        aa. If the Contractor wants additional Inspections, they will be conducted at the Contractor's expense. Cost of multiple Substantial Completion Inspections will be billed at the Architect's and Engineers' hourly rates as identified in the Architect Owner Agreement.

        bb. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

aaa. The Architect's Agreement with the Owner includes one reinspection to determine if the Substantial Completion Punch List has been completed. Cost of more than one re-inspection will be at the Contractor's expense and will be billed at the Architect's and Engineers' hourly rates as identified in the Architect Owner Agreement.

cc. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Contract requirements.

2. Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed by Contractor. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Complete and submit the Owner Training Log in the format provided at the end of this section.

4. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

aa. The Architect's Agreement with the Owner includes one inspection to determine Final Completion. Cost of more than one inspection will be at the Contractor's expense and will be billed at the Architect's and Engineers' hourly rates.

5. Submit Contractor Close Out Documents prior to requesting the final inspection. Close Out Documents are to consist of the documents listed

on the attached Checklist, and any additional documents required elsewhere in the specifications.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.

b. Date.

c. Name of Architect and Construction Manager.

d. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.

b. Accurately record information in an understandable drawing technique.

c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

aa. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

bb. Mark important additional information that was either shown schematically or omitted from original Drawings.

cc. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

dd. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

c. Note related Change Orders, Record Drawings, and Product Data, where applicable.

1.7 EXTRA STOCK - SPARE PARTS LIST

A. Submit a list summarizing all of the spare parts required by each specific section of the specifications, and provide the requested spare parts. Refer to specification section 2 through 16 for spare parts requirements. Obtain a signed

receipt indicating the date, time, location, and the person to whom the part were delivered and received.

1.8 WARRANTIES

A. All work shall be warranted for a period of 1 year unless a longer warranty period is stated elsewhere in the specifications. All warranty periods shall start on date of the approved substantial completion of the final phase of work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Complete a log of activities as indicated in attached Owner Training Log.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Owner, with at least seven days' advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

5. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

a. System design and operational philosophy.

b. Review of documentation.

c. Operations.

d. Adjustments.

e. Troubleshooting.

f. Maintenance.

g. Repair.

h. Review spare parts list

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Remove tools, construction equipment, machinery, and surplus material from Project site.

d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition. Provide floor waxing as specified elsewhere in the construction documents.

e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

f. Sweep concrete floors broom clean in unoccupied spaces.

g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

i. Remove labels that are not permanent.

j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

aa. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

aaa. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

bbb. Replace parts subject to unusual operating conditions.

ccc. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

ddd. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

eee. Clean ducts, blowers, and coils if units were operated without filters during construction.

fff. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

ggg. Leave Project clean and ready for occupancy.

2. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

OWNER TRAINING LOG

07-31-13

Owner's Name:

Construction Contractor:

Signature of Contractor Representative:

Date Submitted:

	Given by:	**Date(s):**	**Time: (Start/finish)**	**Trainees (each to initial):**
HVAC Controls				
HVAC System				

Fire Alarm System

TIPPIN LAB BUILDING HVAC REPLACEMENT

CLOSE-OUT DOCUMENT CHECKLIST

Provide five (5) hard copies of each items, plus a scanned PDF copy of the entire package on CD:

CONTRACTOR'S CLOSE OUT DOCUMENTS:

	1-year warranty Contractor's warranty
	Manufactured systems warranties
	Final Test and Balance Report with attached engineer certification
	Transmittal form, signed by Owner, listing the received quantities of the extra stock (spare parts) materials
	Owner Training Log
	16-division list of subcontractors including telephone numbers and contact names
	Copies of extended warranties as specified, dated to match Certificate of Substantial Completion
	Electrical systems Operation and Maintenance Manuals
	Light Fixture list, with description of each lamp and ballast type, model #, and supplier name/telephone #.
	Operation and Maintenance Manual(s) for all HVAC equipment
	Operation and Maintenance Manual(s) for HVAC control systems
	Approved Equipment Submittals, paper and electronic copy, as specified Mechanical Systems Standard.
	Electronic Control System as-built drawings, as specified in HVAC Controls standard.
	Explanation or evidence of resolution for any Notices of Non-Payment which have been filed
	Original Consent of Surety to final payment
	Original Release and Affidavit
	Spare parts list summary form.
	City’s CMMS asset forms (attached)

ARCHITECTS CLOSE OUT DOCUMENTS

	Electronic as-built drawings (as **AutoCAD© DWG** and **full-size PDF** files) and specifications (PDF files)
	Architect certification letter that punch list is complete and recommendation for acceptance
	Certificate of Final Inspection (signed/sealed)

CMMS Asset Information

Please print/type all of the following requested information.

Equipment Name *(i.e., motor, instrument, lighting, HVAC, etc.)* _____

Manufacturer_____ Equipment #_____

Serial Numbr_____ **New** *or* **Replacement**

Model Number/Name_____

Location_____ Green Tag #_____

Manufactured Date_____ Acquired Date_____

Installed Date_____ Start Date_____

Feet of Head_____ GPM_____ Voltage_____

Amperage_____ RPM_____ HP_____ Phase_____

Range/Span_____ Catalog #_____

Name of person completing this form_____

Additional Comments_____

_____

_____

Please return this form to Carlos Diaz-Estrada, Production Maintenance Supervisor, John Krokenberger, Mechanical Electrical Supervisor or Pat McPhee, I & C Supervisor.

DAVID L. TIPPIN WATER TREATMENT FACILITY
LABORATORY HVAC REPLACEMENT AND RENOVATION

SECTION 02070 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Requirements of Division One shall apply to all work hereunder.

1.02 WORK INCLUDED

A. Coordinate and verify existing conditions, including utilities, prior to commencement of selective demolition.

B. Remove portions of existing slabs/walks as required and shown.

C. Remove designated building equipment, fixtures, partitions and components. Remove partial items as required.

D. Cap and identify exposed utilities.

E. Provide temporary partitions as necessary to allow continued building occupancy by Owner during phased construction.

F. Maintain approved means of egress from existing building exits as required by code.

G. Other items of demolition as indicated on drawings.

1.03 RELATED SECTIONS

A. Section 01100 - SUMMARY OF WORK

B. Section 01500 - TEMPORARY FACILITIES AND CONTROLS

1.04 SUBMITTALS

A. Permits and notices authorizing demolition.

B. Permit for transport and disposal of debris.

C. Schedule: Indicating demolition procedures and operational sequence for review and acceptance by Architect/Engineer prior to start of work. Include coordination for shut-off, capping and continuation of utility services as required.

1.05 JOB CONDITIONS

A. Occupancy: Areas to be demolished will be vacated and discontinued in use prior to start work.

1.06 PROTECTION

A. Do not interfere with use of adjacent existing buildings or parking areas. Maintain free and safe passage to and from.

1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

2. Do not close or obstruct corridors or passageways within the existing building except as shown on the Demolition Plans.

B. Prevent damage, movement or settlement of structure. Provide and place bracing or shoring and be responsible for safety and support of structure. Assume liability for such movement, settlement, damage or injury.

C. Cease operations and notify the Architect/Engineer and Owner immediately, if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored.

D. Provide, erect and maintain barricades, lighting, and guardrails as required by applicable regulatory advisory to protect occupants of building and workers.

1. Erect temporary covered passageways as required by authorities having jurisdiction.

E. Explosives: Use of explosives will not be permitted.

F. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Except where noted otherwise, maintain possession of materials being demolished. Immediately remove from site.

B. Equipment and articles of value remain the property of the Owner. Notify Architect prior to removal and obtain acceptance regarding method of removal.

C. Items of salvageable value only to Contractor may be removed from area as work progresses. Salvaged items must be transported from site as they are removed.

PART 3 - EXECUTION

3.01 PREPARATION

A. Erect weatherproof closures for exterior openings. Maintain exit requirements.

B. Erect and maintain dustproof partitions as required to prevent spread of dust, fumes and smoke to other parts of the building. On completion, remove partitions and repair damaged surfaces to match adjacent surfaces.

C. Coordinate installation and removal of temporary partitions with the Owner to facilitate Owner's use of building.

D. During removal of any existing parapets or roofing, provide proper protection from falling objects entrances which are to be kept open during normal working hours.

E. Carry out demolition work to cause as little inconvenience to adjacent occupied building areas as possible.

3.02 DEMOLITION

A. Demolish in an orderly and careful manner as required to accommodate new work, including that required for connection to the existing building. Protect existing foundations and supporting structural members.

B. Perform demolition in accordance with applicable authorities having jurisdiction.

C. Immediately repair all demolition performed in excess of that required, at no cost to the Owner.

D. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level.

E. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution. Do not use water at interior of building.

2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of work. Supply and maintain dust mats at all dust partition doors.

3.03 DISPOSAL

A. Burning of materials on site is not permitted.

B. Remove from site any contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers and public.

C. Remove demolished materials, debris, tools and equipment from site upon completion of work. Leave site in a condition acceptable to the Architect/Engineer.

D. Transport materials removed from demolished structures and dispose of off site at an approved location.

END OF SECTION 02070

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparing of subgrade for building, slabs, walks, pavements and other site work.

B. Excavating and backfilling for utilities outside building lines.

C. Rough and finish grading.

D. Excavating for filling and grading.

E. General filling and compaction.

1.02 DEFINITIONS

A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.

1. Under footings, foundation bases or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect, who will make an inspection of conditions. If Architect determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect.

1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

E. Structure: Buildings, foundations, slabs, or other man-made stationary features occurring above or below ground surface.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Contractor will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations. Contractor to coordinate testing schedule and requirements as specified herein.

1.04 PROJECT CONDITIONS

A. Site Information: Data in subsurface investigation reports was used for the basis of the design and are available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

1. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

a. Provide minimum of 48-hour notice to Architect, and receive written notice to proceed before interrupting any utility.

3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

C. Use of Explosives: Use of explosives is not permitted.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.

2 Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

3. Perform excavation by hand within drip line of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Unless otherwise noted by the Subsurface/Geotechnical Report, the following soils are or are not acceptable:

1. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SW, and SP, free of rubble, organics, clay, debris and other similar unsuitable material.

2. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SM, SC, ML, MH, CL, CH, OL, OH, and PT.

B. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

C. Contractor to provide fill material as required, and shall be responsible to run proctor tests for fill suitability.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

3.02 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.03 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.04 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.05 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.06 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.

2. Under walks and pavements, use satisfactory excavated or borrow material, or a combination.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.

2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.

3. Removal of concrete formwork.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

5. Removal of trash and debris from excavation.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.07 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

B. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction. **Contractor to coordinate and adjust site preparation and compaction requirements as per the Subsurface/ Geotechnical Report**.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557:

a. Under walks, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

4. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.08 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.09 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Contractor shall provide testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

1. Field density tests shall be taken by the Testing Laboratory at locations and depths required by the Testing Laboratory to endeavor to insure that all existing subgrade soil, backfill and fill is properly placed and compacted.

2. Two field density tests, in accordance with ASTM D 1556, will be performed per 1,000 square feet for concrete mechanical yard.

3. Footing subgrade: For each strata of soil on which footings will be placed, conduct at least one test every 25 lineal feet for continuous and strip foundations. In no case shall the number of tests be less than three for continuous and strip foundations to verify required design bearing capacities.

4. If in opinion of Engineer, based on testing service reports and inspection, subgrade of fills which have been placed are below specified density, provide additional compaction and testing at no additional charge to the Owner.

3.10 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

3.11 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.15 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

END OF SECTION 02200

SECTION 02830 –VINYL FENCING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. This work includes the furnishing and installation of custom 5 feet high vinyl fence and gates, including all components (i.e. pickets, rails, posts), as shown on the drawings and matching existing mechanical fencing design being removed.

1.02 QUALITY ASSURANCE

A. Manufacturer:

1. Provide vinyl fencing and gates as a complete system controlled by a single source manufacturer, including necessary erection accessories, fittings, and fastenings.

B. Erector Qualifications:

1. Installation shall be performed only by a qualified installer with at least five (5) years experience in installations of a similar nature, and as approved by the Architect.

C. Requirements of Regulatory Agencies:

1. The work performed under this section shall be strictly governed by local and state authorities of this area.

D. Warranty:

1. Provide manufacturer standard warranty.

1.03 SUBMITTALS

A. Shop Drawings:

1. Submit electronic shop drawings to Architect for approval of all vinyl fencing and gate fabrications and assemblies, including signed and sealed drawings indicating that the ornamental fence meets or **exceeds the required wind zone pressure, including the foundation design**.

2. Submit drawings in accordance with requirements described in this Section.

3. Obtain Architect’s approval of drawings prior to proceeding with manufacturing.

4. Shop drawings shall indicate fabrication, assembly and erection details, size and gauge of all members, fastenings, supports and anchors, patterns, clearances, and all necessary connections to work of other trades.

B. Product Data:

1. Submit manufacturer's technical data, and installation instructions, including **Florida Product Approval and Notice of Acceptance (NOA) Certification**.

1.04 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. Vinyl Fencing shall be as noted on Drawings.

a. Fencing design as shown on drawings.
b. Fencing heights as shown on drawings.
c. Provide required reinforcing and anchoring for applicable use.

B. Manufacturer

1. Provide vinyl fence, gates and accessories equal to Danielle Fence Co., Model "Lakeland 2" with traditional post caps. Gates to have manufacturer's standard hardware plus "panic paddle EXIT device".

2. Finish: Provide manufacturer white finish.

C. Accessories:

1. Provide all required accessories for a complete and operational vinyl fence with gates.

2.03 FABRICATION

A. Per manufacturer standard and accepted practices for vinyl fence.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

B. Set fence posts on concrete and secured as recommended by the manufacturer.

C. Center and align posts. Install ground-set items in concrete for anchorage. Recheck vertical and top alignment of posts and make necessary corrections.

3.02 CLEANING

A. Job site shall be cleared of excess materials. Post hole excavations shall be scattered uniformly away from posts. Clean aluminum fence with mild household detergent and rinse well with clean water. Mortar shall be removed from exposed posts using a 10% solution of muriatic acid followed immediately by several rinses with clean water.

END OF SECTION 02830

SECTION 03310 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Provide cast-in-place concrete work as shown on drawings and specified herein.

B. Codes and Standards: ACI 301, “Specifications for Structural Concrete Building”, ACI 318, “Building Code Requirements for Reinforced Concrete”; comply with applicable provisions except as otherwise indicated.

1.02 MATERIALS CERTIFICATES

A. Provide materials certificates signed by manufacturer and Contractor, certifying that each material item complies with or exceed specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.03 QUALITY CONTROL

A. Contractor’s testing laboratory will perform sampling and testing during concrete placement, to include the following. This testing does not relieve Contractor of responsibility of providing concrete in compliance with specifications. Contractor may perform additional testing as necessary to ensure quality of concrete.

1. Sampling: ASTM C 172.

2. Slump: ASTM C 143; one test as point of discharge for each set of compressive test specimens; additional tests when concrete consistency seems to have changed.

B. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens made.

C. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

D. Compress Strength Test: ASTM C 39; one set for each day’s pour exceeding 5 cubic Yards, plus additional sets for each additional 5 cubic yards over each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required. When the total quantity of a given class of concrete is less than 50 cubic yards, Architect may waive strength test is field experience indicates evidence of satisfactory strength. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

1. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength tests equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

1.04 TEST RESULTS

A. Test results will be reported in writing to Architect, Contractor, and concrete producer within 24 hours after tests are made.

1.05 NONDESTRUCTIVE TESTING

A. Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

1.06 ADDITIONAL TESTS

A. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have no been attained in the structure, as directed by Architect. Testing service may conduct test to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

1.07 SUBMITTALS

A. Submit the following:

1. Manufacturer's data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials, and others as requested by Architect.

2. Laboratory test or evaluation reports for concrete materials and mix designs.

1.08 MIX PROPORTIONS AND DESIGN

A. Proportion mixes complying with mix design procedures specified in ACI 301.

1. Submit written report to Architect for each proposed concrete mix at least 15 days prior to the start of work. Do not begin concrete production until mixes have been reviews and are acceptable to Architect.

2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results, or other circumstances warrant. Do no use revised concrete mixes until submitted to and accepted by Architect.

B. Concrete to be 3,000 psi strength after 28 days, unless otherwise noted on drawings.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Fly Ash: ASTM C 618, Type C or F.

1. Limit use of fly ash in concrete mix designs to exceed 25 percent of cement content by weight.

C. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when acceptable to Architect.

D. Water: Drinkable.

E. Air-Entraining Admixture: ASTM C 260.

F. Water-Reducing Admixture: ASTM C 494; type as required to suit project conditions. Use only admixtures that have been tested and accepted in mix designs.

2.02 RELATED MATERIALS

A. Waterstops: Flat dumbbell or centerbulb type, size to suit joints, or either rubber (CRD C 513) or PVC (CRD C 572).

B. Moisture Barrier: Clear 10-mils-thick polyethylene.

C. Membrane-Forming Curing Compound: ASTM C 309, Type I.

D. Expansion Joint Material: Non-bituminous expansion joint filter shall be 1” thick non-extruded cork, sponge rubber or closed cell plastic foam fill and shall not contain asphalt or tar, conforming to ASTM D 1752, Type II, or AAAHO M-153, Type II.

2.03 FORM MATERIALS

A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.

B. Exposed Concrete Surfaces: Suitable material to suit project conditions.

2.04 REINFORCING MATERIALS

A. Deformed Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

B. Welded Wire Fabric: ASTM A 185: 6 x 6 – W1.4 x W1.4 required on slab. Furnish flat sheets and provide stirrups to maintain mesh form laying on ground.

PART 3 - EXECUTION

3.01 FORMING AND PLACING CONCRETE

A. Ready-Mix Concrete: ASTM C 94.

B. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation, and position.

C. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.

D. Clean and adjust forms prior to concrete placement. Apply form-release agents or wet forms, as required. Retighten forms during concrete placement if required to eliminate mortar leaks.

E. Vapor Barrier: Following leveling and tamping base fro slabs on grade, place vapor retarder/barrier sheeting with longest dimension parallel with direction of pour.

1. Lap joint 6 inches and seal vapor barrier joints with manufacturers' recommended mastic and pressure-sensitive tape.

F. Reinforcement: Position, support, and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers and hangars, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

G. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.

H. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joists so as not to impair strength and appearance of structure. Place isolation and control joints in slabs-on-ground to stabilize differential settlement and random cracking.

I. Installation of Embedded Items: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting diagrams, templates, and instruction provided by others for locating and setting.

J. Concrete Placement: Comply with ACI, placing concrete in a continuous operations within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

K. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items into forms.

L. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.

1. In cold weather comply with ACI 306.

2. In hot weather comply with ACI 305.

3.02 CONCRETE FINISHES

A. Exposed-to-View Surfaces: Provide medium broom finish for exposed surfaces. Remove fins and projections, patch defective areas.

B. Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

END OF SECTION 03310

SECTION 03320 - CONCRETE PATCHING, LEVELING AND GROUTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Requirements of Division One shall apply to all work hereunder.

1.02 WORK INCLUDED

A. Work included under this Section includes patching, leveling, grouting and repairing of all interior concrete floors, concrete walks, demolition damage, unlevelness, etc. within the project as required to complete the Work. Included is grouting of all anchors, dowels, plates, etc.

1.03 RELATED SECTIONS

A. Section 03310 - CAST-IN-PLACE CONCRETE

B. Section 01045 - CUTTING AND PATCHING

1.04 QUALITY ASSURANCE

A. Manufacturer: Minimum of five (5) years successful experience in the manufacture of the type products specified.

B. Workmanship of fabrication and installation shall be of top quality and only performed by personnel skilled in the required techniques necessary for a first class finished installation.

C. Materials shall be in as much as possible from a single manufacturer. Deliver materials to site in manufacturer's labeled containers. Follow all recommendations of the manufacturer for the proposed installation.

1.05 SUBMITTALS

A. Product Data: In accordance with Section 01300, included manufacturer's data concerning strength, bond, appropriateness for location intended, etc. List which materials are to be used at what locations, installation recommendations, clean-up, etc.

1.05 PROJECT CONDITIONS

A. Interior Conditions: Maintain temperature and humidity in installation area to match final project conditions. Do not install any product until required temperature and humidity have been stabilized and will be maintained in installation areas.

B. Exterior Conditions: Follow manufacturer's printed recommendations regarding temperature ranges. Ensure substrate is at temperature or within acceptable range.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to full compliance with all requirements, the following manufacturers offer products that may be incorporated into the work.

1. Cementitious floor leveling underlayment:

   a. Equal to: Burke Co. - Flow True Premium Floor Leveller

2. Epoxy crack grouting, patching and repairing material:

   a. Equal to: Burke Co. - Burk Epoxy.

1. Non-shrink, non-metallic grout:

   a. Equal to: Burke Co., - Non-Ferrous, Non-Shrink Grout.

2.02 PATCHING MATERIALS

A. For patching, leveling and repairing existing interior concrete, utilize product specifically designed for concrete patching with superior bonding capabilities to the existing concrete. Floor leveling material shall be a cementitious based compound capable of obtaining a minimum compressive strength of 4,100 psi after 28 days. Material shall be compatible with floor finish, setting bed, adhesive, etc. For repairing cracked, spalled, or otherwise damaged surfaces, utilize an epoxy resin system with 100% solids capable of obtaining a minimum compressive strength of 9,000 psi.

B. Provide any primers, additives, or other components necessary for complete and first class installation. Utilize a concrete primer for porous concrete surfaces to be leveled.

C. Where required for greater thickness to be filled, use a clean, dry, well-graded aggregate extender as recommended by the manufacturer. Do not add any admixtures, unless approved by manufacturer and Architect. Do not use any chlorides in mixture.

D. In expose exterior or wet interior area, finish with a non-slip surface. Otherwise finish to a smooth dense, ready to accept floor covering material. For exposed interior areas, provide a clear sealer applied in accordance with manufacturer's requirements. Verify compatibility with patching material.

E. Do not use any thinners or solvents in mixtures.

2.03 GROUTING MATERIALS

A. For non-shrink grouting of structural components, anchors, equipment, base plates, wall cavities, railings, etc., utilize a non-gas liberating, non-shrink, non-metallic cement grout designed for such uses. Grout shall obtain minimum compressive strength of 6,500 psi in 28 days.

B. Do not use any admixtures. Material shall be ready to use as supplied by manufacturer with addition of water only.

C. Water: Clean, potable, with same requirements as for concrete.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Remove any loose concrete.

B. If surface is moderately contaminated with oil, grease, curing compounds, wax, coatings, food acids, dust or laitance, it shall be cleaned with detergents and rinsed thoroughly. Then, surface shall be roughened by grinding, sandblasting, or mechanical scarification and vacuumed or blown with compressed air to completely remove all loosened material.

C. To remove only laitance, or normal amount or dirt or solids from a concrete surface, use a 1:2 muriatic acid/water etch. Rinse with an ammonia solution followed by another thorough rinsing with clean water. Proper surface preparation as required by manufacturer shall be performed.

D. Surface preparation and filling of cracks shall be in accordance with the manufacturer's instructions. Substrate shall be clean and properly prepared.

3.02 INSTALLATION

A. Install all materials in strict accordance with manufacturer's requirements. Verify that material to be used is compatible with all surfaces and materials that come in contact with the products. Do not re-temper material after initial mixing.

B. Apply primers to existing surfaces as required. Mix all ingredients in accordance with manufacturer's requirements.

C. Do not install if surface temperatures or ambient temperature is not within manufacturer's accepted range.

D. Mix only the amount of material that can be utilized within a short time period, as recommended by manufacturer.

E. Upon application into recesses, holes, cracks, etc., sufficiently tamp or vibrate material to ensure complete filling of void. Place material continuously and from one side only to avoid air entrapment. Place additional material into void if surface recedes below desired finish level.

F. When patching holes deeper than manufacturer's limits, apply material in layers to allow thermal expansion contract to take place. Each layer shall be allowed to cool and harden before the next layer is placed.

G. When grouting beneath base plates, at railing posts, and other locations exposed to the weather, provide slope away from items to ensure proper drainage.

H. Provide sufficient vent holes for grout to allow proper curing.

I. Properly cure all installed materials in accordance with manufacturer's requirements. Use damp methods as recommended.

J. Apply sealant to surfaces where required only after material has cured.

K. Do not overwork installed materials to prevent segregation, bleeding, or breakdown of initial set.

3.03 CLEANING AND PROTECTION

A. Immediately clean adjacent surfaces of any splatter, drop or other incidental contact of material with surfaces. Prevent damage to any other surface or material.

B. Provide protection against traffic or use of areas until such time as material has sufficiently cured in accordance with manufacturer's requirements and unique job conditions.

C. Clean work areas during and after installation of all excess materials, containers, wrapping, splatter, etc. Repair or replace any damaged areas to specified condition.

END OF SECTION 03320

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 QUALITY ASSURANCE

A. Codes and Standards: Comply with governing codes and applicable provisions of the following:

1. National Concrete Masonry Association (NCMA), including "TEK Bulletins".

2. American Concrete Institute (ACI), including ACI 531, ACI 531R and ACI 531.1.

3. Portland Cement Association (PCA), "Concrete Masonry Handbook".

B. Fire Performance Characteristics: Where fire-resistance ratings are indicated for unit masonry work, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory and other manufactured products, including certifications that each type complies with specified requirements.

1.04 JOB CONDITIONS

A. Protection of Work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over all surface.

F. Protect sills, ledges and projections from droppings of mortar.

G. Cold Weather Protection

1. Do not lay masonry units which are wet or frozen.
2. Remove all masonry determined to be damaged by freezing conditions.

3. No masonry work shall be performed when the air temperature is 38 deg. F. and falling.

PART 2 - PRODUCTS

2.01 MASONRY UNITS - GENERAL

A. Manufacturer: Obtain masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas.

B. Masonry Unit Characteristics: Provide units complying with standards referenced and requirements indicated.

2.02 CONCRETE MASONRY UNITS (CMU)

A. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" (15-5/8" x 7-5/8" actual), unless otherwise indicated.

B. Hollow Load Bearing (HL) CMU: ASTM C 90 and as follows:

1. Grade N.

C. Weight Classification: Normal weight units unless otherwise indicated. (125 lbs. per cu. ft. or more, oven dry weight of concrete.)

D. Cure units by atmospheric drying for not less than 30 days before installation, to comply with ASTM C 90, Type II.

E. Exposed Faces: Provide manufacturer's standard color and texture, unless otherwise indicated.

1. Where special finishes are indicated, provide units with exposed faces of the following general description matching color and texture as selected by Architect from manufacturers standard color and texture.

a. Standard aggregate, ground finish.

b. Standard aggregate, split face finish.

2.03 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Masonry Cement: ASTM C 91.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

E. Aggregate for Grout: ASTM C 404.

F. Water: Clean and potable.

2.04 MASONRY ACCESSORIES

A. Horizontal Joint Reinforcing and Ties for Masonry: Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner ("L") and intersecting ("T") units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross rods, into units with widths of approximately 2" less than nominal width of walls and partitions as required to position side rods for full embedment in mortar with mortar coverage of not less than 5/8" on joint faces exposed to exterior and not less than 1/2" elsewhere. Provide the following type of joint reinforcing unless otherwise indicated.

1. Truss type with diagonal cross rods spaced not more than 16" o.c.

B. Number of Side Rods: Single pair for single wythe masonry.

C. Wire Sizes: Fabricate with 9-gage side and cross rods, unless otherwise indicated.

D. Wire Finish: Provide manufacturer's standard mill galvanized finish except as otherwise indicated.

E. For exterior walls hot-dip galvanized joint reinforcing after fabrication to comply with ASTM A 153, Class B-2 coating (1.5 oz. per sq. ft.).

F. Steel Strap Anchors: Provide straps, bars, bolts and rods fabricated from not less than 16 ga. sheet metal or 3/8" diameter rod stock, unless otherwise indicated.

G. Miscellaneous Masonry Accessories

1. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60 for bars No. 3 to No. 18.

2.05 MORTAR AND GROUT MIXES

A. Do not lower the freezing point of mortar by use of admixtures or anti-freeze agents.

B. Do not use calcium chloride in mortar or grout.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.

D. Limit cementitious materials in mortar to portland cement - lime.

E. Use Type S mortar for all exterior masonry work.

F. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Thickness: Build masonry construction to the full thickness shown, except, build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

B. Cut masonry units with motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Use dry cutting saws to cut concrete masonry units.

C. Do not wet concrete masonry units.

D. Pattern Bond: Lay exposed masonry in running bond vertical joint in each course centered on units in courses above and below except as otherwise noted.

E. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half size units at corners, jambs and wherever possible at other locations.

F. Lay-up walls plumb and with courses level, accurately spaced and coordinated with other work.

G. Stopping and Resuming Work: Rack back 1/2-masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required to be wetted), and remove loose masonry units and mortar prior to laying fresh masonry.

H. Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

I. Fill space between hollow metal frames and masonry solidly with mortar.

J. Where built-in items are to be embedded in cores of hollow masonry units, place a layer metal lath in the joint below and rod mortar or grout into core.

K. Fill CMU cores with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar conditions unless otherwise indicated.

3.02 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units will full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout. For starting courses on footings where cells are not grouted, spread out full mortar bed including areas under cells.

B. Joints - Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise indicated, lay walls with 3/8" joints. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials. Tool all exposed joints in masonry walls slightly concave using a jointer larger than joint thickness. Rake out mortar in preparation for application of caulking or sealants where shown.

C. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar.

3.03 HORIZONTAL JOINT REINFORCING

A. Provide continuous horizontal joint reinforcing as shown and specified. Full embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls and 1/2" at other locations. Lap reinforcement a minimum of 6". Do not bridge control and expansion joints with reinforcing, unless otherwise indicated. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, pipe enclosures and other special conditions.

B. Space conditions horizontal reinforcing as follows:

1. For single wythe walls, space reinforcing at 16" o.c. vertically, unless otherwise indicated.

2. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcing placed in 2 horizontal joints approximately 8" apart, both immediately above lintels and below sills.

3. Extend reinforcing a minimum of 2'-0" beyond jambs of the opening, bridging control joints where provided.

3.04 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

C. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings. Comply with recommendations in NCMA TEK Bulletin No. 28.

END OF SECTION 04200

SECTION 04230 - REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Provide each type of reinforced unit masonry work as indicated on drawings and in schedules and specified herein.

B. Requirements of Section 04200, "Unit Masonry" apply to work of this section.

1.03 SUBMITTALS

A. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Refer to Section 04200 for masonry materials and accessories not included in this section.

B. Reinforcement Bars: Provide deformed bars of Grade 60 complying with ASTM A 615.

C. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

PART 3 - EXECUTION

3.01 PLACING REINFORCEMENT

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).

C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

D. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 5/8" on exterior face of walls and 1/2" at other locations. Lap units not less than 6" at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

3.02 INSTALLATION - GENERAL

A. Refer to Section 04200 for general installation requirements of unit masonry.

3.03 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. General

1. Do not wet concrete masonry units (CMU).

2. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross- webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.

B. Walls

1. Pattern Bond: Lay CMU wall units in 1/2 running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimensions indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells on non-reinforced vertical cells, or provide units with solid bottoms.

C. Grouting

1. Use "Fine Grout" per ASTM C 476 for filling spaces less than 4" in one or both horizontal directions.

2. Use "Course Grout" per ASTM C476 for filling 4" spaces or larger in both horizontal directions.

D. Low-Lift Grouting

1. Provide minimum clear dimension of 2” and clear area of 8 sq. in. in vertical cores to be grouted.

2. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 10 ft.

3. Lay CMU to maximum pour height. Do not exceed 5’ height, or if bond beam occurs below 5’ height stop pour at course below bond beam.

4. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2” below top course of pour.

END OF SECTION 04230

SECTION 05720 – HANDRAILS AND GUARDRAILS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Provide all materials, labor, transportation, protection, apparatus, tools, equipment, incidentals and items necessary to complete in all respects, all interior prefinished aluminum stair railings, handrails, and guardrails, complete with landings, pertinent brackets, closure plates, fittings and pipe railings, and including brackets and flanges complete as located and shown on drawings.

B. Related Work Specified Elsewhere:

1. Section 05500 – METAL FABRICATIONS

1.02 DESIGN CRITERIA

A. The Architect has shown design conditions and effects required, however, support methods, attachments, anchorage and loading shall be the responsibility of the Contractor.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Work performed under this section shall be strictly governed by local and state authorities of this area.

B. Shop Assembly:

1. Preassemble all items specified as work of this section to the greatest extent possible to minimize field splicing and assembly. Disassemble units as required from shipping and handling. Clearly mark units for reassembly in the field.

C. Performance Criteria:

1. Loading Requirements:

a. Railings / Guardrails: Capable of withstanding a uniform load of 50 lbs. per lineal foot applied simultaneously in both vertical and horizontal directions, and concentrated loads of 200 lbf applied at any point in any direction. Uniform and concentrated need not be assumed to act concurrently.

2. Meet Florida Building Code 2010 requirements.

D. Warranty:

1. Provide manufacturer standard warranty of finishes and installation.

E. Design railings to withstand code requirements and a wind loading of a minimum 120 mph.

F. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

1.04 SUBMITTALS

A. Calculations:

1. Submit calculations showing conformance with the loading requirements of this section and including wind load pressures based on 120 mph and code point loads for handrails and guardrails. Calculations shall include design of railings, handrails and all related connections. Calculations shall be signed and sealed by a Professional Engineer registered in the State of Florida.

B. Product Data:

1. Submit manufacturer's fabricator's and finisher's product data, installation instructions, use limitations and recommendations for each material used. Provide certificates stating that materials comply with requirements.

C. Shop Drawings:

1. Submit electron submittals to the Architect for approval. Submit drawings in accordance with requirements described in this section. Approval of drawings shall be obtained prior to proceeding with fabrication.

2. Provide large scale drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations and details of anchorages, connections, and accessory items. Provide installation templates and coordination diagrams.

D. Field Measurements:

1. Take accurate field measurements before preparation of shop drawings and fabrication. DO NOT delay job progress.

E. Samples:

1. Submit duplicate representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected. Provide minimum 12" long samples of handrails. Provide full size samples of all exposed fittings and brackets.

PART 2 - PRODUCTS

2.01 PREPARATION OF SURFACES

A. All components shall be properly cleaned and prepared for installation.

2.02 FABRICATION AND MANUFACTURER

A. General

1. Construct handrails and guardrails to conform to sizes and arrangements indicated. Provide complete assemblies including framing, struts, clips, brackets, angles, bearing plates and other components necessary for the support and anchoring or handrails and guardrails required to anchor to the supporting structure.

B. Handrails and Guardrails:

1. Exterior handrails and guardrails to be as designed on the drawings (ring opening less than 4”) where shown, as manufactured by Fabworx or equal. Post installation to be as indicated on drawings.

2. Fabricate pipe railings to design, dimensions and details indicated. Provide pipe of sizes and shapes indicated and as required to meet wind load pressures.

2. Interconnect railing members as per manufacturer standard details. Form changes in direction of railing members by bending members, insertion of prefabricated elbow fittings, radium bends or by mitering. Provide 1-1/2” diameter aluminum pipe handrails at both side of stairs and stair landing to be attached to stair railing. Provide extensions at top and bottom to meet code.

3. All angles, brackets to be cast or formed of the same type of material and finish as supported rails.

C. Finishes:

1. Railings are to have a PVDF powder coating as per manufacturer standards. Color to be based white.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Handrails and Guardrails:

1. Only experienced mechanics familiar with this particular type of work shall be employed. Installation work shall be performed in accordance with these specifications and approved shop drawings. All shall be installed in a neat, precise, workmanlike manner.

2. Handrails and guardrails shall be installed in areas located detailed on drawings. Secure handrails to concrete per standard manufacturer's cored system to meet load requirements. All workmanship shall be equal to the best practiced modern methods and as determined by the Architect.

3.02 CLEANING, TOUCH-UP AND PROTECTION

A. Touch-up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned or repaired.

B. Provide temporary protection to ensure work is protected from damage or deterioration at time of Final Acceptance. Remove protections and reclean as necessary immediately before Final Acceptance.

C. Upon completion of all work under this section, promptly remove all equipment and debris caused by this branch construction.

END OF SECTION 05720

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Conditions of the Contract apply to this section.

1.02 SCOPE

A. Furnish all labor, material and related items necessary to complete the work indicated on the drawings and/or specified. These items of work to be performed shall include, but are not limited to the following:

1. Nailing strips and grounds.
2. Hardware for securing rough carpentry materials.
3. Lay work out accurately to lines indicated.

1.03 QUALITY ASSURANCE

A. Qualifications of Workmen: Provide sufficient workmen and supervisors of who shall be present at all times during execution of this portion of the work, and who shall be thoroughly familiar with the type of construction n involved and the materials and techniques specified.

B. Rejection: In acceptance or rejection of rough carpentry, the Architect will make no allowance for lack of skill on the part of the workman.

C. Product Handling

1. Protection

a. Store all materials in such a manner as to ensure proper ventilation and drainage, and to protect against damage and the weather.

b. Keep all materials clearly identified with all grade marks legible. Keep all damaged material clearly identified as damaged, and store separately to prevent its inadvertent use.

c. Do not allow installation of damaged or otherwise non-complying material.

d. Use all means necessary to protect the installed work and materials of all other trades.

2. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - EXECUTION

2.01 INSPECTION

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

2.02 WORKMANSHIP

A. General: All rough carpentry shall produce joints true, tight and well-nailed, with all members assembled in accordance with the drawings and with all pertinent codes and regulations.

B. Selection of Lumber Pieces: Carefully select all members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making connections.

C. Cut out and discard all defects which will render a piece unable to serve it intended function. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, rook, mildew, fungus, or mold, as well as for improper cutting and fitting.

2.03 PRESSURE TREATED LUMBER

A. General: Use only pressure treated lumber for all sills, nailing grounds in, or in contact with, concrete.

B. Treatment: Pressure treat all wood, as indicated on drawings and Section 06100. All pressure treated lumber for use on site shall have cut ends saturated with same preservative used on the material originally.

C. Perform all treatment in strict accordance with the published recommendations of the manufacturer of the treatment preservative.

PART 3 - GENERAL FRAMING

3.01 INSTALLATION

A. General:

1. All rough carpentry work shall be set accurately to required levels and lines, with members plumb and true, and accurately cut and fitted.

2. All rough carpentry work shall be securely attached to substrates by anchoring and fastening as shown, and as required for structural adequacy. On exposed rough carpentry work, nail heads shall be countersunk and holes filled.

3. Fasteners shall be of size that will not penetrate members where opposite side will be exposed to view or will received finish materials. Tight connections shall be made. Fasteners shall be installed without splitting of wood; predrill as required.

4. Use washers where required for fasteners to avoid movement of material through loading and/or vibration.

5. Seal ends where exposed to moisture or where moisture could migrate via gravity, capillary action, expansion or pressure gradients.

B. Wood Grounds, Nailers, and Blocking:

1. Wood grounds, nailers, and blocking shall be installed where indicated on the Drawings, and wherever required for screeding or attachment of other work. Shapes shall be formed as shown and cut as required for true line and level of work to be attached.

2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork prior to concrete placement.

PART 4 - WORKMANSHIP

4.01 Work shall be performed in conformance with good trade practice, recommendations of manufacturer's building codes, and these specifications unless specifically indicated otherwise on the drawings

END OF SECTION 06100

SECTION 06400 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Architectural woodwork includes all interior and exterior woodwork exposed to view, and includes, but not limited to:

a. Laboratory Casework, including fixed base units and wall units.

b. Casework hardware.

c. Molded Epoxy Resin Lab Sinks and Tops (with integral backsplash).

d. Shop applied finishes.

1.02 QUALITY ASSURANCE

A. Fabricator's Qualifications:

1. Fabricator of casework shall have a minimum of five (5) years experience in the fabrication of custom laboratory casework.

B. Reference Standards:

1. Standards: The following referenced standards and standard specifications, referred to thereafter by designation only, form a part of this Section:

a. American National Standards Institute (ANSI):
Mat-Formed Wood Particleboard.
Medium Density Fiberboard for Interior Use.
Marine Grade Plywood.

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

C 1036, Specification for Flat Glass.
C 1048, Specification for Heat Treated Flat Glass - Kind HS, Kind FT, Coated and Uncoated Glass.
D 523, Test Method for Specular Gloss.
D 2898, Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
E 84, Test Method for Surface Burning Characteristics of Building Materials.

c. American Wood Preservers Association (AWPA):

Structural Lumber-Fire-Retardant Treatment by Pressure Processes.

d. Architectural Woodwork Institute (AWI):

Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program Fifth Edition.

e. National Electrical Manufacturers Association (NEMA):

NEMA LD 3-91, Application, Fabrication and Installation of High-pressure Decorative Laminates.

f. Hardwood Plywood Manufacturers Association (HPMA):

HPMA FE-86, Voluntary Standard for Formaldehyde Emission from Hardwood Plywood Wall Paneling, Wood Composition Board Wall Paneling and Industrial Panels Having Face Veneers.

g. National Wood Window and Door Association (NWWDA):

NWWDA I.S.4 Industry Standard for Water Repellent Preservative.

h. U.S. Voluntary Product Standard (PS):

U.S. Voluntary Product Standard PS 1-83, Construction and Industrial Plywood.

i. Forest Stewardship Council (FSC).

1.03 SUBMITTALS

A. Shop Drawings, Samples and Product Data: Submit in accordance with the provisions of Section 01330.

B. Shop Drawings: Submit for all items of architectural laboratory casework. Show location of each item, dimensioned plans and elevations, and full size or 3 inch scale details. Include all required field dimensions on shop drawings. Also include details of joinery, reinforcement, and hardware locations.

C. Samples for Verification Purposes: Submit samples of the following:

1. High-pressure plastic laminate clad panel products, 6” x 12”, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.

2. Edge banded plywood products, 6” x 12”, for each species and cut.

3. Miscellaneous hardware and specialty items as requested by the Architect.

D. Product Data:

1. Submit manufacturer’s descriptive literature in accordance with provisions of Section 01330; include hardware and specialty items not manufactured by the woodworker.

2. Submit data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

1.04 DELIVERY AND STORAGE

A. The woodwork manufacturer and Contractor shall be jointly responsible to make certain that woodwork is not delivered until the building and storage areas are sufficiently dry so that the woodwork will not be damaged by excessive changes in ambient humidity and relative moisture content.

B. Complete concrete work, masonry work and any other wet work before delivery of woodwork items.

C. Protect casework during transit, delivery, storage and handling to prevent damage, soiling, and deterioration.

1.05 PROJECT CONDITIONS

A. Field Dimensions: The woodwork manufacturer is responsible for details and dimensions not controlled by project conditions and shall show on his shop drawings all required field dimensions beyond his control.

1. The Contractor and woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

2. The Contractor shall acknowledge the woodwork manufacturer's need for accurate field dimensions prior to custom fabrication.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. ANSI/AHA A135.4.

2. High - pressure laminate: NEMA LD3.

3. Softwood plywood: PS1.

4. Formaldehyde emission levels: comply with formaldehyde emission requirements of each voluntary standard referenced below:

a. Hardwood plywood: HPMA FE.

2.02 FABRICATION, GENERAL

A. Any reference to Premium, Custom or Economy grade in this Specification shall be as defined in the latest edition of the AWI "Quality Standards". Any item not given a specific quality grade shall be Premium grade as defined in the latest edition of the AWI "Quality Standards".

B. Wood Moisture Content: Comply with requirements of referenced quality standards for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of cabinets and edges of solid lumber members less than 1" in nominal thickness: 1/16".
   2. Edges of solid wood (lumber) members less than 1" in nominal thickness: 1/16".
   3. Edges of rails and similar members more than 1" in nominal thickness: 1/8".

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.

E. Access panels: Whether or not shown, access to any conduit or plumbing concealed within a unit is required. Coordinate these locations with the Plumbing and Electrical Drawings and include location of each of these removable panels on the shop drawings.

F. Attach concealed continuous blocking to underside of any counter as stiffener where span is 4'-0" or more and counter is not supported on casework.

G. Any base cabinet with members made of plywood, which when set in place would have such members in direct contact with resilient flooring or concrete slab, shall be isolated from such substrates by bottom edgebanding with a minimum 1=1/2" high hardwood edgeband.

2.03 LABORATORY CASEWORK WITH CHEMICAL RESISTANT HIGH-PRESSURE LAMINATE FINISH (See 2.05 for Epoxy Tops and Sinks)

A. Quality Standard: Comply with AWI Section 400 and its Divisions 400A, and 400B "Architectural Cabinets".

B. AWI Quality Grade: Custom.

C. Construction: Details shall conform to reveal overlay for cabinet work. All cabinets' construction shall be plywood with laminate surface as per drawings.

D. Plastic Laminate: Chemical Resistant (equal to Winsonart Chemsurf) High-pressure decorative type meeting or exceeding performance standards of NEMA LD 3, in following grades:
   1. GP 50 (0.050" thick), horizontal grade for all horizontal and vertical applications unless otherwise indicated, which equals or exceeds performance standards set by National Electrical Manufacturers Association (NEMA LD3-1975) for Class 1 high pressure laminate plastic as to resistance to wear, burn, stains, moisture and dimensional stability.
   2. Cores: MDO-BB-G2-EXT-APA plywood complying with PS 1 for all cabinet construction except shelving not exposed to view.

3. Backing sheet: Backing sheet grade, of same thickness as laminate, applied to unexposed side of substrates to which high-pressure decorative laminate grades have been applied.

4. BK20 (0.20" thick), backing sheet grade applied to unexposed side of substrates to which high-pressure decorative laminate grades have been applied.

5. For Bidding purposes, colors to be selected (by owner and architect) from manufacturer's full color range of Wilsonart or equal.

2.04 CASEWORK HARDWARE AND ACCESSORY MATERIALS

A. General: Provide casework hardware and accessory materials associated with architectural cabinets.

B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural casework.

C. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA QA156.18 for BHMA code number indicated.

2.05 EPOXY RESIN LABORATORY TOPS AND SINKS

A. Materials: Provide tops, splashes and sinks molded from modified epoxy resins and inert fillers of uniform mixture, which together form a thermosetting material.

1. Color: Provide non-glare "Black" tops and "Black" sinks to match existing.

2. Products: Subject to compliance with requirement, provide products of one of the following or equal:

a. Epoxyn, Mountain Home, Arkansas

b. Laboratory Tope, Inc., Taylor, Texas

B. Physical Properties: Minimum values, unless otherwise indicated, measured in accordance with standard test methods referenced with each property, as follows:

1. Flexural Strength: ASTM 790, 14,500 psi.

2. Compressive Strength: ASTM D 695, 34,500 psi.

3. Hardness Rockwell "M": ASTM D 785, 110.

4. Density: ASTM D 792, 2.0 g/cc.

5. Water Absorption: ASTM D 570, 0.03%

6. Flame Test: ASTM D 635, self-extinguishing.

C. Fabrication: Provide 1" thick tops in most practical lengths up to 98" maximum.

1. Provide tops with integral ¾" thick by 4" high coved backsplashes, with a minimum 5/8" radius at junction between top and splash.

2. Provide flat tops with "marine edge" to control spillage.

3. Provide cutouts for electrical boxes, plumbing trim and other countertop devices, as required. Drill all holes for fixtures and fittings. Coordinate locations with existing tops.

D. Top Fabrication Tolerances:

1. Size: Length ± 1/8", width and thickness ± 1/16".

2. Squareness: ± 1/64" for each 12".

3. Flatness: ± 1/16" for each 36" span; ± 3/32" in 96" span.

4. Location of cutouts and drillings: ± 1/8".

5. Sizes of cutouts and drillings: + 1/8", -0".

E. Epoxy Resin Sinks: Provide one-piece molded epoxy resin sinks, and accessories in sizes and quantities shown on drawings. Furnish each sink with a 1-1/2" diameter epoxy resin tailpiece with strainer, unless otherwise indicated. Provide suitable hangers for installation of sinks to underside of counter tops. Furnish sinks in black color.

PART 3 - EXECUTION

3.01 PREPARATION

A. Pre-Installation Meeting:

1. The Contractor shall arrange a meeting at Project Site prior to delivery of finish carpentry materials. Review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive Work.

   Include in meeting: Contractor, Architect, and Owner's Representatives (if any); installers of finish carpentry work, wet work such as plastering, other finishes, painting, mechanical work and electrical work; and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions.

2. Proceed with finish carpentry installation only when everyone concerned agrees that required ambient conditions can be properly maintained.

3.02 WORKMANSHIP, GENERAL

A. Casework, counter tops and mill work finish and trim shall conform to design and detail indicated. Where practical, finish and assemble work at the woodworking shop.

B. Finish casework and millwork finish and trim smooth and free from machine or tool marks that will telegraph through finish.

C. Apply plastic laminate backer sheets to unexposed surfaces of all decorative laminate covered wood, or plywood.

3.03 INSTALLATION

A. General:

1. Architectural woodwork shall be executed in accordance with details on Drawings. Workmanship shall be of first quality and the construction of all parts shall be of the best current practice. The work shall be assembled so as to hold together with close joints; fastenings shall be concealed; and all work shall be properly and firmly backed-up and blocked where and as required.

B. Casework:

1. Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

3.04 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

A. Repair damaged and defective architectural woodwork work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace materials. Adjust joinery for uniform appearance.

B. Clean hardware, lubricate and make final adjustments for proper operation.

C. Clean architectural woodwork work on exposed and semi-exposed surfaces. Touch shop applied finishes to restore damaged or soiled areas.

D. Protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

3.05 CASEWORK HARDWARE SCHEDULE

A. Casework hardware includes, but is not limited to, the following:

1. Pulls: Satin chrome 4" wire pull, Stanley #4484 or approved equal.

2. Hinges: 5 Knuckle 2-3/4” reveal overlay type with hospital tips and adjustable screw holes, US 20 polished chrome finish, self-closing hinges. Manufacturer/Model #: Rockford #375 or Weber Knapp # M25R4-0-9-091. For doors up to 24 in. wide, weighing up to 20 lbs. - provide 2 hinges; for doors up to 24 in. wide, weighing 20-40 lbs., provide 3 hinges.

3. Full extension draw slides:

a. Drawers under and over 4" deep: Knape and Vogt #8400

4. Drawer silencers: Glynn Johnson #GJ65; provide two per drawer.

5. Heavy-duty adjustable shelf standards and brackets; double slotted steel supports and brackets, Knape and Vogt #85 standards with #185 brackets.

6. Adjustable shelf standards and supports: Steel standards and supports, Knape and Vogt #255 standards with #256 supports.

7. Pin type adjustable supports: Zinc-plated steel for inserting into 1/4" diameter drilled holes, Knape and Vogt #346 supports.

8. Wiring grommets: 2” (51mm) diameter plastic grommets Series SG by Doug Mockett & Company, Inc., Manhattan Beach, CA; color to match plastic laminate.

END OF SECTION 06400

SECTION 07270 - FIRESTOPPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. This Section includes the firestopping of all penetrations through fire-rated walls, and ceilings as herein specified and required by code.

B. Definitions:

1. Fire Barrier: Any floor, wall, or ceiling which is indicated as having a fire-resistance rating.

2. Firestopping: Materials or devices used to seal openings that have been made in fire-rated floors, walls, and/or ceilings for the purposes of passing building service penetrations such as electrical conduits, electrical data of communications cabling, plumbing or mechanical pipes, HVAC or mechanical ducting of any type.

C. Related Work Specified Elsewhere:

1. CUTTING AND PATCHING: Section 01045.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Underwriters Laboratories Inc. (UL):

a. Building Materials Directory, latest edition.

b. Fire Resistance Directory, latest edition.

c. UL1479 - Fire Tests of Through-Penetration Firestops.

2. Factory Mutual (FM):

a. FMS P7825 - Approval Guide 1989; Factory Mutual System; 1989 or later editions.

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

a. E 814 - Standard Method of Fire Tests of Through-Penetration Firestops.

b. E 84 - Surface Burning Characteristics of Building Materials.

B. Testing Requirements:

1. All materials shall be tested as firestop systems in accordance with ASTM E 814 (UL1479) or equivalent. Systems designs shall provide a fire-resistance rating equal to or exceeding the fire-resistance rating of the floor, wall, or ceiling assembly in which it is being installed. Testing shall have been conducted or witnessed by an independent testing agency acceptable to the authorities having jurisdiction.

C. Environmental and In Service Requirements:

1. All materials supplied under this Specification, when installed as firestop systems, shall be suitable for use in the specified environment, and to the expected service conditions of the installation.

2. Environmental Conditions: The following conditions shall be considered in selection of appropriate materials for environmental conditions:

a. Water Sealing: Openings requiring water sealing (such as openings through exterior walls or below grade subject to hydrostatic pressure) shall be sealed using appropriate waterproofing methods and materials subject to Engineer's approval. FIRESTOPPING SHALL BE INDEPENDENT AND IN ADDITION TO THIS FUNCTION.

b. Water-Resistance: All firestopping materials and firestop designs shall be water-resistant and shall be insoluble in water when dried or cured (where said drying and/or curing is required for firestop functionally). All firestopping materials shall be capable of maintaining functionally under conditions of high humidity or transient exposure to water.

c. Ambient Installation Temperatures: Firestop materials supplied shall be capable of being installed under prevailing temperature conditions unless provisions have been made to heat or cool the area of installation as required.

3. In-Service Conditions: The following conditions (along with any other specifications or requirements pertinent to this document) shall be considered in the selection of materials and designs for firestopping.

a. Ampacity Derating: Materials and system designs shall not require ampacity derating in power cable installations.

b. Materials Compatibility: Materials supplied under this Specification shall be compatible with all materials used in the system including materials used in or on penetrants, as well as all construction materials used in conjunction with the system. No solvent based materials shall be used unless specific test documentation is provided certifying compatibility with all contact materials.

c. Flammability and Outgassing: All materials supplied under this Specification shall pose no particular fire hazard in storage, installation, cure or under in-service conditions.

d. Installations Subject to Movement of Penetrants: Openings with penetrants subject to movement or vibration shall be sealed with products and systems designed to accommodate such movement without reduction or loss of functionality.

e. Installations Subject to Frequent Retrofit: Materials and designs provided for through-penetrations where changes or penetrations will be made on a frequent basis, shall be capable of retrofit without damage to the system.

1.03 SUBMITTALS

A. Manufacturer's Data:

1. Submit manufacturer's technical information and installation instructions for each manufactured product.

B. Certification:

1. Submit certificates indicating that said materials conform to specified requirements.

2. Submit evidence of UL Classification, FM Approval, or equivalent third party testing. Submit certificate that such listings are current and subject to follow-up service inspection by listing body.

1.04 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of products to minimize storage time at Project Site.

B. Deliver products to Project Site in original unopened containers bearing the name of the manufacturer, product name, type, and testing agency's identification mark.

C. Store products in accordance with manufacturer's instructions and provide protection from damage and exposure to the elements. All materials shall be stored in locations providing the temperature conditions as detailed by the manufacturer's written instructions. All damaged or deteriorated materials shall be removed from the Project Site.

1.05 JOB CONDITIONS

A. Sequencing/Scheduling:

1. Perform firestopping work after completion of work which penetrates fire barriers, but prior to covering up or eliminating access to the penetration. Coordinate with installers of such other work.

B. Protection:

1. Protect installed work during and after curing period.

2. Protect installed work from damage from construction operations using substantial barriers if necessary.

3. Repair damaged materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide firestopping materials of the following manufacturers provided compliance with specification requirements:

1. International Protective Coatings (IPC) Corporation.

2. 3M.

3. Blo Fireshield, Inc.

4. Dow Corning Corporation.

B. DO NOT substitute for products required by the tested assembly.

2.02 MATERIALS

A. Firestopping Materials:

1. Provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.

2. Use the materials required for the tested assemblies indicated on the schedule. Where no tested assembly is indicated for a particular penetration, use any tested assembly which complies with the requirements of the specifications.

3. Provide products which:

a. Allow normal expansion and contraction movement of the penetrating item without failure of the penetration seal.

b. Emit no hazardous, combustible, or irritating by-products during installing or curing period.

c. Do not require special tools for installation.

B. Labels:

1. Red, permanent marking using the words "FIRE-RATED ASSEMBLY - DO NOT DISTURB - SEE MAINTENANCE INSTRUCTIONS" or equivalent as approved by the authorities having jurisdiction.

2. For marking fire barriers, use wording "FIRE BARRIER - PROTECT ALL OPENINGS" in a manner acceptable to the authorities having jurisdiction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Pre-Installation Inspection:

1. Inspect all fire barriers for penetrations of any type; mark or otherwise identify all penetrations indicating action required: 1) repair; 2) firestopping. Conduct inspection prior to covering up or enclosing walls or ceilings.

2. In the configuration of a particular penetration does not conform to the configuration to suit the assembly, do not use the firestopping assembly in other configurations except as specifically stated in the test report or as approved by the authorities having jurisdiction.

3.02 PREPARATION

A. Prepare penetration in accordance with the material manufacturer's instructions.

B. All contact surfaces, including penetrants and construction surfaces, shall be free of loose dirt, scale or rust, as well as grease or oil.

C. Power to exposed cables shall be shut off, all cable jacketing inspected, and any damage shall be reported to the Electrical Installer and repaired by same before proceeding.

D. Provide drop cloths or other protection as needed to protect surrounding areas.

3.03 INSTALLATION

A. Install penetration seals as per design requirements in strict accordance with manufacturer's instructions.

B. Inspect installation including sealant materials and any damming or support materials to verify integrity of installation. Where system design permits, remove damming or support materials only after it has been determined that sealant materials have fully cured or dried.

C. Install any covering materials or finish as per design requirements and manufacturer's instructions.

3.04 PERMANENT IDENTIFICATION OF PENETRATIONS

A. Mark each fire barrier above lay-in ceilings with words identifying it as a fire barrier at intervals required by authorities having jurisdiction, but not less than 20-feet per 2.02, Paragraph B., herein.

3.05 REPAIRS AND MODIFICATIONS

A. Identify damaged and/or improperly installed seals for repair or modification.

B. Modifications to penetrants shall be accomplished as per the firestop manufacturer's recommendations.

C. Only materials used in the original seal and designated by the manufacturer as suitable for said repair shall be used for this purpose.

3.06 FIELD QUALITY CONTROL

A. All seals shall be inspected for proper installation, drying, curing, adhesion as appropriate for the materials and systems being used. Where necessary, repairs shall be made and repaired installations shall be reinspected.

B. Access of work areas shall remain in place until designated inspector is notified that installation has been completed and is ready for inspection as required.

C. Obtain the services of firestopping material manufacturer's representative to instruct installers and to inspect the completed installations for correctness.

3.07 CLEANING

A. Clean up excess material adjacent to penetrations sealed as work progresses by methods and with cleaning materials approved by the manufacturers of the materials and of products to be cleaned.

END OF SECTION 07270

SECTION 07900 - JOINT SEALANTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. This work includes the furnishing and installation of all joint sealants indicated on Drawings and herein specified.

2. Refer to "Sealant Schedule" located at end of this Section.

1.02 QUALITY ASSURANCE

A. Applicators Qualifications:

1. Sealants shall be applied by an established applicator fully experienced in this type of work with at least five (5) years experience in installations of a similar nature.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Joint Backing:

1. Joint backing shall be closed cell polyethylene in round or square shape; and shall be non-staining, non-absorbent and capable of at least 30% recovery.

B. Exterior Sealants:

1. General Electric Silpruf Sealant, Tremco Spectrum 2 Silicone Sealant, or approved equal.

2. Color of sealant will be selected by Architect from manufacturer's standard color line.

C. Interior Sealants:

1. Arylic-Latex Sealant, latex rubber modified, as manufactured by Dow Corning, Tremco, Pecora, or WR Meadows, Inc.

2. Color of sealant will be selected by Architect from manufacturer's standard color line.

D. Mildew-Resistant Sealant:

1. One-part mildew-resistant silicone sealant, Type S; Grade NS, Class 25. Uses NT, G, A, and as applicable to nonporous joint substrants indicated; O, formulated with fungicide for sealing interior joints with nonporous substrates around sinks and plumbing fixtures.

E. Primer:

1. Primer, if required, shall be as recommended by manufacturer.

F. Refer to Sealant Schedule located at end of this Section for location of materials.

PART 3 – EXECUTION

3.01 PREPARATION

A. All joints or channels shall be cleaned and free of dirt, oil, grease, moisture, loose mortar or other foreign matter.

B. Metal surfaces shall be wiped with Xylol or MEK and then dried.

C. Masonry surfaces shall be cleaned with a wire brush and then blown clean. All waterproofing treatments, if occurring, contaminating the joint shall be completely removed.

3.02 JOINT PRIMING

A. Prime joint substrates where indicated and/or recommended by sealant manufacturer. Apply primer to comply with joint sealant manufacturer's instructions. Confine primers to areas of joint sealer bond; do not allow spillage or migration onto adjoining surfaces.

3.03 APPLICATION

A. Joint Backing:

1. Install joint backing rod in accordance with manufacturer's instructions and recommended sizing for width of joint.

B. Sealant:

1. Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.

2. Apply sealant with hand gun or air gun under sufficient pressure and through nozzle openings of such a diameter so that a full bead of sealant is run into the joint and fills the opening completely.

3. All beads shall be tooled immediately after application to ensure firm and full contact with the inner-face of the joint.

4. Depth of sealant bead, in general, shall be ½ width of joint.

5. Remove all excess material and smears adjacent to joint as work progresses.

6. Add security caulking on top of regular caulking to a height of 7'- 4". The security caulking is to be such that the regular caulking is beyond the normal reach of persons.

3.04 SEALANT SCHEDULE

A. Sealants shall be applied to all openings which normally require sealing including, but not limited to, the following:

1. Exterior expansion and control joints.

2. Exterior joint subject to movement.

3. Interior and exterior joints around hollow metal door frames, and storefront frames.

4. Interior and exterior joints where dissimilar materials meet and are normally sealed.

END OF SECTION 07900

SECTION 09510 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Provide all labor, equipment and materials necessary to install acoustical ceiling systems complete as located and detailed on Drawings.

a. Acoustical lay-in tile.

1.02 QUALITY ASSURANCE

A. Applicator Qualifications:

1. Installation shall be performed only by a qualified installer with at least five (5) years experience in installations of a similar nature.

B. Design Criteria:

1. All finish materials specified under this Section shall have a minimum Class I (or A) flame spread rating of 25 or less when tested in accordance with ASTM E 84, Standard Test Method for Surface Burning characteristics of Building Materials (Tunnel Test).

2. The Acoustical grid system shall conform to structural classifications of ASTM C 635.

1.03 SUBMITTALS

A. Samples:

1. Submit triplicate full-size samples of acoustical material proposed for use including suspension system. Each sample shall bear a label indicating the type, quality, and color of the material and shall bear the manufacturer's name.

1.04 PRODUCT, DELIVERY, STORAGE, AND HANDLING

A. The materials shall be delivered to the Project Site in the manufacturer's original, unopened, labeled containers or packages. Materials shall be stored in enclosed areas with same temperature and humidity conditions as areas in which materials are to be installed.

B. All packages under this section shall be properly marked on the outside with the identification of the material contained in the package, so that they may be readily identified with the location to be used.

1.05 JOB CONDITIONS

A. Review Drawings for layout, location, and pattern of acoustical units, location of recessed light fixtures, ceiling diffusers and grilles, details of suspension system, details of change of level, details of ceiling penetrations, access door locations (if occurring), special edge treatment, and all necessary connections to work of other trades.

B. Mechanical and Electrical Contractors shall furnish all necessary supports for their materials independent and prior to installation of suspended grid systems.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Acoustical Ceiling Tile Units:

1. Suspended Tile:

a. Lay-in: Acoustical ceiling units shall be non-directional, fine texture, square edge 24" x 24" x 5/8", equal to “Armstrong, Ceramaguard / High Humidity Tile”. Color to be white.

2. Provide a 30 year warranty for sagging, warping or delineation as direct result of defects in material or factory workmanship.

B. Exposed Tee Mechanical Suspension System:

1. Provide the following system equal to Armstrong:

a. Prelude XL 15/16 inch grid.

b. Structural Classification: Intermediate-duty system. Cross tees shall carry minimum 12 pounds per lineal foot.

c. Molding: Provide standard edge molding standard with system.

2. Approved Manufacturers:

a. Armstrong

b. Chicago Metallic Corporation

c. USG Interiors

3. Cross tees shall carry 12 pounds per lineal foot and be rated intermediate duty.

4. Finishes:

a. All steel formed parts shall be chemically cleansed, hot dipped galvanized to resist corrosion and red rust.

b. Color shall be International White by Armstrong or equal.

c. Provide hot dipped galvanized grid at all locations.

C. Hanger wire shall be galvanized carbon steel per ASTM A641, soft temper, prestretched, with a yield stress of at least 3-times design load, but not less than 12 gauge (0.106) diameter.

D. Accessories shall be specifically designed as an integral part of the grid system and shall be installed as per manufacturer’s recommendations.

PART 3 - EXECUTION

3.01 PREPARATION

A. Spaces to receive acoustical treatment shall be satisfactorily closed and protected against the weather before beginning work, and shall be dry, with no more dampening materials to be installed.

3.02 INSTALLATION

A. Application of acoustical treatment shall be performed by installers approved by the manufacturer and in strict accordance with the manufacturer's specifications except as modified herein.

B. Install acoustical units in a true and even plane, in straight line course laid out symmetrically about center lines of ceiling or panel. Border tile shall not be less than six (6) inches wide. Unless shown otherwise on reflected ceiling plan drawings, the work shall be so laid out that where blocks are cut, border strips shall be of the same width on opposite sides and fit neatly against vertical surfaces.

C. Suspend main beams from structure by not less than #12 gage galvanized wire located not over four (4) feet center to center, attached to the acoustical tile suspension system from the structural system above. Do not suspend grid system from metal deck, HVAC ducts, electrical conduit, or plumbing lines. Use trapeze type hangers at HVAC ducts over 4' - 0" wide. Cross tees shall be located by preformed slots in web of transverse cross tees. Main beams and cross tees shall rest on angle moldings at walls. Tabs of cross tees intersecting cross tees shall remain unbent.

D. Keep finished surface of acoustical units free of soiling.

3.03 EXTRA STOCK

A. Furnish to the Owner, extra stock of acoustical materials, consisting of a minimum of 2 percent of the area for each size, type, and thickness installed on the job. Properly package, seal, and identify stock materials.

3.04 WARRANTIES

A. Provide manufacturer’s standard minimum thirty (30) year warranty against sagging of ceiling panels and rusting of grid.

END OF SECTION 09510

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Work in general includes providing all labor, materials, scaffolding, equipment, appliances, services and transportation for surface preparation, surface repairs, caulking, sealants, patching and application of the paint coating to the substrates and systems outlined in this and other specification sections. It is the intent of the specifications that all surfaces (except those specifically noted otherwise) be painted or finished for a thoroughly complete job in every respect whether every item is herein specified or not.

B. Provide paint products with low or no VOCs.

C. Surfaces to be Painted:

1. Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors and/or types are designated in "schedules".

2. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas.

3. If color or finish is not designated, Architect will select these from standard colors and/or finishes available from manufacturer.

D. Surfaces Not Painted:

1. Unless otherwise indicated, the following categories of work are not included as part of field-applied finish work:

a. Pre-finished Items: Do not include painting when factory-finishing or installer-finishing is specified for such items as, but not limited to, acoustical materials, architectural casework, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.

b. Concealed Surfaces: Painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, pipe spaces, and duct shafts.

c. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials do not require finish painting.

d. Operating Parts: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts do not require finish painting.

1.02 QUALITY ASSURANCE

A. Applicator's Qualifications:

1. Painting shall be performed only by a qualified applicator with at least five (5) years experience in applications of a similar nature.

B. Single Source Responsibility:

1. Provide primers and other undercoat paint produced by the same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

C. Coordination of Work:

1. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.03 SUBMITTALS

A. Product Data:

1. Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples:

1. Prior to beginning work, Architect will select from color chips furnished by Applicator for surfaces to be painted. Use representative colors when preparing samples for review.

2. Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

3. Samples shall be 12" x 12" in size, applied to a surface comparable to actual field installation.

1.04 DELIVERY AND STORAGE

A. Delivery:

1. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

a. Name and title of material.

b. Federal Spec. number, if applicable.

c. Manufacturer's stock number and date of manufacturer.

d. Manufacturer's name.

e. Contents by volume, for major pigment and vehicle constituents.

f. Thinning instructions.

g. Application instructions.

h. Color name and number.

B. Storage and Handling:

1. Store all materials and equipment in an assigned area.

2. Protect floor and wall surfaces against damage.

3. Take necessary precautions to keep fire hazard to a minimum.

4. Keep oily or greasy rags and waste in covered metal containers to avoid danger of fire, and only those immediately in use shall be kept within the areas of the building.

5. Leave surfaces of storage space clean.

1.05 JOB CONDITIONS

A. Environmental Conditions:

1. Do not apply paint in rain, fog or mist, when dew point and temperature are within 5 degrees of each other, or otherwise when surfaces are damp, wet or contaminated in any way, unless otherwise permitted by paint manufacturer's printed instructions.

2. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

3. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

4. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated or cooled within temperature limits specified by the manufacturer during application and required drying periods.

B. Notification

1. The site will remain occupied by the Owner, the school staff, students and public, for the duration of the work. School staff, students and public shall be segregated from all areas of painting activity until the coating system has dried sufficiently for the required service duty.

2. Notify the school staff where and when the application of specified coatings would result in the release of excessive or objectionable fumes. Coordinate the time frame for the application of such coatings to minimize the disturbance to school staff, students and public.

3. Notify the school staff where and when the use of power tools would be utilized in the preparation of existing surfaces. Coordinate the time frame for power tool work to minimize the disturbance to school staff, students and public.

C. Protection:

1. All existing shrubbery, sidewalks, asphalt, concrete, sprinkler systems, and all areas not receiving paint shall be fully protected against damage or residue from preparation and painting work. All damage resulting from this work shall be repaired or replaced at no cost to the Owner.

D. Application:

1. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50-degrees F and 90-degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

2. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45-degrees F and 95-degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

3. Do no apply paint in rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

4. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

1.06 WARRANTY

A. Warrantees for paint coatings, placed into service, as part of the work of this contract, shall be put into place by both the paint manufacturer(s) and the paint applicator(s).

B. The paint manufacturer shall warrant that the applied paints, coatings and sealants shall be free from any appreciable deterioration due to defect in manufacture. Additionally, applied paints, coatings and sealants will continue to perform satisfactorily for a period of 1 year from the date of substantial completion, as established by the Owner and the Architect.

1. Warrantee shall include all labor equip0ment and all material necessary and related to the correction or replacement of failed paints, coatings or sealants, in order to re-establish the integrity of the work specified and approved, at no additional cost to the Owner.

a. Warrantee shall apply to cracking, peeling, chipping or disbondment of paint, coatings or sealants.

b. It is understood that minor chalking and color fading is expected; however, catastrophic discoloration or loss of color shall be covered by warrantee.

2. Exclusions from the warrantee will be limited to the following:

a. Mechanical or physical damage.

b. Structural failure beyond which the development of minor cracking would

be evident.

c. Damage due to a hurricane or windstorm event.

d. Failure due to the introduction of moisture to the underlying surface from a source other than the failure of paints, coatings and sealants.

e. Vandalism.

f. Failure of the Owner to properly maintain paints, coatings and sealants in accordance to printed manufacturers recommendations.

3. The Guarantor may monitor the performance of installed materials on or about each annual anniversary date of substantial completion, for the duration of the warrantee. Observed incidences of paint, coating and sealant failure, or failure resulting from the lack of proper maintenance, shall be brought to the attention of the Owner, in writing.

4. The Owner shall notify the manufacturer, in writing, of documented failures of applied paint, coating or sealant systems, within the 1 year warrantee period. The manufacturer shall return to the Owner, within 30 days, a written response outlining the scope, details and materials required for corrective action. The manufacturer shall coordinate with the Owner an appropriate schedule for the execution of mutually agreed upon corrective action.

C. The paint applicator shall warrant that the applied paints, coatings and sealants shall be free from any appreciable deterioration due to defect in installation or workmanship to both the manufacturer and the Owner. Additionally, applied paints, coatings and sealants will continue to perform satisfactorily for a period of 5 years from the date of substantial completion, as established by the Owner and the Architect.

1. Warrantee shall include all labor, materials and equipment necessary and related to the correction or replacement of failed paints, coatings or sealants, in order to re-establish the integrity of the work specified and approved, at no additional cost to the Owner.

a. Warrantee shall apply to cracking, peeling, chipping or disbondment of paint, coatings or sealants.

b. It is understood that minor chalking and color fading is expected; however, catastrophic discoloration or loss of color shall be covered by warrantee.

2. Exclusions from the warrantee will be limited to the following:

a. Mechanical or physical damage.

b. Structural failure beyond which the development of minor cracking would be evident.

c. Damage due to a hurricane or windstorm event.

d. Failure due to the introduction of moisture to the underlying surface from a source other than the failure of paints, coatings and sealants.

e. Vandalism.

f. Failure of the Owner to properly maintain paints, coatings and sealants in accordance to printed manufacturers recommendations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with specified requirements, provide products (no substitutions) of one of the following:

1. The Sherwin-Williams Company (SW).

2. Benjamin Moore and Co. (Moore).

3. Pratt and Lambert (P & L).

2.02 MATERIALS

A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

PART 3 – EXECUTION

3.01 EXAMINATION PRIOR TO BEGINNING WORK

A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly clean and dry before paints, coatings or sealants are applied.

1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, delaminating coatings, organic contamination, unstable substrate or conditions detrimental to formation of a durable paint film or a uniform, smooth final finish.

2. Do not begin to apply paint until unsatisfactory conditions have been corrected. Unsatisfactory conditions shall be detailed and reported to the CM in writing.

3. Test the application of scheduled paints, coatings or sealants on intended prepared surfaces in order to gauge compliance to the requirements of this specification, manufacturer’s recommendations and application methodology.

4. Where the contractor testing fails to achieve or exhibit proper substrate bonding, film thickness, multiple coatings compatibility, lack of proper cure or other identified problem, obtain a test performed by an independent testing laboratory (not a paint manufacturer's representative) on the adhesion of the existing paint on affected surfaces. Comply with the recommendations of that laboratory for obtaining a finished surface.

a. The CM or Contractor may consult with a representative of the paint manufacturer, on a preliminary basis, to determine the general nature and scope of the in-field test failure.

b. Where the paint manufacturer's representative, CM, Contractor, and the Architect can mutually agree upon the scope and nature for the test failure, as well as for a simplified means of corrective action, independent testing may be deemed as not required.

5. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.02 SURFACE PREPARATION

A. GENERAL

1. All surfaces to be painted shall be cleaned and prepared as specified. The painting contractor is responsible for the finish of his work. Should any surface be found unsuitable to produce a proper paint or sealant finish, the Owner or Owner's agent shall be notified, in writing, and no materials shall be applied until the unsuitable surfaces have been made satisfactory.

2. Coating performance is affected by proper product selection, application, and surface preparation. Coating integrity and service life will be reduced because of improperly prepared surfaces. The selection and implementation of proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

B. PREVIOUSLY COATED SURFACES

1. Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, **ALL** surface contamination such as oil, grease, loose and marginally adhering paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence and sealers must be removed to assure sound bonding to the tightly adhering old paint. In addition, glossy surfaces of old paint films must be clean and dull before repainting. Spot prime all bare areas with the appropriate primer.

2. Recognize that any surface preparation short of total removal of the old coatings may compromise the service length of the system. **Always** check for compatibility of the previously painted surface with the new coating by applying a test patch of 2-3 square feet. Allow to dry thoroughly, check adhesion.

C. CLEANING & MILDEW CONTROL

1. Remove mildew using a solution of chlorine bleach and water mixed to a ratio of 1 part chlorine bleach and 3 parts water. Allow solution to remain on the surface for 10 minutes before rinsing thoroughly with clean water. **CAUTION: DO NOT ADD HOUSEHOLD DETERGENTS OR AMMONIA TO THE BLEACH SOLUTION.** Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off with soap and clean water any solution that touches the skin.

3.03 CAULKING / PUTTY PROCEDURES

A. All construction joints, expansion joints, window and door perimeters, and baseboards shall be cleaned prior to caulking to assure desired adhesion to both surfaces. Joints include metal to metal, metal to masonry, masonry to masonry, wood to masonry, wood to wood, wood to drywall.

B. All joints shall be carefully inspected for caulking deterioration, loss of adhesion, cracking or loss of properties. Failing caulk shall be removed and the area cleaned prior to re-caulking with specified caulk to assure desired adhesion to both surfaces.

C. Do not apply caulking when rain or temperatures below 40^{o}F are expected.

D. Apply caulk with conventional caulking gun or pressure equipment. Apply in continuous bead. Smooth and trim caulk with finger or appropriate tool immediately to ensure firm, full contact with the surfaces of the joint.

E. Putty/spackling compound shall be applied directly from the container using finger, putty knife or broad knife wider than the hole, crack, or indention being repaired. Force into repair with slight excess overlapping edges or repair. Let dry and sand with fine or medium sandpaper or sanding block. For best results, priming may be required. Do not use putty or spackling compound in joints or crevices that flex or move.

3.04 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions. Materials shall be well ground; shall not settle readily, cake, or thicken in container; shall be broken up readily with a paddle to smooth consistency; and shall have easy brushing properties. No more thinning shall be performed than is necessary to obtain the desired consistency.

B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.05 INSPECTION AND SAMPLES

A. Wet film thickness will be checked with a properly calibrated Wet Film Thickness Gauge or by specifically approved instruments.

B. It will be the paint contractor's responsibility to own and use a wet film gauge to check the application thickness as the painting proceeds. This method checked against volume solids and coverage rate is the best guide in determining what the dry film thickness will be.

C. A small sample area of each phase of the work shall be done and checked by a project representative. This will serve upon acceptance as the job standard for the remainder of that phase of work. This will also prevent misunderstandings as to interpretation of this specification's standards.

D. The Owner will engage the services of an independent testing laboratory to sample paint material being used. Samples of the material delivered to the project will be taken, identified, sealed, and certified in the presence of the contractor.

1. The testing agency will perform appropriate tests as required by the Owner.

2. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove non-complying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.06 EXTRA MATERIALS

A. Provide one (1) gallon of each type of coating specified with color mixed clearly marked for maintenance use.

3.07 APPLICATION

A. All materials shall be applied in strict accordance with the manufacturer's written instructions. The number of coats specified is intended to produce well covered and uniform spaces. It shall be the responsibility of the Applicator to produce finished surfaces, showing no transparency or uneven sheen. Colors shall be uniform.

B. Only skilled workmen shall execute work, and all materials shall be evenly spread, smoothly applied, absolutely free of runs or streaks. Workmanship shall be of the highest grade and subject to review of the Architect.

C. Use applicators and techniques best suited for substrate and type of material being applied.

D. **Verify that specified paint and finish coats are compatible with prime paints used.**

E. Apply additional coats when undercoats show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

F. Sand lightly between each succeeding enamel or varnish coat.

G. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

H. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

I. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate.

J. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

K. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

L. Completed work: Match approved samples for color, texture and coverage. Remove, re-finish or re-paint work not in compliance with specified requirements.

3.08 CLEANING AND PROTECTION

A. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

B. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and re-painting.

C. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.09 PAINT FINISHES AND MATERIALS SCHEDULE

A. The following surfaces shall be finished with the designated number of coats (in addition to shop or manufacturer's coats) with the respective designated products of Sherwin Williams (SW) (unless otherwise noted), or approved equals, with a Dry Film Thickness (DFT) of not less than the mils indicated:

EXTERIOR

1. Exterior Stucco at New Retaining Wall:

Prime: Sherwin-Williams (S-W) Loxon Conditioner, A24 W100 Series at a spread rate of 200- 300 square feet per gallon. Spread rate will vary due to texture and porosity of substrate, VOC (less exempt solvents) 100 g/L

Second Coat: S-W A-100 Exterior Latex Satin (A82 Series) at 5 mils wet, 1.65 mils DFT. VOC (less exempt solvents) 50 g/L

Third Coat: S-W A-100 Exterior Latex Satin (A82 Series) at 5 mils wet, 1.65 mils DFT. VOC (less exempt solvents) <50 g/L

INTERIOR

1. Gypsum Board, CMU:

   First Coat: S-W PrepRite ProBlock Latex Interior/Exterior Latex Primer/Sealer, B51 series at 4.0 mils wet, 1.4 mils DFT. VOC (less exempt solvents) <100 g/L

   Second Coat: S-W Harmony Interior Latex Semi-Gloss, B10 series at 4.0 mils wet, 1.6 DFT. VOC (less exempt solvents) = 0 g/L. This product is manufactured with anti-microbial agents and is formulated without silica.

   Third Coat: S-W Harmony Interior Latex Semi-Gloss, B10 series at 4.0 mils wet, 1.6 DFT. VOC (less exempt solvents) = 0 g/L. This product is manufactured with anti-microbial agents and is formulated without silica.

2. Metal (Galvanized):

   Latex Systems - Semi-Gloss Finish

   First Coat: S-W DTM Acrylic Semi-Gloss Coating, B66-200 Series; Low VOC

   Second Coat: S-W DTM Acrylic Semi-Gloss Coating, B66-200 Series; Low VOC (2-4 mils dry per coat)

3. Metal Doors and Frames and Window Frames:

   a. 1-coat SW KEM KROMIK Universal Metal Primer, B50 Series: 3.0 mils DFT

   b. 2-coats SW DTM Acrylic Coating Semi-Gloss, B66 Series: 2.5 mils DFT each coat.

4. Wood (Stain)

   a. 1-coat SW Oil Stain

   b. 1-coat SW Oil Base Gloss Varnish

   c. 1-coat SW Oil Base Satin Varnish

   d. Stain concrete to match existing.

END OF SECTION

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15010 - MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Work herein shall conform to all applicable laws, ordinances, and to regulations of the local utility companies. The general conditions and all requirements of the contract documents shall apply to all work of this section. Work shall be in accordance with the requirements of:

1. 2010 Florida Building Code (FBC): (This code includes the Florida Building Code, Accessibility as Chapter 11.) This code includes the 2010 FBC Building, Mechanical, Plumbing, Fuel Gas Volumes and Energy Conservation Volumes. Further, see the 2010 FBC; Building Chapter 35; FBC, Mechanical Chapter 15; Plumbing Chapter 13 and FBC Fuel Gas Chapter 8 and FBC, Energy Conservation Chapter 6. (Effective March 15, 2012)

2. 2010 Florida Fire Prevention Code (FFPC): (This code also includes the Florida versions of NFPA 1 and NFPA 101.) (Effective December 31, 2011)

B. Cooperate with all other trades and install work as fast as the progress of the job will permit.

C. Use only mechanics skilled in the work they are to perform and have a competent representative on the job when any work is being done.

D. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.

E. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.

F. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner's representative's approval shall be final.

1.2 SPECIFICATIONS AND DRAWINGS

A. The Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval shall not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.

B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

C. Shop and erection drawing submittals shall conform to the requirements of the General Conditions and Division-1 specifications except as modified herein.

D. Submit required and/or requested shop and erection drawings, for review by Engineer before ordering or installing any equipment or material. Equipment or material ordered or installed before Engineer review may not be accepted and may have to be removed from the project if deemed unacceptable.

E. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature which shall clearly indicate the construction, material, physical dimensions, wiring diagrams and complete operating data clearly marked for each item. Data of general nature shall not be accepted.

F. Shop drawings on paper larger than 11”x17” shall be submitted in the form of one set of paper and one set full size PDF files. All drawings are to be submitted no later than 60 days after the contract has been awarded.

1. Coordination drawings shall show major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing, servicing and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.

G. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals shall not be considered for approval. Submittals shall

be submitted for all applicable products and materials specified in each individual section of these specifications.

H. Make submittals for the equipment and materials in accordance with the following:

1. Mark the submittals, "SUBMITTED UNDER SECTION_(FILL IN SECTION #)_".

2. Submittals shall be marked to show specification reference including the section and paragraph numbers.

3. The submittals shall include the following:

a. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required. Provide any additional information specifically requested in the individual specification section or on the drawings.

b. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.

I. Shop drawings on paper 11”X17” or smaller in size shall be submitted in tabbed and indexed three ring binder. The binder shall not exceed 11-5/8” height. Partial submittals are unacceptable. The index shall indicate the related specification section number.

J. If engineering review of drawings received after the time allotted as described in “F” above or for plans that have been rejected two or more times due to non-compliance or incompleteness shall result in a letter written to the owner stating that the contractor is delaying the project and may result in schedule delays.

K. The Contractor shall certify that all electrical shop drawings are in conformance with the plans and specifications. Deviations from the plans and specifications shall be noted, and the specific area of the deviation clouded and in contrasting color (green) with a complete explanation for the reasons for the deviation. Any redesign of the system shall be Certified by a Professional Engineer currently registered in the State of Florida, and shall be accompanied by the fees as described in “J” above.

L. Carefully examine all shop drawings and mark-up as necessary before submitting to the Engineer for review. The consultant shall only consider shop drawings bearing the contractor's stamp of approval.

M. The engineer's review shall not relieve the contractor from the responsibility for deviations from drawings and specifications. The engineer's review shall be construed to apply only to general arrangement and shall not relieve the contractor from the responsibility for the correctness of details and dimensions and provision of the correct equipment.

N. The contractor shall retain copies of all reviewed shop drawings on the job site for reference.

O. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.3 PERMITS, FEES AND INSPECTIONS:

A. The Contractor shall satisfy the terms of the permits.

B. Obtain all required certificates of inspection for work and deliver them to the Owner before requesting acceptance and final payment for the work.

C. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.

D. The Contractor shall inform the Owner of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.4 GENERAL

A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number shall be provided as specified. Substitutions shall not be permitted except as described herein and in the Supplementary and General Conditions.

B. Since manufacturers reserve the right to change their products at any time, contractors shall verify all dimensions, performance data, etc. for each piece of

equipment submitted to assure compliance with the intent of the drawings and specifications.

C. All materials shall be new and of quality as specified, and when required, be clearly labeled and/or stamped as manufactured in the United States.

D. Where an accepted substitution or deviation requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit, and any other equipment or accessories normal to this equipment, contractor shall furnish said changes and additions and pay all costs for all changes and additions to his work and the work of others affected by this substitution or deviation.

E. Deviations mean the use of any listed approved manufacturer other than those on which the drawings are based.

1.5 SHOP AND ERECTION DRAWINGS AND SAMPLES

A. The Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval shall not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.

B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

C. Shop and erection drawing submittals shall conform to the requirements of the General Conditions and Division-1 specifications except as modified herein.

D. Submit required and/or requested shop and erection drawings, for review by Engineer before ordering or installing any equipment or material. Equipment or material ordered or installed before Engineer review may not be accepted and may have to be removed from the project if deemed unacceptable.

E. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature which shall clearly indicate the construction, material, physical dimensions, wiring diagrams and complete operating data clearly marked for each item. Data of general nature shall not be accepted.

F. Shop drawings on paper larger than 11”x17” shall be submitted in the form of one set of paper and one set full size PDF files. All drawings are to be submitted no later than 60 days after the contract has been awarded.

1. Coordination drawings shall show major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing, servicing and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.

G. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals shall not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.

H. Make submittals for the equipment and materials in accordance with the following:

1. Mark the submittals, "SUBMITTED UNDER SECTION_(FILL IN SECTION #)_".

2. Submittals shall be marked to show specification reference including the section and paragraph numbers.

3. The submittals shall include the following:

a. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required. Provide any additional information specifically requested in the individual specification section or on the drawings.

b. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.

I. Shop drawings on paper 11”X17” or smaller in size shall be submitted in tabbed and indexed three ring binder. The binder shall not exceed 11-5/8” height.

Partial submittals are unacceptable. The index shall indicate the related specification section number.

J. The Contractor shall certify that all electrical shop drawings are in conformance with the plans and specifications. Deviations from the plans and specifications shall be noted, and the specific area of the deviation clouded and in contrasting highlighter color (green) with a complete explanation for the reasons for the deviation. Any redesign of the system shall be Certified by a Professional Engineer currently registered in the State of Florida.

K. Carefully examine all shop drawings and mark-up as necessary before submitting to the Engineer for review. The consultant shall only consider shop drawings bearing the contractor's stamp of approval.

L. The engineer's review shall not relieve the contractor from the responsibility for deviations from drawings and specifications. The engineer's review shall be construed to apply only to general arrangement and shall not relieve the contractor from the responsibility for the correctness of details and dimensions and provision of the correct equipment.

M. The contractor shall retain copies of all reviewed shop drawings on the job site for reference.

N. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.6 EXPERIENCE

A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project and who also maintains, as part of the firm, a service department with qualified personnel who regularly perform this type of work. The Contractor shall, upon request, show evidence of at least two jobs of similar character and size installed within the preceding two years.

1.7 COORDINATION WITH OTHER TRADES

A. Contractor shall coordinate his work with other trades to avoid interferences and delays. He shall assist in working out space requirements to make a satisfactory installation.

B. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with the work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.

C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.8 STORAGE OF MATERIALS

A. All materials shall be stored on-site shall be coordinated with plant staff. All materials shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.

B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.

C. Provide continuous protection for all equipment already installed.

1.9 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT

A. Provide openings and excavation required for the installation of the work. Patch work and backfill as required. Finished work shall match the existing adjoining work.

B. Verify all conditions affecting the work to be performed under this contract.

C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, and hangers as required. No columns, beams, joists, building foundations nor any other structural building component shall be cut, drilled or disturbed in any way. Conflicts shall immediately be brought to the attention of the Engineer.

D. All excavation on sites containing existing buildings and existing services, shall be done with hand shovel to avoid damage to existing services. Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Engineer at no cost to the Owner and with no extension of time limitation.

1.10 REMOVAL OF RUBBISH

A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work in accordance with Section 01700 - Construction Procedures. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Engineer.

1.11 ELECTRICAL WORK FOR MECHANICAL SYSTEMS

A. Factory installed starters, controllers, and control equipment mounted in manufactured mechanical equipment necessary for mechanical equipment operation shall be furnished under Division 15 Mechanical.

B. Power wiring for motors and installation of starters shall be under Division 16 Electrical.

C. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems, and wiring and conduit thereof, including interlock wiring, shall be under Division 15 of Specifications, installed in accordance with requirements of Division 16.

D. Motors shall be furnished under Division 15 Mechanical of capacity required to operate equipment specified, but shall not be less than that specified.

E. Furnish and install all low voltage (120V and under) temperature control wiring for equipment provided under this division.

F. Provide conduit when required for control wiring.

1.12 MOTORS

A. All motors shall be furnished and installed under Division 15 Mechanical and shall be wired under Division 16 Electrical.

B. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion proof when located in hazardous atmospheres. Type II weather protected motors may be used in lieu of TEFC motors on roof mounted fan units and similar equipment.

C. Unless indicated otherwise, motors shall be NEMA Design B with a service factor of 1.15 with total temperature rise of 90 degrees C. (resistance measured) in 40 degrees C. ambient when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 80 degrees C. in the above conditions. Motors located in areas exceeding 40 degrees C. ambient shall be factory rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Design N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.

D. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Engineer of the change and shall then coordinate the change and shall pay all additional charges in connection with the change.

E. All motors supplied on this project three (3) HP and larger shall have a power factor not less than 85 percent under rated load conditions. Power factor of less than 85 percent shall be corrected to at least 90 percent under rated load conditions. Power factor corrective devices, installed to comply with this Code, shall be switched with the utilization equipment.

F. All motors supplied on this project shall be energy efficient. All efficiency testing and labeling shall be performed in accordance with the NEMA Standard MG 1-12.54 and IEEE 112 Test Standard, Method B. Minimum efficiencies shall conform to the following listing:

Motor HP	Efficiency (%)
3/4	80.0
1	82.5
1-1/2	84.0
2	85.5
3	87.5
5	87.5

7-1/2	89.5
10	89.5
15	91.0
20	91.7

1.13 QUIET OPERATION AND VIBRATION

A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.

B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.14 EQUIPMENT IDENTIFICATION

A. Each unit shall be identified by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include: supply and exhaust fans, air conditioning and heating machinery and apparatus, pumps, piping, control cabinets, and other equipment units as may be directed by the Engineer.

1.15 CLEANING AND ADJUSTMENTS

A. Upon completion of the work, Contractor shall clean and lubricate fans, motors, and other running equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.

B. Scratched or damaged painting shall be touched up as necessary to return the painting to "new" condition and appearance.

C. All piping and equipment shall be thoroughly blown out under pressure and cleared of all foreign matter, wasting air, gas or water through temporary connections as long as necessary to thoroughly clean system before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding and other objectionable matter from getting into the piping system and equipment.

D. During blow out period, baskets from strainers shall be removed, traps and control valves, etc., shall be by-passed.

E. All cleaning shall be done prior to any sterilization, pressure testing, flow balancing or equipment adjustment procedures.

F. During construction protect all piping and equipment from damage and dirt. Cap the open ends of all piping and equipment.

1.16 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.

B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.17 TESTS

A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Engineer. Provide all instruments, labor and services necessary to conduct tests.

1.18 INSTRUCTIONS

A. Fully instruct Owner's personnel in the care and operation of mechanical systems and furnish a letter to the Engineer advising the particular person who has received such instruction.

1.19 GUARANTEE

A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a period of one year from date of final acceptance. Any defects appearing within this year period shall be repaired without additional cost to the Owner.

1.20 ACCEPTANCE

A. Before requesting final inspection:

1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.

2. Submit statement that equipment is properly installed, adjusted, fully lubricated and operation is satisfactory.

3. Certify in writing to the Engineer that the Owner's representative has been instructed as to the care and operation of the system and that catalog service and maintenance information has been turned over to the Engineer.

4. Submit copy of written guarantee.

5. Submit copy of other data as may be outlined in these specifications.

B. Copies of the above data shall be submitted to the Engineer prior to requesting final inspection.

1.21 FACILITY STARTUP BROCHURE

A. At the completion of work, Contractor shall provide startup instruction in accordance with Section 01700 and shall submit a bound brochure containing the following:

1. Shop Drawings

2. Maintenance Manuals

3. Control Wiring and Piping Diagrams

4. Operating Instructions

5. Copy of Guarantee

6. Certificate of Instruction of Owner's Representative

7. Certificate of Job Completion

8. Record Documents

B. Where projects are of sufficient size to make a single brochure impractical, several brochures shall be prepared by trade and As-Built Drawings may be submitted as a separate item.

C. Brochure shall be indexed and divided for reasonable clarity.

D. Brochure shall be turned over to the Engineer for review and approval. The contractor shall make modifications to the brochure as deemed necessary for compliance and clarity, by the Engineer, and re-submit the final brochure to the Engineer to be forwarded to the Owner.

END OF SECTION 15010

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15060 - PIPES & PIPE FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to pipes and pipe fittings specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division 15 sections.

B. Type of pipes and pipe fittings specified in this section include the following:

1. Steel Pipes.

2. Copper Tube.

3. Plastic Pipes.

4. Miscellaneous Piping Materials/Products.

C. Pipes and pipe fittings furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 15 sections.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 CODES AND STANDARDS:

A. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.

1. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).

B. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.

C. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundation (NSF).

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe and pipe fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.

B. Welding Certifications: Submit reports as required for piping work.

C. Brazing Certifications: Submit reports as required for piping work.

D. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications in maintenance manual; in accordance with requirements of Division 1.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.

C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.2 STEEL PIPES AND PIPE FITTINGS:

A. Black Steel Pipe: ASTM A53, A106 or A120; except comply with ASTM A53 or A106 where close coiling or bending is required.

B. Malleable-Iron Threaded Fittings: ANSI B16.3.

C. Malleable-Iron Threaded Unions: ANSI B16.39; selected by Installer for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats (iron, bronze or brass).

D. Threaded Pipe Plugs: ANSI B16.14.

E. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.

1. Material Group: Group 1.1.

2. End Connections: Buttwelding.

3. Facings: Raised-face.

F. Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short-radius elbows and returns; rated to match connected pipe.

G. Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1-1/2", and where pipe size is less than 1-1/2", and do not thread nipples full length (no close-nipples).

2.3 COPPER TUBE AND FITTINGS:

A. Copper Tube: ASTM B88; type (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated.

B. Cast-Copper Solder-Joint Fittings: ANSI B16.18.

C. Wrought-Copper Solder-Joint Fittings: ANSI B16.22.

D. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.

2.4 PLASTIC PIPES AND PIPE FITTINGS:

A. Polyvinyl Chloride Pipe (PVC): ASTM D1785.

B. Polyvinyl Chloride Drain, Waste, and Vent Pipe (PVC): ASTM D2665.

C. Chlorinated Polyvinyl Chloride Pipe (CPVC): ASTM F441.

D. PVC Fittings:

1. Schedule 40 Socket: ASTM D2466.

2. Schedule 80 Socket: ASTM D2467.

3. Schedule 80 Threaded: ASTM D2464.

4. DWV Socket: ASTM D2665.

5. Sewer Socket: ASTM D2729.

6. Solvent Cement: ASTM D2564.

7. Solvent Cement (To Join PVC to ABS): ASTM D3138.

2.5 GROOVED PIPING PRODUCTS:

A. General: As Installer's option, mechanical grooved pipe couplings and fittings may be used for piping systems in mechanical equipment rooms having

operating conditions not exceeding 230°F (110°C), excluding steam piping and any other service not recommended by manufacturer, in lieu of welded, flanged, or threaded methods, and may also be used as unions, seismic joints, flexible connections, expansion joints, expansion compensators, or vibration reducers.

B. Coupling Housings: Malleable iron conforming to ASTM A47 or ductile iron conforming to ASTM A536.

C. Coupling Housings Description: Grooved mechanical type, which engages grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two or more parts, secure together during assembly with nuts and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.

D. Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomers having properties as designated by ASTM D2000.

E. Bolts and Nuts: Heat-treated carbon steel, ASTM A183, minimum tensile 110,000 psi.

F. Branch Stub-Ins: Upper housing with full locating collar for rigid positioning engaging machine-cut hole in pipe, encasing elastomeric gasket conforming to pipe outside diameter around hole, and lower housing with positioning lugs, secured together during assembly with nuts and bolts.

G. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.

H. Malleable Iron: ASTM A47.

I. Ductile Iron: ASTM A536.

J. Fabricated Steel: ASTM A53, Type F for 3/4" to 1-1/2"; Type E or S, Grade B for 2" to 20".

K. Steel: ASTM A234.

L. Flanges: Conform to Class 125 cast iron and Class 150 steel bolt hole alignment.

M. Malleable Iron: ASTM A47.

N. Ductile Iron: ASTM A536.

O. Grooves: Conform to the following:

1. Standard Steel: Square cut.

P. Manufacturer: Subject to compliance with requirements, provide grooved piping products of one of the following:

1. ITT Grinnell Corp.

2. Stockham Valves & Fittings, Inc.

3. Victaulic Co. of America.

2.6 MISCELLANEOUS PIPING MATERIALS/PRODUCTS:

A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements.

B. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

C. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with installation requirements.

D. Tin-Antimony Solder: ASTM B32, Grade 95TA.

E. Gaskets for Flanged Joints: ANSI B16.21; full-faces for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.

F. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.

G. Manufacturer: Subject to compliance with requirements, provide piping connectors of the following:

1. Fernco, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance.

B. Comply with ANSI B31 Code for Pressure Piping.

C. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.

D. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures.

3.2 PIPING SYSTEM JOINTS:

A. General: Provide joints of type indicated in each piping system.

B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

C. Solder copper tube-and fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.

D. Weld pipe joints in accordance with ASME Code for Pressure Piping, B31.

E. Weld pipe joints only when ambient temperature is above 0oF (-18oC) where possible.

F. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.

G. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes l2" to 20".

H. Build up welds with stringer-bead bass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.

I. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.

J. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

K. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.

L. Making Solvent-Cemented Joints: ASTM D2235, and ASTM F402.

M. Grooved Pipe Joints: Comply with fitting manufacturer's instructions for making grooves in pipe ends. Remove burrs and ream pipe ends. Assemble joints in accordance with manufacturer's instructions.

3.3 CLEANING, FLUSHING, INSPECTING:

A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out

piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

B. Inspect pressure piping in accordance with procedures of ASME B31.

C. Disinfect water service piping in accordance with AWWA C601.

3.4 PIPING TESTS:

A. Test pressure piping in accordance with ASME B31.

B. General: Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.

C. Required test period is 2 hours.

D. Test each piping system at 150% of operating pressure indicated, but not less than 25 psi test pressure.

E. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

F. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

G. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 15060

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15100 - VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to valves specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 15 sections.

B. Types of valves specified in this section include the following:

1. Gate Valves.

2. Drain Valves.

3. Ball Valves.

4. Butterfly Valves.

C. Valves furnished as part of factory-fabricated equipment, are specified as part of equipment in other Division 15 sections.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Valve Types: Provide valves of same type by same manufacturer.

C. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on valve body.

D. Codes and Standards:

E. MSS Compliance: Mark valves in accordance with MSS-25 "Standard Marking System for Valves, Fittings, Flanges and Unions".

F. ANSI Compliance: For face-to-face and end-to-end dimensions of flanged- or welded-end valve bodies, comply with ANSI B16.10 "Face-to-Face and End-to-End Dimensions of Ferrous Valves".

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.

B. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 VALVES:

A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide end connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

B. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

C. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, 6" and smaller.

2.2 GATE VALVES:

A. Comply with the following standards:

1. Cast-Iron Valves: MSS SP-70.

2. Bronze Valves: MSS SP-80.

3. Steel Valves: ANSI B16.34.

B. Manufacturer: Subject to compliance with requirements, provide gate valves of one of the following:

1. Crane Co.

2. Fairbanks Co.

3. Hammond Valve Corp.

4. ITT Grinnell Valve Co., Inc.

5. Jenkins Bros.

6. Lunkenheimer Co.

7. Milwaukee Valve Co., Inc.

8. Nibco, Inc.

9. Powell (Wm) Co.

10. Stockham Valves and Fittings.

11. Walworth Co.

2.3 DRAIN VALVES:

A. Comply with the following standards:

1. Water Heater Drain Valves: ASSE 1005.

B. Manufacturer: Subject to compliance with requirements, provide globe valves of one of the following:

1. Hammond Valve Corp.

2. Lee Brothers; Div. Phelps Dodge Brass Co.

3. Mansfield Plumbing Products.

4. Nibco Inc.

5. Prier Brass Mfg. Co.

6. Tanner Mfg. Co.

2.4 BALL VALVES:

A. Comply with the following standards:

1. Cast-Iron Valves: MSS SP-72.

2. Steel Valves: ANSI B16.34.

B. Manufacturer: Subject to compliance with requirements, provide ball valves of one of the following:

1. Conbraco Industries, Inc.

2. Crane Co.

3. Fairbanks Co.

4. Hammond Valve Corp.

5. ITT Grinnell Valve Co., Inc.

6. Jamesbury Corp.

7. Jenkins Bros.

8. Metraflex Co.

9. Nibco, Inc.

10. Powell (The Wm.) Co.

11. Stockham Valves and Fittings, Inc.

12. Walworth Co.

13. Watts Regulator Co.

2.5 BUTTERFLY VALVES:

A. General: Comply with MSS SP-67. Provide lug-body type valves for all applications.

B. Manufacturer: Subject to compliance with requirements, provide butterfly valves of one of the following:

1. Center Line; Mark Controls Corp.

2. Crane Co.

3. Demco; Div. Cooper Industries, Inc.

4. Fairbanks Co.

5. ITT Grinnell Valve Co., Inc.

6. Jamesbury Corp.

7. Jenkins Bros.

8. Keystone Valve USA.

9. Nibco, Inc.

10. Powell (The Wm.) Co.

11. Stockham Valves and Fittings.

2.6 VALVE FEATURES:

A. General: Provide valves with features indicated and, where not indicated otherwise, provide proper valve features as determined by Installer for installation requirements. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.

B. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5, (steel), or ANSI B16.24 (bronze).

C. Threaded: Valve ends complying with ANSI B2.1.

D. Socket-Welding: Valve ends complying with ANSI B16.11.

E. Solder-Joint: Valve ends comply with ANSI B16.18.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Except as otherwise indicated, comply with the following requirements:

1. Install valve where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of

piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

C. Mechanical Actuators: Install mechanical actuators with chain operators where indicated. Extend chains to about 5' above floor and hook to clips to clear aisle passage.

D. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:

1. Tube Size 2" and Smaller: Soldered-joint valves.

2. Pipe Size 2" and Smaller: One of the following, at Installer's option:

a. Threaded valves.

b. Butt-welding valves

c. Socket-welding valves.

d. Flanged valves.

3. Pipe Size 2 1/2" and Larger: One of the following, at Installer's option.

a. Grooved-end valves.

b. Butt-welding valves.

c. Socket-welding valves.

d. Flanged valves.

E. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

F. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

G. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.

H. Fluid Control: Except as otherwise indicated, install gate, ball, and butterfly valves to comply with ANSI B31.9. Where throttling is indicated or recognized as principal reason for valve, install butterfly valves, unless indicated otherwise on the plans.

3.2 ADJUSTING AND CLEANING:

A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.

B. Valve Identification: Tag each valve in accordance with Division 15 section "Mechanical Identification".

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.3 VALVE SCHEDULE:

A. General: Provide the following valves for various valve types listed in Division 15 piping sections.

3.4 GATE VALVES:

A. 2" and Smaller: Class 125, bronze, screw-in bonnet, rising stem, solid wedge.

	Threaded Ends	Solder Ends
Crane:	428	1334
Fairbanks:	0252	0282
Grinnell:	3010	3010-SJ
Hammond:	IB640	IB635
Jenkins:	47	1242
Lunkenheimer:	2127	2132
Milwaukee:	148	1149

Nibco:	T-111	S-111
Powell:	500-S	1821-S
Stockham:	B-100	B-108
Walworth:	55	55-SJ

B. 2" and Smaller: Class 125, bronze, screw-in bonnet, non-rising stem, solid wedge.

	Threaded Ends	Solder Ends
Crane:	438	1324
Fairbanks:	0250	0280
Grinnell:	3000	3000-SJ
Hammond:	IB645	IB647
Jenkins:	370	1240
Lunkenheimer:	2129	2133
Milwaukee:	105	1145
Nibco:	T-113	S-113
Powell:	507	1822
Stockham:	B-103	B-104
Walworth:	55	4-SJ

C. 2 1/2" and Larger: Flanged ends, class 125, iron body, bolted bonnet, solid wedge, bronze mounted.

	OS&Y	Non-Rising Stem
Crane:	4651/2	461
Fairbanks:	0405	0403
Grinnell:	6020	6060
Hammond:	IR1140	IR1138
Jenkins:	651A	326
Lunkenheimer:	1430	1428
Milwaukee:	F-2885	F-2882
Nibco:	617-O	F-619
Powell:	1793	1787
Stockham:	G0623	G-612
Walworth:	8726-F	8719-F

D. Hose End, 2 1/2": FM, 174 psi, bronze body, solid wedge, inside screw, non-rising stem.

Provide cap and chain.

Fairbanks: 0210.

Jenkins: 707.

Lunkenheimer: 366.

Nibco: T-103-HC.

Walworth: 115.

E. Threaded End; 2" and Smaller: FM, UL-listed, 175 psi, bronze body, solid wedge, outside screw and yoke, rising stem.

Crane: 459.

Fairbanks: 0222.

Hammond: IB681.

Jenkins: 175U.

Nibco: T-104-O.

Stockham: B-133.

Walworth: 904.

F. Flanged End; 2 1/2" and Larger: FM, UL-Listed, 175 psi, iron body bronze mounted, solid wedge, outside screw and yoke, rising stem.

Crane: 467.

Fairbanks: 0412.

Hammond: IR1154.

Jenkins: 825-A.

Nibco: F-607-O.

Stockham: G-634.

Walworth: 8713-F.

3.5 DRAIN VALVES:

A. Class 125: Bronze body, screw-in bonnet, rising stem, composition disc, 3/4" hose outlet.

	Threaded Ends	Solder Ends
Hammond:	712	711
Lee:	717-20	717-12
Mansfield:	526.40	526.41
Nibco:	73	72
Prier:	C-73ST	C-71ST
Tanner:		806 851

3.6 BALL VALVES:

A. 1" and Smaller: 150 psi, bronze body, standard port, bronze trim, 2-piece construction, TFE seats and seals.

	Threaded Ends	Solder Ends
Conbraco:	70	70
Crane:	2182	2182
Grinnell:	3700	3700-SJ
Jamesbury:	21-1100	-
Jenkins:	900T	902T
Metraflex:	IT	IS
Nibco:	T-585	S-585
Powell:	4520R20	421OR
Stockham:	S-216BRRT	S-216BRRS
Watts:	B-6000	B-6001

A. 1 1/4" to 2": 150 psi, bronze body, standard port, 3-piece body, TFE seats with bronze trim.

	Threaded Ends	Solder Ends
Conbraco:	82	82
Fairbanks:	0851	-
Nibco:	T-595-Y	S-959-Y
Powell:	4201-R	4201-R
Watts:	B-6800	B-6801

3.7 BUTTERFLY VALVES:

A. 6" and Smaller: 150 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, manual lever and lock.

	Lug
CenterLine:	Series LT
Crane:	14
Demco:	Series CE
Fairbanks:	3502
Grinnell:	WC-LC-8211
Hammond:	33824
Jamesbury:	8815L

	Lug
Keystone:	10
Nibco:	WL-NL-082-3
Powell:	Series5000
Stockham:	LD-711-BS3E
Grooved Ends:	Victaulic Series 700.

B. 8" and Larger: 150 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, gear operator.

	Lug
CenterLine:	SeriesLT
Crane:	14
Demco:	SeriesCE
Fairbanks:	602
Grinnell:	LC-8212
Keystone:	122
Nibco:	NL-082-5
Powell:	Series5000
Stockham:	LD-721-BS3E
Grooved Ends:	Victaulic Series 701.

END OF SECTION 15100

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15120 - PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to piping specialties specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of piping specialties work required by this section is indicated on drawings and schedules and by requirements of this section.

B. Types of piping specialties specified in this section include the following:

1. Pipe Escutcheons
2. Pipeline Strainers
3. Vandal-Proof Vent Caps
4. Dielectric Unions
5. Mechanical Sleeve Seals
6. Fire Barrier Penetration Seals
7. Water Hammer Arresters
8. Drip Pans
9. Pipe Sleeves
10. Sleeve Seals

C. Piping specialties furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-15 sections.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 CODES AND STANDARDS:

A. FCI Compliance: Test and rate "Y" type strainers in accordance with FCI 73-1 "Pressure Rating Standard for "Y" Type Strainers". Test and rate other type strainers in accordance with FCI 78-1 "Pressure Rating Standard for Pipeline Strainers Other than "Y" Type".

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions, and dimensioned drawings for each type of manufactured piping specialty. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.

B. Shop Drawings: Submit for fabricated specialties, indicating details of fabrication, materials, and method of support.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of manufactured piping specialty. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 PIPING SPECIALTIES

A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 PIPE ESCUTCHEONS

A. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside the pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

D. Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following:

1. Chicago Specialty Mfg. Co.

2. Producers Specialty & Mfg. Corp.

3. Sanitary-Dash Mfg. Co.

2.3 LOW PRESSURE Y-TYPE PIPELINE STRAINERS:

A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens with 3/64" perforations @ 233 per sq.in.

1. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.

2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

4. Butt Welded Ends, 2-1/2" and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.

5. Grooved Ends, 2-1/2" and Larger: Tee pattern, ductile-iron or malleable-iron body and access end cap, access coupling with EDPM gasket.

B. Manufacturer: Subject to compliance with requirements, provide low pressure Y-type strainers of one of the following:

1. Armstrong Machine Works.

2. Hoffman Specialty ITT; Fluid Handling Div.

3. Metraflex Co.

4. R-P&C Valve; Div. White Consolidated Industries, Inc.

5. Spirax Sarco.

6. Trane Co.

7. Victaulic Co. of America.

8. Watts Regulator Co.

2.4 HIGH PRESSURE Y-TYPE PIPELINE STRAINERS

A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 250 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations @ 233 per sq.in.

1. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.

2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted steel retainer with off-center blowdown fitted with pipe plug.

4. Butt Welded Ends, 2-1/2" and Larger: Schedule 80 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.

B. Manufacturer: Subject to compliance with requirements, provide high pressure Y-type strainers of one of the following:

1. Armstrong Machine Works.

2. Hoffman Specialty ITT; Fluid Handling Div.

3. Metraflex Co.

4. R-P&C Valve; Div. White Consolidated Industries, Inc.

5. Spirax Sarco.

6. Trane Co.

7. Watts Regulator Co.

2.5 VANDAL-PROOF VENT CAPS:

A. General: Provide cast-iron vandal-proof vent caps, full size of base for steel pipes.

B. Manufacturer: Subject to compliance with requirements, provide vandal-proof vent caps of one of the following:

1. Josam Mfg. Co.

2. Smith (Jay R.) Mfg. Co.

3. Tyler Pipe; Sub. of Tyler Corp.

4. Zurn Industries, Inc.; Hydromechanics Div.

2.6 DIELECTRIC UNIONS

A. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.

B. Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following:

1. B & K Industries, Inc.

2. Capital Mfg. Co.; Div. of Harsco Corp.

3. Eclipse, Inc.

4. Epco Sales, Inc.

5. Perfection Corp.

6. Rockford-Eclipse Div.

2.7 MECHANICAL SLEEVE SEALS

A. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

B. Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following:

1. Thunderline Corp.

2.8 FIRE BARRIER PENETRATION SEALS

A. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or duct work. Refer to plumbing drawings for fire barrier penetration details.

B. Cracks, Voids, or Holes Up to 4" Diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 time when exposed to flame or heat, UL-listed.

C. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350ºF (121 to 177ºC), UL-listed.

D. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:

1. Electro Products Div./3M.

2. Nelson; Unit of General Signal.

2.9 WATER HAMMER ARRESTERS:

A. General: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.

B. Manufacturer: Subject to compliance with requirements, provide water hammer arresters of one of the following:

1. Amtrol, Inc.

2. Smith (Jay R.) Mfg. Co.

3. Tyler Pipe; Sub. of Tyler Corp.

4 Zurn Industries, Inc.; Hydromechanics Div.

2.10 FABRICATED PIPING SPECIALTIES:

A. Drip Pans: Provide drip pans fabricated from stainless sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

B. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet Metal: Fabricate from stainless steel sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricated from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.

2. Steel-Pipe: Fabricate from Schedule 40 stainless steel pipe; remove burrs.

3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.

4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.

C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:

1. Mechanical Sleeve Seals: Installed between sleeve and pipe.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on

exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:

a. Pumps

b. Steam traps serving steam main drips

c. Temperature control valves

d. Pressure reducing valves

e. Temperature or pressure regulating valves

C. Vandal-Proof Vent Caps: Install vandal-proof vent caps on each vent pipe passing through roof, and elsewhere as indicated. Locate base of vent cap 6" above roof surface, or higher where required by Code.

D. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

E. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

F. Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.

G. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

3.2 INSTALLATION OF FABRICATED PIPING SPECIALTIES:

A. Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

B. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.

2. Install iron-pipe sleeves at exterior penetrations; both above and below grade.

3. Install steel-pipe or plastic-pipe sleeves except as otherwise indicated.

C. Sleeve Seals: Install in accordance with the following:

1. Link-Seal or equivalent: Fill and pack annular space between sleeve and pipe with Link-Seal Modular Seals, Model “C” or equivalent.

END OF SECTION 15120

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15135 - METERS AND GAGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to meters and gages specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of meters and gages required by this section is indicated on drawings and/or specified in other Division-15 sections.

B. Types of meters and gages specified in this section include the following:

1. Temperature Gages and Fittings.

a. Glass Thermometers.

b. Thermometer Wells.

c. Temperature Gage Connector Plugs.

2. Pressure Gages and Fittings.

a. Pressure Gages.

b. Pressure Gage Cocks.

c. Pressure Gage Connector Plugs.

3. Flow Measuring Meters.

a. Wafer-Type Flow Meters.

b. Calibrated Balance Valves.

C. Meters and gages furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-15 sections.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of meters and gages, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. ANSI and ISA Compliance: Comply with applicable portions of ANSI and Instrument Society of American (ISA) standards pertaining to construction and installation of meters and gages.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of meter and gage. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gage schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gage.

B. Maintenance Data: Submit maintenance data and spare parts lists for each type of meter and gage. Include this data and product data in Maintenance Manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 GLASS THERMOMETERS:

A. General: Provide glass thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.

B. Case: Die cast aluminum finished in baked epoxy enamel, glass front, spring secured, 9" long.

C. Adjustable Joint: Die cast aluminum, finished to match case, 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device.

D. Tube and Capillary: Mercury filled, magnifying lens, 1% scale range accuracy, shock mounted.

E. Scale: Satin faced, non-reflective aluminum, permanently etched markings.

F. Stem: Copper-plated steel, or brass, for separable socket, length to suit installation.

G. Range: Conform to the following:

1. Chilled Water: 30° - 180°F with 2°F scale divisions.

2. Hot Water: 30° - 240°F with 2°F scale divisions.

H. Manufacturer: Subject to compliance with requirements, provide glass thermometers of one of the following:

1. Ernst Gage Co.

2. Marshalltown Instruments, Inc.

3. Trerice (H.O.) Co.

4. Weiss Instruments, Inc.

2.2 THERMOMETER WELLS:

A. General: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well.

B. Manufacturer: Same as thermometers.

2.3 TEMPERATURE GAGE CONNECTOR PLUGS:

A. General: Provide temperature gage connector plugs pressure rated for 500 psi and 200°F (93°C). Construct of brass and finish in nickel-plate, equip with 1/2" NPS fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.

B. Manufacturer: Subject to compliance with requirements, provide temperature gage connector plugs of one of the following:

1. Peterson Equipment Co.

2.4 PRESSURE GAGES:

A. General: Provide pressure gages of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.

B. Type: General use, 1% accuracy, ANSI B40.1 grade A, phosphor bronze bourdon type, bottom connection.

C. Case: Drawn steel or brass, glass lens, 4-1/2" diameter.

D. Connector: Brass with 1/4" male NPT.

E. Scale: White coated aluminum, with permanently etched markings.

F. Range: Conform to the following:

1. Water: 0 - 100 psi.

G. Manufacturer: Subject to compliance with requirements, provide pressure gages of one of the following:

1. Ametek/U.S. Gauge.

2. Marsh Instrument Co.; Unit of General Signal.

3. Marshalltown Instruments, Inc.

4. Trerice (H.O.) Co.

5. Weiss Instruments, Inc.

2.5 PRESSURE GAGE COCKS:

A. General: Provide pressure gage cocks between pressure gages and gage tees on piping systems. Construct gage cock of brass with 1/4" female NPT on each end, and "T" handle brass plug.

B. Siphon: 1/4" straight coil constructed of brass tubing with 1/4" male NPT on each end.

C. Snubber: 1/4" brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.

D. Manufacturer: Same as for pressure gages.

2.6 PRESSURE GAGE CONNECTOR PLUGS:

A. General: Provide pressure gage connector plugs pressure rated for 500 psi and 200°F (93°C). Construct of brass and finish in nickel-plate equip with 1/2" NPS fitting, with self-sealing valve core type neoprene gasketed orifice suitable for

inserting 1/8" O.D. probe assembly from dial type insertion pressure gage. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.

B. Manufacturer: Subject to compliance with requirements, provide pressure gage connector plugs of one of the following:

1. Peterson Equipment Co.

2.7 WAFER-TYPE FLOW METERS:

A. General: Provide as indicated, cast-iron wafer-type flow meters equipped with readout valves to facilitate connecting of differential pressure meter to flow meter. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Provide calibrated nameplate with flow meter detailing its flow range through range of differential head pressures.

B. Manufacturer: Subject to compliance with requirements, provide wafer-type flow meters of one of the following:

1. Bell & Gossett ITT; Fluid Handling Div.

2.8 CALIBRATED BALANCE VALVES:

A. General: Provide as indicated, calibrated globe type balance valves equipped with readout valves to facilitate connecting of differential pressure meter to balance valves. Provide calibrated nameplate to indicated degree of closure of precision machined orifice. Construct balancing valve with internal EPT O-ring seals to prevent leakage around rotating element. Provide balance valves with preformed polyurethane insulation suitable for use on heating and cooling systems, and to protect balance valves during shipment.

B. Manufacturer: Subject to compliance with requirements, provide calibrated balance valves of one of the following:

1. Armstrong

2. Griswold

3. Johnson

4. Yokogawa

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which meters and gages are to be installed. Notify the enginner before proceeding with work if unsatisfactory conditions are present.

3.2 INSTALLATION OF TEMPERATURE GAGES:

A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.

B. Locations: Install as indicated on the drawings.

C. Thermometer Wells: Install in piping tee where indicated, in vertical upright position. Fill well with oil or graphite, secure cap.

D. Temperature Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.3 INSTALLATION OF PRESSURE GAGES:

A. General: Install pressure gages in piping tee with pressure gage cock, located on pipe at most readable position.

B. Locations: Install in the following locations, and elsewhere as indicated:

1. At suction and discharge of each pump.

2. At inlet and outlet of each chiller.

3. At discharge of each pressure reducing valve.

C. Pressure Gage Cocks: Install in piping tee with snubber. Install siphon for steam pressure gages.

D. Pressure Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.4 INSTALLATION OF FLOW MEASURING METERS:

A. General: Install flow measuring meters on piping systems located in accessible locations at most readable position.

B. Locations: Install in the following locations, and elsewhere as indicated.

1. At discharge of each pump.

2. At inlet of each hydronic coil in built-up central systems.

3. At inlet of each water chiller.

C. Wafer-Type Flow Meters: Install between 2 Class 125 pipe flanges, ANSI B16.1 (cast-iron) or ANSI B16.24 (cast-bronze). Provide minimum straight lengths of pipe upstream and downstream from meter in accordance with manufacturer's installation instructions.

D. Calibrated Balance Valves: Install on piping with readout valves in vertical upright position. Maintain minimum length of straight unrestricted piping equivalent to 3 pipe diameters upstream of valve.

3.5 ADJUSTING AND CLEANING:

A. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.

B. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

END OF SECTION 15135

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15140 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to supports and anchors specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of supports and anchors required by this section is indicated on drawings and/or specified in other Division-15 sections.

B. Types of supports and anchors specified in this section include the following:

1. Horizontal-Piping Hangers and Supports.
2. Hanger-Rod Attachments.
3. Building Attachments.
4. Saddles and Shields.
5. Miscellaneous Materials.
6. Anchors.
7. Equipment Supports.

C. Supports and anchors furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-15 sections.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. Code Compliance: Comply with Standard Plumbing Code 1994 pertaining to product materials and installation of supports and anchors.

2. UL and FM Compliance: Provide products which are UL-listed and FM approved.

3. MSS Standard Compliance:

   a. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.

   b. Select and apply pipe hangers and supports, complying with MSS SP-69.

   c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.

   d. Terminology used in this section is defined in MSS SP-90.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 HORIZONTAL-PIPING HANGERS AND SUPPORTS:

A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

B. Adjustable Steel Clevis Hangers: MSS Type 1.

C. Steel Double Bolt Pipe Clamps: MSS Type 3.

D. Steel Pipe Clamps: MSS Type 4.

E. Pipe Hangers: MSS Type 5.

F. Split Pipe Rings: MSS Type 11.

G. Clips: MSS Type 26.

H. Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.

I. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base-support and cast-iron floor flange.

2.3 HANGER-ROD ATTACHMENTS:

A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

B. Steel Turnbuckles: MSS Type 13.

2.4 BUILDING ATTACHMENTS:

A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

B. Concrete Inserts: MSS Type 18.

C. Top Beam C-Clamps: MSS Type 19.

D. Side Beam or Channel Clamps: MSS Type 20.

E. Center Beam Clamps: MSS Type 21.

F. Steel Brackets: One of the following for indicated loading:

1. Light Duty: MSS Type 31.

2. Medium Duty: MSS Type 32.

3. Heavy Duty: MSS Type 33.

2.5 SADDLES AND SHIELDS:

A. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.

C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

D. Thermal Hanger Shields: Constructed of 360° insert of high density, 100 psi, water-proofed calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.

E. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following:

1. Elcen Metal Products Co.

2. Pipe Shields, Inc.

2.6 MANUFACTURERS OF HANGERS AND SUPPORTS:

A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:

1. B-Line Systems, Inc.

2. Carpenter and Patterson, Inc.

3. Corner & Lada Co., Inc.

4. Elcen Metal Products Co.

5. Fee & Mason Mfg. Co.; Div. Figgie International.

6. ITT Grinnel Corp.

2.7 MISCELLANEOUS MATERIALS:

A. Metal Framing: Provide products complying with NEMA STD ML 1.

B. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A36.

C. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PREPARATION:

A. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

B. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.3 INSTALLATION OF BUILDING ATTACHMENTS:

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.4 INSTALLATION OF HANGERS AND SUPPORTS:

A. General: Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

D. Provisions for movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

G. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields.

3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.5 INSTALLATION OF ANCHORS:

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

C. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.6 EQUIPMENT SUPPORTS:

A. Provide concrete housekeeping bases for all floor-mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.

3.7 ADJUSTING AND CLEANING:

A. Hanger Adjustments: Adjust hangers so as to distribute loads equally on attachments.

B. Supports Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 15140

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15175 - VARIABLE FREQUENCY DRIVE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Division 1 Specification Sections, apply to work of this section.

1.2 SCOPE

A. The work, apparatus and materials which shall be furnished under these specifications and accompanying drawings shall include all items specified hereinafter and shown on the drawings. All other materials necessary for the complete installation shall be furnished and installed by the Contractor to provide complete systems as indicated on the drawings and as specified herein.

B. Coordinate all required interlocks with Division 16. Drives shall contain the necessary auxiliary contacts and control coil voltage to interface with the HVAC temperature control system and fire alarm control system.

1.3 DESCRIPTION OF WORK

A. Extent of motor controller work is indicated by drawings and schedules. Types of motor controllers specified in this section include the following:

1. Variable Frequency Drives.

1.4 QUALITY ASSURANCE

A. The following Variable Frequency Drive Manufacturer: Allen Bradley.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical motor controller work similar to that required for this project.

C. Codes and Standards:

1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to motor controllers.

2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to motor controllers. Provide motor controllers and components which have been UL-listed and labeled.

3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of motor controllers.

1.5 SUBMITTALS

A. Product Data:

1. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers and catalog information.

2. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.

3. Submit a Harmonic Distortion Analysis for the jobsite location.

4. Surge suppression method and device.

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY DRIVE

A. Furnish complete variable frequency drives as specified herein for the fans and pumps designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 12 enclosure, or other NEMA Type according to the installation and operating conditions at the job site.

B. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to negate the need for motor derating.

C. An advanced sine wave approximation and voltage vector control shall be used to allow operation at rated motor shaft output at nominal speed with no derating. This voltage vector control shall minimize harmonics to the motor to increase motor efficiency and life.

D. The VFD shall include a full-wave diode bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.

E. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL-508 certified for the building and assembly of option panels. Local representative panel shop assembly for option panels is not acceptable. The appropriate UL stickers shall be applied to both the drive and option panel, in the case where these are not contained in one panel.

F. The VFD shall have a DC link reactor to minimize power line harmonics. If DC link reactors are not provided VFD shall be provided with a 3% impedance line reactor and isolation transformer.

G. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

H. The VFD shall be able to provide full torque at any selected speed up to base speed to allow driving direct drive fans without derating.

I. An automatic energy optimization selection feature shall be provided standard in the drive. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide a 3% to 10% additional energy savings.

J. Input and output power circuit switching can be done without interlocks or damage to the VFD.

K. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or decouple the motor from the load to run the test.

L. Protective Features

1. Class 20 I2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications.

2. Protection against input transients, loss of AC line phase, short circuit, ground fault, overvoltage, undervoltage, drive overtemperature and motor overtemperature. The VFD shall display all faults in plain English. Codes are not acceptable.

3. Protect VFD from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output with an input voltage as low as 150 volts for 208/230 volt units, and 285 volts for 460 volt units.

4. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.

5. Drive shall have semi-conductor rated input fuses to protect power components.

6. To prevent breakdown of the motor winding insulation, the dV/dt must be below 1500 V/msec per IEC recommendations. The supplier shall include with the quotation the dV/dt values of the drive.

7. Drive shall include a “signal loss detection” circuit to sense the loss of the control signal, and shall be programmable to react as desired in such instance.

8. Drive shall be designed and constructed so that input or outputs can be disconnected with the drive running without the need for interlocks.

9. Drive shall catch a rotating motor operating forward or reverse up to full speed.

10. VFD shall be rated for 100,000 amp interrupting capacity (AIC).

11. Drive shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.

12. Drive shall continue to operate without faulting until input voltage exceeds 300 volts on 208/230 volt drives, and 604 volts on 460 volt drives.

    a. Provide drive input and main fusing.

13. Provide surge suppression on the input of each drive for power and low voltage line protection. Devices shall be approved by the drive manufacturer. EDCO, DiTEK, Joslyn, or manufacturer's approved equal.

M. Interface Features

1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the drive and determine the speed reference.

2. Provide a 24 V DC output signal to indicate that the drive is in Auto/Remote mode.

3. Digital manual speed control. Potentiometers are not acceptable.

4. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.

5. All keypads shall be identical and interchangeable.

6. Drive may be operated with keypad removed.

7. All VLT 6000 drives shall use the same control keypad.

8. To setup multiple drives, it shall be possible to upload all setup parameters to the drive's keypad, place that keypad on all other drives in turn and download the setup to each drive.

9. Display shall be programmable to display in 9 languages including English, Spanish and French.

10. The display shall have four lines, with 20 characters on three lines and eight large characters on one line.

11. Two lines of the display shall allow free programming so that the exact unit controlled by the drive can be identified.

12. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the drive when the keypad is removed.

13. A quick setup menu with factory preset typical HVAC parameters shall be provided on the drive eliminating the need for macros.

14. The drive shall be fitted with an RS 485 serial communications port and be supplied with Windows® compatible software to display all monitoring,

fault, alarm and status signals. The software shall allow parameter changes to be made to the drive settings, as well as storage of each controller's operating and setup parameters, and remote operation of the drive.

15. Two set-point control interface (PID control) shall be standard in the unit. Drive shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.

16. Floating point control interface shall be provided to increase/decrease speed in response to switch closures.

17. Sleep mode shall be provided to automatically stop the drive when speed drops below set "sleep" level for a specified time. Drive automatically restarts when speed command exceeds set "wake" level.

18. Run permissive circuit shall be provided to accept a "system ready" signal to assure that the drive does not start until dampers or other auxiliary equipment are in the proper state for drive operation.

19. An elapsed time meter and kWh meter shall be provided.

20. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, KWH, Output Voltage, No Load Warning, DC Bus Voltage, Drive Temperature in degrees, and Motor Speed in engineering units per application (in percent speed, GPM, CFM,...). Drive will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.

21. Up to four meter displays can be shown at once on the display. This allows the actual value of the follower signal to be shown simultaneously with the drive's response to that signal for ease in commissioning.

22. Drive will sense the loss of load and signal a no load/broken belt warning or fault.

23. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.

24. The VFD shall store in memory the last 20 faults and record all operational data.

25. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

26. Two programmable relay outputs, one Form C 240 V AC, one Form A 50 V AC, shall be provided for remote indication of drive status.

27. Two programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include 0-10 V dc, 0-20 mA and 4-20 mA.

28. Two programmable analog outputs shall be provided for indication of drive status. These outputs shall be programmable for output speed, voltage, frequency, amps and input kW.

29. Under fire mode conditions the VFD shall automatically default to a preset speed.

N. Adjustments

1. VFD shall have an adjustable carrier frequency.

2. Sixteen preset speeds shall be provided.

3. Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves may be automatically contoured to prevent tripping.

4. Four current limit settings shall be provided.

5. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit, inverter overload and motor overload.

6. The number of restart attempts shall be selectable from 0 through 20 and the time between attempts shall be adjustable from 0 through 600 seconds.

7. An automatic “on delay” may be selected from 0 to 120 seconds.

O. Bypass

1. Provide a manual bypass consisting of a door interlocked main fused disconnect padlockable in the off position, a built-in motor starter and a

four position DRIVE/OFF/LINE/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the drive. In the OFF position, the motor and drive are disconnected. In the LINE position, the motor is operated at full speed from the AC power line and power is disconnected from the drive so that service can be performed. In the TEST position, the motor is operated at full speed from the AC line power. This allows the drive to be given an operational test while continuing to run the motor at full speed in bypass. Provide a normally closed dry contact and interlock with the drives safety trip circuitry to stop the motor whether in DRIVE or BYPASS mode in case of an external safety fault.

P. Service Conditions

1. Ambient temperature, -10 to 40°C (14 to 104°F).

2. to 95% relative humidity, non-condensing.

3. Elevation to 3,300 feet without derating.

4. AC line voltage variation, -10 to +10% of nominal with full output.

5. No side clearance shall be required for cooling of any NEMA 1 units, or of any NEMA 12 units of less than 75 HP at 460 volts. All power and control wiring shall be done from the bottom.

Q. Quality Assurance

1. To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.

2. All optional features shall be functionally tested at the factory for proper operation.

PART 3 - EXECUTION

3.1 DRIVES AND ASSOCIATED CONTROLS

A. Unless otherwise indicated, drives shown on the drawings shall be furnished and installed under this section. The full load current and starting characteristics of each motor shall be verified for proper selection of motor over load devices. The

Contractor shall furnish and install all steel shapes, etc., necessary for a support of all motor controllers.

B. Unless otherwise indicated, all control devices, such as thermostats, firestats, etc., shall be installed in place and wired under other sections of the specifications. Coordinate required starter auxiliary contacts and coil voltages for a properly operational system.

C. Motor controllers shall be installed in accordance with all applicable NEC installation requirements.

D. Variable Frequency Drive Startup Assistance: The manufacturer shall provide start-up assistance in the form of a factory trained service technician. When factory authorized start-up is performed, the warranty shall be extended to 60 months from date of shipment. Provide training by factory trained service technician.

3.2 IDENTIFICATION OF EQUIPMENT

A. Identification shall be provided for all motor controllers installed by the Contractor. Identification shall consist of white laminated plastic plates with black engraved letters.

END OF SECTION 15175

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15180 - WATER TREATMENT OF COOLING AND HEATING WATER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Provide flushing, cleaning and charging services (work of this section) as follows:

1. Chilled Water - After the air handlers have been installed and after pipe pressure tests have been successfully completed, flush and clean the chilled water system before initial charging. Charge the chilled water system with the initial charge of chemicals once the chilled water system has been flushed and cleaned.

2. Heating Water - After the heating water system modifications have been completed, flush and clean the entire heating water system before initial charging. Charge the heating water system with the initial charge of chemicals once the heating water system has been flushed and cleaned.

B. Chemicals for initial charging of condenser water and both closed systems, and in sufficient quantities for one year from start-up shall be provided by Nalco Water Treatment Company under contract to the Mechanical Contractor.

C. Perform initial clean-out. The Mechanical Contractor shall flush and clean-out all closed recirculation water systems under the supervision of Water Treatment Specialist. All chemicals to be provided by Water Treatment Company. Maintain a concentration of 1,000 ppm of phosphate during the clean-up period. Drain and flush open recirculation system until clear. A report of completion shall be rendered by Water Treatment Company to the General Contractor, Architect and Owner.

1.3 SUBMITTALS BY WATER TREATMENT COMPANY:

A. Shop drawings.

B. Product information:

1. Proposed chemicals to be used.

2. Equipment specifications and drawings.

C. Operating and maintenance manuals.

PART 2 - PRODUCTS

2.1 CLOSED-LOOP CHILLED WATER SYSTEM provided by Water Treatment Company and installed by Mechanical Contractor:

A. Charge system with Borate-Nitrite to 800-1200 ppm by Water Treatment Company.

2.2 CLOSED-LOOP HOT WATER SYSTEM provided by Water Treatment Company and installed by Mechanical Contractor.

A. Charge system with Borate-Nitrite to 800-1200 ppm by Water Treatment Company.

PART 3 - EXECUTION

3.1 WATER TREATMENT PROGRAM:

A. Water Treatment Specialist shall supervise the equipment cleaning.

B. Following installation of the system, a Water Treatment Specialist shall:

1. Chemically treat all systems.

2. Test the chemical properties of the make-up and the treated water to determine the proper control settings and chemical formula.

3. Check the entire system for proper automatic operation.

4. Following start-up, the regular maintenance schedule and chemicals prescribed by the service contract between the owner shall be complied with, as long as the service contract between the owner is in place – not work of this contract.

5. The Water Treatment Specialist shall coordinate with the Mechanical Contractor for three (3) tower or condenser cleanings during the first year of operation. Cleaning shall be included in respective monthly report.

END OF SECTION 15180

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15190 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to identification devices specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-15 sections.

B. Types of identification devices specified in this section include the following:

1. Painted Identification Materials.
2. Plastic Pipe Markers.
3. Plastic Tape.
4. Valve Tags.
5. Engraved Plastic-Laminate Signs.
6. Plastic Equipment Markers.
7. Plasticized Tags.

C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of equipment assembly in other Division-15 sections.

D. Refer to Division-16 sections for identification requirements of electrical work; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide mechanical identification materials of one of the following:

1. Allen Systems, Inc.

2. Brady (W.H.) Co.; Signmark Div.

3. Industrial Safety Supply Co., Inc.

4. Seton Name Plate Corp.

2.2 MECHANICAL IDENTIFICATION MATERIALS:

A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-15 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.3 PAINTED IDENTIFICATION MATERIALS:

A. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-1/4" high letters for duct work and not less than 3/4" high letters for access door signs and similar operational instructions.

B. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

C. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1 for colors.

2.4 PLASTIC PIPE MARKERS:

A. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.

B. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125^{o}F (52^{o}C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.

C. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:

1. Adhesive lap joint in pipe marker overlap.

2. Laminated or bonded application of pipe marker to pipe (or insulation).

3. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".

D. Lettering: Comply with piping system nomenclature as specified, scheduled or shown, and abbreviate only as necessary for each application length.

E. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.5 PLASTIC TAPE:

A. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.

B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.

C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

2.6 VALVE TAGS:

A. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.

1. Provide 1-1/2" diameter tags.

2. Fill tag engraving with black enamel.

B. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

C. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

2.7 ENGRAVED PLASTIC-LAMINATE SIGNS:

A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

B. Thickness: 1/8".

C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.8 PLASTIC EQUIPMENT MARKERS:

A. General: Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code:

1. Green: Cooling equipment and components.

2. Yellow/Green: Combination cooling and heating equipment and components.

3. Blue: Equipment and components that do not meet any of the above criteria.

B. Nomenclature: Include the following, matching terminology on schedules as closely as possible:

1. Name and plan number.

2. Equipment service.

3. Design capacity.

4. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.

C. Size: Provide approximate 2-1/2" x 4" markers for control devices, dampers, and valves; and 4-1/2" x 6" for equipment.

2.9 PLASTICIZED TAGS:

A. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matte finish suitable for writing, approximately 3-1/4" x 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).

2.10 LETTERING AND GRAPHICS:

A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS:

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting, or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 PIPING SYSTEM IDENTIFICATION:

A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

1. Stenciled markers, including color-coded background band or rectangle, and contrasting lettering of black or white. Extend color band or rectangle 2" beyond ends of lettering.

2. Stenciled markers, with lettering color complying with ANSI A13.1.

3. Plastic pipe markers, with application system as indicated under "Materials" in this section. Install on pipe insulation segment where required for hot non-insulated pipes.

4. Stenciled markers, black or white for best contrast, wherever continuous color-coded painting of piping is provided.

B. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

1. Near each valve and control device.

2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.

4. At access doors, manholes, and similar access points which permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.3 VALVE IDENTIFICATION:

A. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.

B. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.

1. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

3.4 MECHANICAL EQUIPMENT IDENTIFICATION:

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:

1. Main control and operating valves.

2. Meters, gages, thermometers, and similar units.

3. Fans, blowers, primary balancing dampers and mixing boxes.

4. Packaged HVAC central-station and zone-type units.

B. Optional Sign Types: Where lettering larger than 1" height is needed for proper identification, because of distance from normal location of required identification, stenciled signs may be provided in lieu of engraved plastic, at Installer's option.

C. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.

D. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

E. Optional Use of Plasticized Tags: At Installer's option, where equipment to be identified as concealed above acoustical ceiling or similar concealment, plasticized tags may be installed within concealed space to reduce amount of text in exposed sign (outside concealment).

3.5 ADJUSTING AND CLEANING:

A. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.

B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION 15190

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15200 - NOISE AND VIBRATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to vibration isolation work specified herein.

1.2 DESCRIPTION OF WORK:

A. Noise criteria, vibration tolerance, and vibration isolation for HVAC and plumbing work.

1.3 RELATED WORK

A. Air Handling Unit Internal Vibration Isolation: Section 15763, AIR HANDLING UNITS.

B. Flexible Duct Connectors, Sound Attenuators and Sound Absorbing Duct Lining: Section 15910, DUCTWORK ACCESSORIES.

C. Sound Tests and Vibration Tests: Section 15990, TESTING, ADJUSTING, AND BALANCING.

1.4 QUALITY ASSURANCE

A. Refer to article, QUALITY ASSURANCE in Section 15050, BASIC METHODS AND REQUIREMENTS (MECHANICAL).

B. Noise Criteria:

1. Noise levels in all 8 octave bands due to equipment and duct systems shall not exceed the values indicated herein. The stated NC levels are "raw" NC levels and do not include room effect. Manufacturer's product data which includes a room attenuation or room effect are not acceptable and must be increased by the room effect.

2. For equipment which has no sound power ratings scheduled on the plans, the contractor shall select equipment such that the indicated noise criteria, local ordinance noise levels, and OSHA requirements are not exceeded. Selection procedure shall be in accordance with ASHRAE 1995 Applications Handbook, Chapter 43, SOUND AND VIBRATION CONTROL. An average value of 10 dB shall be used as the room attenuating effect, i.e., the difference between sound power level emitted to room and sound pressure level in room.

3. In absence of specified measurement requirements, measure equipment noise levels three feet from equipment and at an elevation of maximum noise generation.

C. Allowable Vibration Tolerances for Rotating, Non-reciprocating Equipment: Not to exceed a self-excited vibration maximum velocity of 0.20-inch per second RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions or measured at equipment mounting feet if bearings are concealed. Measurements for internally isolated fans and motors may be made at the mounting feet.

1.5 SUBMITTALS

A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.

B. Manufacturer's Literature and Data:

1. Vibration isolators:

a. Floor mountings.

b. Hangers.

c. Snubbers.

d. Thrust restraints.

2. Bases.

3. Acoustical enclosures.

4. Sound attenuators.

C. Isolator manufacturer shall furnish with submittal load calculations for selection of isolators, including supplemental bases, based on lowest operating speed of equipment supported.

D. Sound attenuator manufacturer shall furnish with submittal sound attenuating capability of each sound attenuator provided.

1.6 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

1. HVAC Applications Handbook 1991, Chapter 42, Sound and Vibration Control.

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

1. A123-89 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

2. A307-90 Carbon Steel Bolts and Studs, 60,000 PSI Tensil Strength

3. D2240-86 Rubber Property - Durometer Hardness

D. Manufacturers Standardization (MSS):

1. SP-58-88 Pipe Hangers and supports-Materials, Design and Manufacture

E. Occupational Safety and Health Administration (OSHA):

1. 0ccupational Noise Exposure

PART 2 - PRODUCTS

2.1 GENERAL

A. Type of sound attenuator, isolator, base, and minimum static deflection shall be as required for each specific equipment application as recommended by isolator

or equipment manufacturer but subject to minimum requirements indicated in the schedule on the drawings.

B. Group 1: Moderately Sensitive Spaces NC 30

1. Conference Rooms, Media Center

C. Group 2: Typical Classroom Spaces and Offices NC 35

1. Classrooms, private offices, lobby, corridors and open office areas.

2.2 VIBRATION ISOLATORS

A. Floor Mountings:

1. Double Deflection Neoprene (Type N): Shall include neoprene covered steel support plated (top and bottom), friction pads, and necessary bolt holes.

2. Spring Isolators (Type S): Shall be free-standing, laterally stable and include acoustical friction pads and leveling bolts. Isolators shall have a minimum ratio of spring diameter-to-operating spring height of 1.0 and an additional travel to solid equal to 50 percent of rated deflection.

3. Spring Isolators with Vertical Limit Stops (Type SP): Similar to spring isolators preceding, except include a vertical limit stop to limit upward travel if weight is removed and also to reduce movement due to wind loads. Provide clearance around restraining bolts to prevent mechanical short circuiting.

4. Pads (Type D), Washers (Type W), and Bushings (Type L): Pads shall be felt, cork, neoprene waffle, neoprene and cork sandwich, neoprene and fiberglass, neoprene and steel waffle, or reinforced duck and neoprene. Washers and bushings shall be reinforced duck and neoprene. Size pads for a maximum load of 50 pounds per square inch.

B. Hangers: Shall be combination neoprene and springs unless otherwise noted and shall allow for expansion of pipe.

1. Combination Neoprene and Spring (Type H): Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent

between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.

2. Spring Position Hanger (Type HP): Similar to combination neoprene and spring hanger except hanger shall hold piping at a fixed elevation during installation and include a secondary adjustment feature to transfer load to spring while maintaining same position.

3. Neoprene (Type HN): Vibration hanger shall contain a double deflection type neoprene isolation element. Hanger rod shall be separated from contact with hanger bracket by a neoprene grommet.

4. Spring (Type HS): Vibration hanger shall contain a coiled steel spring in series with a neoprene grommet. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.

5. Hanger supports for piping 2-inches and larger shall have a pointer and scale deflection indicator.

C. Snubbers: Each spring mounted base shall have a minimum of four all-directional or eight two directional (two per side) seismic snubbers that are double acting. Elastomeric materials shall be shock absorbent neoprene bridge quality bearing pads, maximum 60 durometer, replaceable and have a minimum thickness of 1/4-inch. Air gap between hard and resilient material shall be not less than 1/8-inch nor more than 1/4-inch. Restraints shall be capable of withstanding design load without permanent deformation.

D. Thrust Restraints (Type THR): Restraints shall provide a spring element contained in a steel frame with neoprene pads at each end attachment. Restraints shall have factory preset thrust and be field adjustable to allow 1/4-inch maximum movement when the fan starts and stops. Restraint assemblies shall include rods, angle brackets and other hardware for field installation.

E. Manufacturer: Subject to compliance with requirements, provide vibration isolators of one of the following:

1. Vibration Eliminator Co., Inc.

2. Mason Industries

2.3 BASES

A. Rails (Type R): Design rails with isolator brackets to reduce mounting height of equipment and cradle machines having legs or bases that do not require a complete supplementary base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension but not less than four-inches. Where rails are used with neoprene mounts for small fans or close coupled pumps, extend rails to compensate overhang of housing.

B. Integral Structural Steel Base (Type B): Design base with isolator brackets to reduce mounting height of equipment which require a complete supplementary rigid base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension, but not less than four-inches.

C. Inertia Base (Type I): Base shall be a reinforced concrete inertia base. Pour concrete into a welded steel channel frame, incorporating pre-located equipment anchor bolts and pipe sleeves. Level concrete to provide a smooth uniform bearing surface for equipment mounting. Provide grout under uneven supports. Channel depth shall be a minimum of 1/12 of longest dimension of base but not less than six inches. Form shall include 1/2-inch reinforcing bars welded in place on minimum of eight inch centers running both ways in a layer 1-1/2 inches above bottom. Use height saving brackets in all mounting locations. Weight of inertia base shall be equal to or greater than weight of equipment supported to provide a maximum peak-to-peak displacement of 1/16-inch.

D. Curb Mounted Isolation Base (Type CB): Fabricate from aluminum to fit on top of standard curb with overlap to allow water run-off and have wind and water seals which shall not interfere with spring action. Provide resilient snubbers with 1/4-inch clearance for wind resistance. Top and bottom bearing surfaces shall have sponge type weather seals. Integral spring isolators shall comply with Spring Isolator (Type S) requirements.

2.4 GENERAL ISOLATOR REQUIREMENTS:

A. Elastomeric isolators shall comply with ASTM D2240 and be oil resistant neoprene with a maximum stiffness of 60 durometer and have a straight-line deflection curve.

B. Exposure to Weather: Isolators, including springs, exposed to weather shall be hot-dip galvanized after fabrication. Hot-dip zinc coating shall be not less than two ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.

C. Uniform Loading: Select and locate isolators to produce uniform loading and deflection even when equipment weight is not evenly distributed.

D. Color code isolator by type and size for easy identification of capacity.

2.5 DUCT SOUND ATTENUATORS

A. General: Contractor shall furnish and install prefabricated silencers in the air handling system of the sizes and performance shown on schedule and/or on drawings. They shall be the product of a nationally known manufacturer who has engaged in the manufacture and distribution of this type of equipment for at least 5 years. Manufacturer shall, upon request, provide certified test reports from a nationally known qualified independent laboratory corroborating his cataloged performance. Test reports shall be based on a 24” x 24” cross sectional rectangular and/or 24” diameter tubular silencers of each type and model required for this project. Manufacturer shall obtain prior product approval from the architect and/or consulting engineer not less than 10 days before bid date.

B. Outer casings shall be of not less than 22 gauge galvanized steel construction. All external seams shall be lockformed and filled with mastic, or continuously welded, and shall be airtight up to 10” water gauge pressure differential. Casings should be suitably stiffened to prevent permanent deformation when tested at 10” pressure differential. They shall not vibrate audibly during normal operation of air handling system.

C. Interior partitions shall be of not less than 24 gauge galvanized steel perforated to remove not more than 18% of the area. Acoustically absorptive filler material made from an inorganic fiber-glass-like material (mineral wool or spun felt) shall be compressed not less than 5% to eliminate voids and prevent settling. Material shall be vermin and moisture proof and impart no odor to the air. Incombustible filler material shall exhibit not more than the following fire hazard classification values when tested in accordance with standard ASTM E84, NFPA 255 or UL-723 test methods:

1. Flamespread 15

2. Fuel Contributed 15

3. Smoke Developed 0

D. Provide polyethylene bagging for fill. Bagging shall be continuous and air tight and shall isolate the fill from the air stream.

E. Acoustical ratings shall be determined by the "duct-to-reverberation room" method as recommended in 1960 by the S1W42 Subcommittee of the American Standards Association. Tests shall be run both with and without air flowing through silencer at not less than three different flow rates. All ratings shall be based on test data from a nationally known qualified independent laboratory. Test method shall eliminate effects due to end reflection, vibration, flanking transmission and standing waves in the reverberant room. Airflow and pressure loss data taken in accordance with AMCA procedures shall be obtained from the same silencer used for acoustic performance tests. Upon request, evidence will be shown of an airflow pressure drop calibration check with an independent laboratory certified by AMCA.

F. Silencer shall provide the minimum attenuation values indicated on the drawings in terms of dB insertion Loss for models shown on drawings at design air velocities.

G. The sound power level generated by airflow through silencer in dB re: 10^{-12} watts (PWL_{12}) shall not exceed the values indicated on the drawings at design flow rates.

H. Airflow pressure drop performance of silencer shall not exceed values indicated on schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Vibration Isolation:

1. No metal-to-metal contact will be permitted between fixed and floating parts.

2. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items made to rotating or reciprocating equipment (pumps, compressors, (etc.) which rests on vibration isolators, shall be isolated from building structure for first three hangers or supports.

3. Common Foundation: Mount each electric motor on same foundation as driven machine. Hold driving motor and driven machine in positive rigid alignment with provision for adjusting motor alignment and belt tension. Bases shall be level throughout length and width. Provide shims to facilitate pipe connections, leveling, and bolting.

4. Provide heat shields where elastomers are subject to temperatures over 100 degrees F.

5. Extend bases for pipe elbow supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.

6. Non-rotating equipment such as heat exchangers and converters shall be mounted on isolation units having the same static deflection as the isolation hangers or support of the pipe connected to the equipment.

B. Inspection and Adjustments: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels.

C. Duct Sound Attenuators: Install duct sound attenuators in strict conformance with manufacturer's written instructions. Maintain required lengths of straight duct upstream and downstream of the attenuator.

END OF SECTION 15200

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15250 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Types of mechanical insulation specified in this section include the following:

1. Piping System Insulation:

    a. Fiberglass

    b. Cellular Glass.

    c. Flexible Unicellular.

2. Duct Work System Insulation:

    a. Fiberglass.

3. Equipment Insulation:

    a. Cellular Glass.

C. Refer to Division-15 section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.

D. Refer to Division-15 section "Mechanical Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.

C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

D. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.

B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Knauf Fiber Glass GmbH.
4. Manville Products Corp.
5. Owens-Corning Fiberglas Corp.
6. Pittsburgh Corning Corp.
7. Rubatex Corp.

2.2 PIPING INSULATION MATERIALS:

A. Fiberglass Piping Insulation: ASTM C 547, Class 1.

B. Cellular Glass Piping Insulation: ASTM C 552, Type II, Class 2.

C. Flexible Unicellular Piping Insulation: ASTM C 534, Type I.

D. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installers option.

E. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.

F. Encase exterior piping insulation with aluminum jacket with weatherproof construction.

G. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

H. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

2.3 DUCTWORK INSULATION MATERIALS:

A. Rigid Fiberglass Ductwork Insulation: ASTM C 612, Class 1.

B. Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.

C. Jackets for Ductwork Insulation: ASTM C 921, Type I.

D. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

E. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

2.4 EQUIPMENT INSULATION MATERIALS:

A. Cellular Glass Equipment Insulation: ASTM C 552, Type I.

B. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.

C. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

D. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

E. Provide aluminum jacket on insulation to the exterior and in mechanical rooms up to six feet above the floor. For these applications aluminum jacket shall provide for 100% coverage.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PLUMBING PIPING SYSTEM INSULATION:

A. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.

B. Cold Piping:

1. Application Requirements: Insulate the following cold plumbing piping systems:

    a. Interior above-ground sanitary drain pipes which receive condensate.

    b. Interior above-ground storm water piping.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

    a. Flexible Unicellular: 1/2" thickness.

C. Hot Piping:

1. Application Requirements: Insulate the following hot plumbing piping systems:

    a. Potable hot water piping.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

    a. Fiberglass: 1" thick for pipe sizes up to and including 6".

3.3 HVAC PIPING SYSTEM INSULATION:

A. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; on heating piping beyond control valve, located within heated space; on condensate piping between steam trap and union; and on unions, flanges, strainers, flexible connections, and expansion joints.

B. Cold Piping (40°F (4.4°C) to ambient).

1. Application Requirements: Insulate the following cold HVAC piping systems:

    a. HVAC chilled water supply and return piping.

    b. Air conditioning condensate drain piping.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

a. Cellular Glass: 1-1/2" thick for pipe sizes up to and including 4", 2" thick for pipe sizes over 4".

3.4 DUCTWORK SYSTEM INSULATION:

A. Insulation Omitted: Do not insulate fibrous glass ductwork, or lined ductwork.

B. Cold Ductwork (Below Ambient Temperature):

1. Application Requirements: Insulate the following cold ductwork.

a. Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.

b. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.

c. Insulate neck and bells of supply diffusers.

d. HVAC return ductwork between room terminal inlet and return fan inlet, or HVAC unit inlet; except omit insulation on return ductwork located in return air ceiling plenums.

e. HVAC plenums and unit housings not pre-insulated at factory or lined.

2. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:

a. Rigid Fiberglass: 1-1/2" thick, increase thickness to 2" in machine, fan and equipment rooms, or

b. Flexible Fiberglass: 1-1/2" thick, application limited to concealed locations.

3.5 EQUIPMENT INSULATION:

A. Cold Equipment (Below Ambient Temperature):

1. Application Requirements: Insulate the following cold equipment:

a. Cold equipment, including chillers, tanks, valve bodies, strainers and pumps.

b. Drip pans under chilled equipment.

c. Cold and chilled water pumps.

d. Roof drain bodies.

2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:

a. Cellular Glass: 3" thick for surfaces above 35°F (2°C) and 4- 1/2" thick for surfaces 35°F (2°C) and lower (cold and chilled water pumps, expansion tanks, and air and solids separators).

b. Flexible Unicellular: 1" thick (roof drain bodies and drip pans).

3.6 INSTALLATION OF PIPING INSULATION:

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

F. Cover valves, fittings, and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

G. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise indicated.

H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.7 INSTALLATION OF DUCTWORK INSULATION:

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation materials with smooth and even surfaces.

C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

E. Extend ductwork insulation without interruption through walls, floors, and similar ductwork penetrations, except where otherwise indicated.

F. Corner Angles: Install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

3.8 INSTALLATION OF EQUIPMENT INSULATION:

A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.

D. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.

E. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.

F. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.

G. Do not insulate handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

H. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames, and accessories.

I. Equipment Exposed to Weather: Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish, or jacketing, as recommended by manufacturer.

3.9 PROTECTION AND REPLACEMENT:

A. Replace damaged insulation which cannot be satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 15250

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15510 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of hydronic piping work is indicated on drawings and schedules, and by requirements of this section.

B. Refer to other Division-15 sections for hydronic specialties; not work of this section.

C. Refer to other Division-15 sections for HVAC pumps; not work of this section.

D. Refer to other Division-15 sections for testing, adjusting, and balancing of hydronic piping systems; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of hydronic piping products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with hydronic piping work similar to that required for project.

C. Codes and Standards:

1. ASME Compliance: Fabricate and install hydronic piping in accordance with ASME B31.9 "Building Services Piping".

2. Florida Building Code-Mechanical, 2001 with 2002 and 2003 Revisions.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for hydronic piping materials and products.

B. Record Drawings: At project closeout, submit record drawings of installed hydronic piping and piping products, in accordance with requirements of Division 1.

C. Maintenance Data: Submit maintenance data and parts lists for hydronic piping materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS:

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ASME B31.9 Code for Building Services Piping where applicable, base pressure rating on hydronic piping systems maximum design pressures. Provide sizes and type matching piping and equipment connections; provide fittings of materials which match pipe materials used in hydronic piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION:

A. General: Provide identification complying with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:

1. Hydronic Piping: Plastic pipe markers.

2. Hydronic Valves: Brass valve tags.

2.3 BASIC PIPES AND PIPE FITTINGS:

A. General: Provide pipes and pipe fittings complying with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:

B. Hydronic Piping:

1. Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; Class 125 cast-iron fittings with threaded joints.

2. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 40; wrought-steel buttwelding fittings with welded joints.

3. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 40; grooved fittings with mechanical grooved couplings in mechanical rooms only.

2.4 BASIC PIPING SPECIALTIES:

A. General: Provide piping specialties complying with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:

1. Pipe escutcheons.

2. Pipeline strainers.

3. Dielectric unions.

4. Sleeves.

5. Sleeve seals.

2.5 BASIC SUPPORTS AND ANCHORS:

A. General: Provide supports and anchors complying with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors", in accordance with the following listing:

1. Adjustable steel clevises, adjustable pipe saddle supports, single pipe rolls, and adjustable roller hangers, for horizontal piping hangers and supports.

2. Two-bolt riser clamps for vertical-piping clamps.

3. Steel turnbuckles, for hanger-rod attachments.

4. Concrete inserts, C-clamps, malleable beam clamps, and steel brackets, for building attachments.

5. Protection saddles, for saddles and shields.

2.6 BASIC VALVES:

A. General: Provide valves complying with Division-15 Basic Mechanical Materials and Methods section "Valves", in accordance with the following listing:

B. Sectional Valves:

1. 2" and Smaller: Ball valves.

2. 2-1/2" and Larger: Butterfly valves.

C. Shutoff Valves:

1. 2" and Smaller: Gate valves.

2. 2" and Smaller: Ball valves.

3. 2-1/2" and Larger: Gate valves.

D. Heating/Cooling Terminal Outlet Valves:

1. 2" and Smaller: Ball valves and balance cocks.

2. 2" and Smaller: Balance valves.

3. 2-1/2" and Larger: Gate valves and balance cocks.

E. Drain Valves:

1. 2" and Smaller: Ball valves.

F. Check Valves:

1. All Sizes: Swing check valves.

2.7 BASIC METERS AND GAGES:

A. General: Provide meters and gages complying with Division-15 Basic Mechanical Materials and Methods section "Meters and Gages", in accordance with the following listing:

1. Thermometers and fittings.

2. Pressure gages and fittings.

3. Flow measuring meters.

2.8 BASIC VIBRATION CONTROL:

A. General: Provide vibration control products complying with Division-15 Basic Mechanical Materials and Methods section "Mechanical Requirements", in accordance with the following listing:

1. Flexible pipe connectors.

2.9 PRE-INSULATED WELDED STEEL PIPING SYSTEM

A. Piping: At the installer's option, steel pre-insulated pipe shall be used for underground chilled water service. The pipe sections shall be welded. Unless otherwise specified, all pipe, fittings, valves, and accessories shall conform to the requirements of ANSI B31.1 and shall be of the proper type for the pressure and temperature of the service.

B. Steel Carrier Pipe and Fittings:

1. Carrier pipe shall be black steel pipe conforming to ASTM A53 ERW Schedule 40 Grade B. The spigot ends shall be beveled for welding.

2. Fittings shall be preinsulated. Fittings shall be pre-insulated by the pipe manufacturer using the same insulation thickness and casing as the pipe. Where necessary laid-up fiberglass casing may be substituted on all or part of the fitting and shall structurally match the casing of the pipe. An anchor plate of the proper size shall be provided when required by the design and shall be an integral part of the fitting. Field applied anchor plates shall not be allowed except by special approval of the engineer. End seals on fittings shall be the same as used on the pipe.

C. Casing (jacket) Pipe shall be PVC or HDPE. The casing, in combination with the foam system, is suitable for H-20 highway loading with two feet of cover providing the pipe bedding and backfill material are properly placed and compacted to H-20 specifications. The casing shall be based on one of the following:

1. PVC Casing pipe for the pre-insulated pipe system shall be Schedule 40 PVC pipe. Pipe of virgin PVC resin meeting the minimum classification requirements of ASTM D 1784, Class 12454-B and has a minimum thickness of 60 mils. The sleeve thickness shall be compatible with and overlap the casing pipe. The following standard 80 lb casing thicknesses may be used as a guide:

Carrier Pipe Size	Casing Thickness

1.5”	.14”
2”	.14”
2.5”	.12”
3”	.12”
4”	.16”
5”	.16”
6”	.20”
8”	.24”
10”	.28”
12”	.25”
14”	.37”
16”	.43”
18”	.43”
20”	.48”
24”	.55”

For other thicknesses, consult the manufacturer.

2. HDPE Casing pipe for the pre-insulated system shall be extruded, black, high density polyethylene (HDPE) having a wall thickness not less than 125 mils for pipe sizes less than or equal to 12”, 150 mils for jacket sizes 12” and larger.

D. Straight run joints shall be field insulated per the manufacturer’s instructions, using PVC or HDPE sleeve, polyurethane foam, and pressure sensitive polyethylene backed, high temperature tape, 30 mils thick, or heat shrink wrap.

E. Fittings shall be factory prefabricated and preinsulated with polyurethane foam to the thickness specified and jacketed with a PVC or molded HDPE fitting cover. Fittings include elbows, tees, reducers and anchors.

F. End Seals: End seals for pre-insulated steel pipe shall be certified to resist infiltration of water at 20 feet of head at the intended operating temperature. Mastic end seals which may meet the requirements of the 20 ft test shall not be allowed.

G. Insulation: Insulation shall be polyurethane foam.

1. Polyurethane foam insulation shall meet the following specifications:

Type:	Two component urethane
Compressive Strength:	35 psi parallel min at 5% Comp
Shrinkage:	None at 70 °F

Free Rise Density: 2.0 to 3.0 lbs/cubic foot

Aged "K" (70 F - 72 hrs) 0.140 BTU-in/hr-sf-°F

Closed Cell Content: 90%

2. Carrier Pipe Size Insulation Thickness

1.5”	1.16”
2”	0.92”
2.5”	1.51”
3”	1.20”
4”	1.67”
5”	1.14”
6”	1.59”
8”	1.57”
10”	1.49”
12”	1.38”
14”	1.98”
16”	2.59”
18”	1.60”
20”	1.92”
24”	1.43”

3. Insulation concentricity: Carrier pipe shall be concentric to casing pipe. The allowable maximum deviation from center line of carrier pipe shall be plus or minus 1/4 inch at the casing center point and plus or minus 1/16 inch at the end seals.

H. Manufacturer: Subject to compliance with requirements, provide preinsulated piping system of one of the following:

1. Thermacor Process

2. Thermal Pipe Systems.

3. Or Engineer’s approved equal.

PART 3 - EXECUTION

3.1 INSPECTION:

A. General: Examine areas and conditions under which hydronic piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF BASIC IDENTIFICATION:

A. General: Install mechanical identification in accordance with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 INSTALLATION OF HYDRONIC PIPING:

A. General: Install hydronic piping in accordance with Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

B. Install eccentric reducers where pipe is reduced in size in direction of flow, with tops of both pipes and reducer flush.

C. Install piping level with no pitch.

D. Connect branch-feed piping to mains at horizontal center line of mains, connect run-out piping to branches at horizontal center line of branches.

E. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.4 INSTALLATION OF PIPING SPECIALTIES:

A. Install piping specialties in accordance with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties".

3.5 INSTALLATION OF SUPPORTS AND ANCHORS:

A. Install supports and anchors in accordance with Division-15 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.6 INSTALLATION OF VALVES:

A. Install valves in accordance with Division-15 Basic Mechanical Materials and Methods section "Valves".

B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more hydronic terminals or equipment connections, and elsewhere as indicated.

C. Shutoff Valves: Install on inlet and outlet of each mechanical equipment item, and on inlet of each hydronic terminal, and elsewhere as indicated.

D. Hydronic Terminal Outlet Valves: Install on outlet of each hydronic terminal, and elsewhere as indicated.

E. Drain Valves: Install on each mechanical equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain hydronic piping system.

F. Check Valves: Install on discharge side of each pump, and elsewhere as indicated.

3.7 INSTALLATION OF METERS AND GAGES:

A. Install meters and gages in accordance with Division-15 Basic Mechanical Materials and Methods section "Meters and Gages".

3.8 EQUIPMENT CONNECTIONS:

A. General: Connect hydronic piping system to mechanical equipment as indicated, and comply with equipment manufacturer's instructions where not otherwise indicated. Install shutoff valve and union on supply and return, drain valve on drain connection.

B. Hydronic Terminals: Install hydronic terminals with hydronic terminal outlet valve and union on outlet; union, shutoff valve on inlet. Install manual air vent valve on element in accordance with manufacturer's instructions. Locate valves and balancing cocks behind valve access doors for ease of maintenance. Where indicated, install automatic temperature control valve with unions between gate valve and element on supply line.

3.9 INSTALLATION OF PREINSULATED PIPE SYSTEMS:

A. Expansion/contraction compensation will be accomplished utilizing factory prefabricated and preinsulated expansion elbows, Z-bends, expansion loops and anchors specifically designed for the intended application. A factory engineered and P.E. sealed drawing shall be supplied.

B. Underground systems shall be buried in a trench of not less than two feet deeper than the top of pipe and not less than eighteen inches wider than the combined O.D. of all piping systems. A minimum thickness of 24 inches of compacted backfill placed over the top of the pipe will meet H-20 highway loading.

C. Apply rust inhibitor at joints prior to enclosing with insulation.

D. A final hydrostatic pressure test of the carrier pipe shall be performed, with system pressure at 125 psig for not less than four hours. Care shall be taken to insure all trapped air is removed from the system prior to the test.

E. Field service will be provided by a certified manufacturer's representative or company field service technician. The technician will be available at the job a minimum of three times to check unloading, storage and handling of pipe, joint installation , pressure testing and backfilling techniques.

3.10 FIELD QUALITY CONTROL:

A. Piping Tests: Test hydronic piping in accordance with testing requirements of Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.11 ADJUSTING AND CLEANING:

A. Cleaning, Flushing, and Inspecting: Clean, flush, and inspect hydronic piping systems in accordance with requirements of Division-15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

B. Chemical Treatment: Refill hydronic piping systems, adding caustic soda to maintain pH of 8.0 to 8.5 and sodium sulfate in amount of 1/3 caustic soda or to maintain residual of 30- to 40- ppm in system. Add trisodium phosphate to make hardness of 0-ppm and residual of approximately 30-ppm in system. Repeat measurements daily for 7 days minimum with system under full circulation and apply chemicals to adjust levels until no change is apparent.

END OF SECTION 15510

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15515 - HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of hydronic specialties required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Types of hydronic specialties specified in this section include the following:

1. Balance Valves.

2. Vent Valves.

3. Air Separators.

4. Compression Tanks

5. Pump Discharge Valves.

6. Shot Feeders.

7. Liquid Flow Switches.

8. Pressure Reducing Valves.

C. Hydronic specialties furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-15 sections.

D. Refer to other Division-15 sections for insulation of hydronic specialties; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of hydronic specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Hydronic Specialty Types: Provide hydronic specialties of same type by same manufacturer.

C. Codes and Standards:

1. ASME Compliance: Manufacture and install hydronic specialties in accordance with ASME B31.9 "Building Services Piping".

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of hydronic specialty. Include pressure drop curve or chart for each type and size of hydronic specialty. Submit schedule indicating manufacturer's figure number, size, location, rated capacities, and features for each required hydronic specialty.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weights, required clearances, and method of assembly of components.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of hydronic specialty. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTIES:

A. General: Provide factory-fabricated hydronic specialties recommended by manufacturer for use in service indicated. Provide hydronic specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option, but more than one type cannot be used on project.

2.2 BALANCE VALVES:

A. General: Calibrated balance valves are specified in Specification Section 15135 Meters and Gauges and are work of this section.

2.3 VENT VALVES:

A. Manual Vent Valves: Provide manual vent valves designed to be operated manually with screwdriver or thumbscrew, 1/8" NPS connection.

B. Automatic Vent Valves: Provide automatic vent valves designed to vent automatically with float principle, stainless steel float and mechanisms, cast-iron body, pressure rated for 125 psi, 1/2" NPS inlet and outlet connections.

C. Manufacturer: Subject to compliance with requirements, provide vent valves of one of the following:

1. Armstrong Machine Works.

2. Bell & Gossett ITT; Fluid Handling Div.

3. Hoffman Specialty ITT; Fluid Handling Div.

4. Spirax Sarco.

2.4 AIR SEPARATORS:

A. General: Provide air separators pressure rated for 125 psi. Select capacity based on total system gpm.

B. Combination Separator/Strainer: Provide external combination air separators/strainers as indicated. Construct of steel complying with ASME Boiler and Pressure Vessel Code and stamped with "U" symbol. Furnish National Board Form U-1 denoting compliance. Provide galvanized steel integral strainer with 3/16" perforations and free area of not less than 5 times cross-sectional area of connecting lines. Provide tangential inlet and outlet connections and internal stainless steel air collector tube designed to direct released air into compression tank. Provide blowdown connections.

C. Manufacturer: Subject to compliance with requirements, provide air separators of one of the following:

1. Amtrol, Inc.

2. Armstrong Pumps, Inc.

3. Bell & Gossett ITT; Fluid Handling Div.

4. Griswold, Inc.

5. Taco, Inc.

2.5 COMPRESSION TANKS:

A. General: For chilled water service, provide floor-mounted bladder type expansion tanks of size and number as indicated. For heating water service,

provide floor-mounted bladderless type expansion tanks of size and number as indicated. Construct of steel for 125 psi pressure rating complying with ASME Boiler and Pressure Vessel Code and stamped with "U" symbol. Furnish National Board form U-1 denoting compliance. Provide tappings in bottom of tank for tank fitting; tappings in end of tank for gage glass.

B. Tank Fittings: Provide tank fittings for compression tanks as indicated, sized for compression tank diameter. Design tank fittings for 125 psi pressure rating and include manual vent to establish proper air volume in tank on initial fill.

C. Manufacturer: Subject to compliance with requirements, provide compression tanks and tank fittings of one of the following:

1. Amtrol, Inc.

2. Armstrong Pumps, Inc.

3. Bell & Gossett ITT; Fluid Handling Div.

4. Taco, Inc.

2.6 PUMP DISCHARGE VALVES:

A. General: Provide pump discharge valves as indicated. Provide non-slam check valve with spring-loaded disc and calibrated adjustment feature permitting regulation of pump discharge flow and shutoff. Design valves to permit repacking under full line pressure, and with bolt-on bonnet. Provide flanged cast-iron valve body, pressure rated for 175 psi, maximum operating temperature of 300ºF (149ºC). Provide straight or angle pattern as indicated.

B Manufacturer: Subject to compliance with requirements, provide pump discharge valves of one of the following:

1. Amtrol, Inc.

2. Armstrong Pumps, Inc.

3. Bell & Gossett ITT; Fluid Handling Div.

4. Taco, Inc.

2.7 SHOT FEEDERS:

A. General: Provide shot feeders of minimum 5 gal. capacity or otherwise as indicated, constructed of cast iron or steel, for introducing chemicals in hydronic

system. Provide funnel and valve on top for loading, drain valve in bottom, and recirculating valves on side. Construct for pressure rating of 125 psi.

B Manufacturer: Subject to compliance with requirements, provide shot feeders of one of the following:

1. Culligan USA.
2. Efficiency Dynamix
3. Vulcan Laboratories, Subsidiary of Clow Corp.
4. York-Shipley, Inc.

2.8 PRESSURE REDUCING VALVES:

A. General: Provide pressure reducing valves as indicated, of size and capacity as selected by Installer to maintain operating pressure on boiler system.

B. Construction: Cast-iron or brass body, low inlet pressure check valve, inlet strainer removable without system shut-down, non-corrosive valve seat and stem, factory-set at operating pressure.

C. Manufacturer: Subject to compliance with requirements, provide pressure reducing valves of one of the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett ITT; Fluid Handling Div.
4. Taco, Inc.

PART 3 - EXECUTION

3.1 INSPECTION:

A. General: Examine areas and conditions under which hydronic specialties are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF HYDRONIC SPECIALTIES:

A. Balance Valves: At Installer's option, install balance valves in lieu of terminal outlet valves and balance cocks. Install on each hydronic terminal and

elsewhere as indicated. After hydronic system balancing has been completed, mark each balance valve with stripe of yellow lacquer across body and stop plate to permanently mark final balanced position.

3.3 VENT VALVES:

A. Manual Vent Valves: Install manual vent valves on each hydronic terminal at highest point, and on each hydronic piping drop in direction of flow for mains, branches, and runouts, and elsewhere as indicated.

B. Automatic Vent Valves: Install automatic vent valves at top of each hydronic riser and elsewhere as indicated. Install shutoff valve between riser and vent valve, pipe outlet to suitable plumbing drain, or as indicated.

C. Flow Control Valves: Install flow control valves on discharge of each pump serving hydronic heating system or zone, and elsewhere as indicated. Install with check mechanism in upright position, with adequate clearance for service and replacement. Screw check down for automatic operation.

3.4 AIR SEPARATORS:

A. Combination Separator/Strainer: Install external combination separators/strainers in pump suction lines. Connect inlet and outlet piping. Run piping to compression tank with 1/4" per foot (2%) upward slope towards tank. Install blowdown valve and piping. Remove and clean strainer after 24 hours and again after 30 days of system operation.

B. Compression Tanks: Install compression tanks on trapeze hangers sized for tank fully loaded, or otherwise as indicated. Install gage glass and cocks on end of tank. Install tank fitting in tank bottom and charge tank in accordance with manufacturer's instructions.

C. Tank Fittings: Install tank fittings in bottom of compression tanks. Use manual vent for initial fill to establish proper water level in tank.

D. Pump Discharge Valves: At Installer's option, install pump discharge valves on each pump discharge line in lieu of separate shutoff valve, check valve, and balance cock. Install in horizontal or vertical position with stem in upward position; allow clearance above stem for check mechanism removal. After hydronic system has been completed, mark calibrated name plate with stripe of yellow lacquer to permanently mark final balanced position.

E. Shot Feeders: Install shot feeders on each hydronic system at pump discharge and elsewhere as indicated. Install in upright position with top of funnel not more

than 48" above floor. Install globe valve in pump discharge line between recirculating lines. Pipe drain to nearest plumbing drain or as indicated.

F. Liquid Flow Switches: Install liquid flow switches on inlet to water chiller, inlet to water condenser, and elsewhere as indicated. Install in horizontal pipe with switch mounted in tee on top of pipe with minimum of 24" of straight pipe with no fittings both upstream and downstream of switch. Remove segments of paddle to fit pipe in accordance with manufacturer's instructions.

G. Pressure Reducing Valves: Install for chilled water makeup system.

END OF SECTION 15515

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15540 - HVAC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-15 Basic Mechanical Materials and Methods section apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of HVAC pumps work required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Types of pumps specified in this section include the following:

1. Frame Mounted End Suction Pumps.

C. Pumps furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-15 sections.

D. Refer to other Division-15 sections for insulation of HVAC pump housings; not work of this section.

E. Refer to other Division-15 sections for vibration control of HVAC pumps; not work of this section.

F. Refer for Division-16 sections for the following work; not work of this section.

1. Power supply wiring from power source to power connection on pumps. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

G. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections:

1. Control wiring and conduit between field-installed controls, indicating devices, and pump control panels.

2. Control wiring and conduit specified as work of Division-15 for Automatic Temperature Controls is work of Section 15950 - HVAC Control Systems.

3. Interlock wiring specified as factory-installed is work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of general-use centrifugal pumps with characteristics, sizes and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI "Hydraulic Institute Standards".

2. UL Compliance: Design, manufacture, and install HVAC pumps in accordance with UL 778 "Motor Operated Water Pumps".

3. UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's pump specifications, installation and start-up instructions, and current accurate pump characteristic performance curves with selection points clearly indicated.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to HVAC pumps. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

D. Maintenance Data: Submit maintenance data and parts lists for each type of pump, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Handle HVAC pumps and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged HVAC pumps or components; replace with new.

B. Store HVAC pumps and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with manufacturer's rigging and installation instructions for unloading HVAC pumps, and moving them to final location.

PART 2 - PRODUCTS

2.1 PUMPS:

A. General: Provide factory-tested pumps, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment. Type, size, and capacity of each pump is listed in pump schedule. Provide pumps of same type by same manufacturer.

2.2 FRAME-MOUNTED END SUCTION PUMPS:

A. General: Provide frame-mounted end suction pumps where indicated, and of capacities and having characteristics as scheduled.

B. Type: Horizontal mount, single stage, vertical split case, flexible coupling, base mounted, designed for 175 psi working pressure.

C. Casing: Cast iron, 125 psi ANSI flanges, tappings for gage and drain connections.

D. Shaft: Steel with replaceable shaft sleeve.

E. Bearings: Regreasable ball bearings.

F. Seal: Mechanical, with carbon seal ring and ceramic seat.

G. Motor: TEFC, regreasable ball bearings.

H. Impeller: Enclosed type, hydraulically and dynamically balanced, keyed to shaft and secured with locking screw.

I. Baseplate: Structural steel with welded cross members, and open grouting area.

J. Coupling: Flexible, capable of absorbing torsional vibration, equipped with coupling guard.

K. Manufacturer: Subject to compliance with requirements, provide frame-mounted end suction pumps of one of the following:

1. Armstrong Pumps, Inc.

2. Aurora Pump: Unit of General Signal.

3. Taco Pumps.

4. ITT Bell & Gossett.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which HVAC pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF PUMPS:

A. General: Install HVAC pumps where indicated, in accordance with manufacturer's published installation instructions, complying with recognized industry practices to ensure that HVAC pumps comply with requirements and serve intended purposes.

B. Access: Provide access space around HVAC pumps for service as indicated, but in no case less than that recommended by manufacturer.

C. Support: Refer to Division-15 section "Vibration Control" for support and mounting requirements of HVAC pumps.

D. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

E. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

F. Piping Connections: Refer to Division-15 HVAC piping sections. Provide piping, valves, accessories, gages, supports, and flexible connections as indicated.

3.3 ADJUSTING AND CLEANING:

A. Alignment: Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer, and in presence of manufacturer's service representative.

B. Start-Up: Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

C. Refer to Division-15 section "HVAC Testing, Adjusting and Balancing" for pump system balancing; not work of this section.

D. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 15540

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15550 – PACKAGED AIR-COOLED WATER CHILLERS

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division – 1 specification sections, apply to work of this section.

B. Division – 15 Basic Mechanical Materials and Methods section apply to work of this section.

1.2 SCOPE:

A. The work under this section shall include furnishing all labor, materials, tools, appliances, and equipment, and performing all operations necessary for the complete installation of all equipment as shown, detailed, and/or scheduled on the drawings, and/or specified in this section of the specifications.

B. Refer for Division – 16 sections for the following work; not work of this section.

1. Power supply wiring from power source to power connection on chiller contactor enclosure. Include disconnects and starters as a part of Division – 15 where specified as furnished, or factory-installed, by manufacturer.

2. Control power circuit from power source to chiller control panel in chiller.

C. Provide the following electrical work as work of this section, complying with requirements of Division – 16 sections:

1. Control wiring and conduit between field-installed controls, indicating devices, and pump control panels.

2. Control wiring and conduit specified as work of Division – 15 for automatic Temperature Controls is work of Section 15971 – Automatic Temperature Controls.

3. Interlock wiring specified as factory-installed is work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of general-use packaged water chillers with characteristics, sizes and capacities

required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Air Conditioning and Refrigeration Institute (ARI):

1. 490-85 Refrigerant Liquid Receivers

2. 520-85 Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units

C. American Society of Mechanical Engineers (ASME):

1. Boiler and Pressure Vessel Code

2. Section 8-D-2-86, Pressure Vessels, Division 1

D. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):

1. 15-92 Safety Code for Mechanical Refrigeration

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

1. C534-82 Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's chiller specifications, installation and start-up instructions, and current accurate chiller performance data. Submit surge suppression devices to be provided with chiller.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to the chiller. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

D. Maintenance Data: Submit maintenance data and parts lists for the chiller, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division – 1.

E. Refer to Division – 16 sections for the following work; not work of this section.

1. Power supply wiring from power source to power connection on pumps. Include starters, disconnects, and required electrical devices as a part of Division – 15 where specified as furnished, or factory-installed, by manufacturer.

F. Provide the following electrical work as work of this section, complying with requirements of Division – 16 sections:

1. Control wiring between field-installed controls, indicating devices, and pump control panels.

2. Control wiring specified as work of Division – 15 for Automatic Temperature Controls is work of Sections 15971 – Automatic Temperature Controls.

3. Interlock wiring specified as factory-installed is work of this section.

PART 2 – PRODUCTS

2.1 GENERAL:

A. Furnish and install as shown on the plans factory assembled, factory charged, and factory run tested air-cooled scroll compressor packaged chillers in the quantity specified. Each chiller shall consist of multiple hermetic scroll compressors, direct expansion evaporator, air-cooled condenser section, control system and all components necessary for safe and controlled unit operation.

B. Manufacturer: Subject to compliance with requirements. Air handlers and chillers will be of the same manufacturer:

1. Carrier

2. McQuay

3. Trane

4. York

2.2 DESIGN REQUIREMENTS:

A. General: The unit shall be pressure-tested, evacuated, and fully charged with Refrigerant-410A (R-410A) and shall include an initial oil charge. After assembly, a complete operational test shall be performed with water flowing through the cooler to assure that the refrigeration circuit operates correctly.

B. Performance: Refer to the schedule of performance on the drawings. The chiller shall be capable of stable operation to a minimum of 16.7 percent of full load without hot gas bypass. Performance shall be in accordance with ARI Standard 590.

C. Acoustics: Sound pressure levels for the units shall meet or be lower than 67 dBA on the overall “A” weighted sound pressure level as measured from a distance of 30 feet from the side of the unit. Chiller manufacturer to provide acoustical treatment as necessary to meet this criteria.

D. Construction: The unit structure shall be heavy-gauge, galvanized steel. This galvanized steel shall be coated with baked-on powder paint, which, when subjected to ASTM B117 500 hour, salt spray testing, yields a minimum ASTM 1654 rating of “6”. Units shall be designed in accordance with NFPA 70 (National Electric Code), ASHRAE/ANSI 15 Safety code for mechanical refrigeration, ASME and rated in accordance with ARI Standard 550/590-98.

E. Compressors: The chiller shall have suction-gas cooled, hermetic, scroll compressors. The compressors shall incorporate a compliant scroll design in both the axial and radial direction. All rotating parts shall be statically and dynamically balanced. A large internal volume and oil reservoir provides greater liquid tolerance. Compressor crankcase heaters shall be included for extra protection against liquid migration.

F. Evaporator: The cooler shall be equipped with a heater controlled by a separate thermostat. The heater shall provide freeze protection for the cooler down to –20ºF ambient. The cooler shall be covered with minimum 3/4" flexible, closed-cell, foam insulation (K=0.25). The water baffles shall be constructed of galvanized steel to resist corrosion. The removable heads shall allow access to the internally enhanced, seamless, copper tubes. Vent and drain connections shall be included. Water inlet and outlet connections shall be grooved for compatibility with field supplied Victaulic connections.

G. Condenser: Fin and tube or micro channel condenser coils of seamless, internally-enhanced, high-condensing-coefficient, corrosion resistant copper tubes shall be arranged in staggered rows, mechanically expanded into aluminum fins. Integral subcooling shall be included. The design working pressure of the coil shall be 450 PSIG. The condenser fans shall be composed of corrosion resistant aluminum hub and aluminum. They shall be designed for maximum efficiency and shall be statically and dynamically balanced for vibration free operation. They shall be directly driven by independent motors, and positioned for vertical air discharge. The fan guards shall be constructed of heavy-gauge, rust-resistant, coated steel. All blades shall be statically and

dynamically balanced for vibration-free operation. The fan motors shall be Totally Enclosed Air-Over, squirrel-cage type, current protected. ODP condenser fan motors are not acceptable. They shall feature ball bearings that are double-sealed and permanently lubricated.

H. Coil Coating: Provide coating on all condenser coils, as described herein.

1. All condenser coils shall be provided with a factory-applied coating resistant to a salt air environment. Coil coating shall be proven in similar salt exposure applications for minimum 3.000 hours salt spray test in accordance with ASTM B-117.

2. The coil coating company shall prove experience in salt resistant coatings for a period of over 10 years. The coating vendor shall provide a written 10 year warranty on all coil coatings with coil replacement (parts and labor included). Coating shall be performed in a controlled factory environment and shall be a "dip" coat process that fully covers coil fins, tubes and casing. Pre-coating fins without final "dip" coating is not acceptable. Field application coatings shall be limited to additional coverage of equipment, touch-up, and warranty work. Coating shall be: epoxy (E-coat) process with urethane U.V. top coats, polyelastomer (equal to Bronze-Glow), or phenolic epoxy (equal to “Heresite" products).

3. The condensing units shall be sized to compensate for capacity losses due to coatings. Any degradation of equipment performance shall be clearly indicated in that equipment’s shop drawing.

4. Standard, uncoated aluminum fin, copper tube coils are not acceptable for exterior condenser coils.

I. Refrigerant Circuit: Each refrigerant circuit shall include: compressor suction and discharge line shutoff valve, liquid line shutoff valve with charging port, low side pressure relief device, filter-drier, solenoid valve, sight glass with moisture indicator, thermostatic expansion valves, and flexible, closed-cell foam insulated suction line.

J. Microprocessor Control Center shall include automatic start, stop, operating, and protection sequences across the range of scheduled conditions and transient. The Microprocessor Control Center shall be enclosed in a rain and dust tight NEMA 3R/12 powder painted steel cabinet with hinged, latched, and gasket sealed door.

1. Provide automatic control of compressor start/stop, anti-coincidence and anti-recycle timers, automatic pumpdown shutdown, condenser fans,

evaporator pump, evaporator heater, unit alarm contacts, and chiller operation from 0°F to 125°F ambient. Provide automatic reset to normal chiller operation after power failure.

2. Provide remote water temperature reset via a Pulse Width Modulated (PWM) input signal or up to two steps of demand (load) limiting.

3. Provide software stored in non-volatile memory, with programmed setpoints retained in lithium battery backed real time clock (RTC) memory for minimum 5 years.

4. Provide minimum forty character liquid crystal display, descriptions in English, numeric data in English units. Provide sealed keypad with sections for Setpoints, Display/Print, Entry, Unit Options & clock, and On/Off Switch.

5. Programmable Setpoints (within Manufacturer limits) shall include: display language; chilled liquid temperature setpoint and range, remote reset temperature range, set daily schedule/holiday for start/stop, manual override for servicing, low and high ambient cutouts, number of compressors, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-recycle timer (compressor start cycle time), and anti-coincident timer (delay compressor starts).

6. Display Data shall include: Return and leaving liquid temperatures, low leaving liquid temperature cutout setting, low ambient temperature cutout setting, outdoor air temperature, English data, suction pressure cutout setting, each system suction pressure, discharge pressure, liquid temperature reset via Building Automation System (by others) via PWM input as standard or a 4-20milliamp or 0-10 VDC input or contact closure with optional BAS interface, anti-recycle timer status for each compressor, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date and time, daily start/stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves, evaporator heater and fan operation, run permissive status, number of compressors running, liquid solenoid valve status, load & unload timer status, water pump status.

7. System Safeties: Shall cause individual compressor systems to perform auto shut down; manual reset required after the third trip in 90 minutes. Include high discharge pressure, low suction pressure, high pressure switch, and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.

8. Unit Safeties: Shall be automatic reset and cause compressors to shut down if low ambient, low leaving chilled liquid temperature, under voltage, and flow switch operation. Contractor shall provide flow switch and wiring per chiller manufacturer requirements.

9. Alarm Contacts: Provide low ambient, low leaving chilled liquid temperature, low voltage, low battery, and (per compressor circuit): high discharge pressure, and low suction pressure.

10. Provide surge suppression devices for protection of all low voltage contro and communications circuits. Devices shall be by EDCO, DiTek, Joslyn, or chiller manufacturer approved equal, and selected for the appropriate clamping voltage and surge energy capacity for each application.

K. Power Connection: Provide Single Point Disconnect with Individual System Breakers: Single point Terminal Block with Non-Fused Disconnect and lockable external handle (in compliance with Article 440-14 of N.E.C.) shall be supplied to isolate power voltage for servicing. Provide factory-installed interconnecting wiring from disconnect to factory supplied circuit breakers.

2.3 REQUIRED OPTIONS AND ACCESSORIES

A. Control Transformer: Shall convert unit power voltage to 115-1-60 (500VA capacity). Factory mounting includes primary- and secondary wiring between the transformer and the control panel. (Factory-mounted.)

B. Low Ambient Kit: This accessory shall include all necessary components to permit chiller operation to 35°F ambient temperature. (Factory-mounted.)

C. Suction Pressure Transducers: The addition of suction transducers shall allow the chiller to sense and display suction pressure. (Factory mounted.)

D. Service Isolation Valves: Compressor service suction and discharge (ball type) isolation valves shall be added to unit per system in addition to the liquid line shutoff valves. Include a system high-pressure relief valve in compliance with ASHRAE 15. (Factory-mounted.)

E. Crankcase Heaters: Provide compressor crankcase heaters for extra protection against liquid migration. (Factory-mounted.)

F. Flow Switch: The flow switch or its equivalent shall be furnished with each unit. Provide vapor-proof SPDT, NEMA 4X switch (150 PSIG DWP), -20°F to 250°F, with 1" NPT connection for upright mounting in horizontal pipe. (Field-mounted.)

G. Low Sound Fans: Provide low sound fans as required to meet specified maximum sound levels. (Factory-mounted.)

H. Vibration Isolation: Neoprene pad isolators for mounting under unit base rails. (Field-mounted.)

I. Protective Wire Panels for Hail Protection: Shall consist of close mesh (1/2”) one-half inch (max.) welded-wire-mesh guards mounted on the exterior of the unit over the condenser coils and lower section of the chiller, which houses the compressors and evaporator to prevent unauthorized access, yet provide free air flow. (Factory-mounted.)

2.4 START-UP SERVICE:

A. Start-up Service: Manufacturer shall furnish a factory-trained service representative to perform leak testing, evacuation, dehydration, and charging of the unit. Chiller manufacturer shall maintain service staff no more than 25 miles from the jobsite. The service agency noted shall be the direct representative of the manufacturer and shall devote the majority of its efforts on behalf of manufacturer’s equipment and shall not be merely a local service company designated by the manufacturer. Start-up service shall include the following:

1. Check equipment for possible shipping damage.

2. Check all safety controls and interlocks.

3. Check unit installation and isolation.

4. Pressure test leak check, and charge unit with manufacturer provided refrigerant.

5. Start unit and make necessary adjustments.

6. Provide formal factory training for proper operation of equipment for owner staff.

7. Provide complete report of activities accomplished.

B. The installing Contractor shall be responsible for the installation of the equipment and any associated piping and wiring in accordance with the manufacturer’s recommendations. Contractor shall be responsible for all pneumatic piping and/or electrical control work. He shall notify the manufacturer 10 days prior to start-up procedure. The Contractor shall also be responsible for placing the pumps, and system in proper operation so that a load is available for the start-up of the machine.

PART 3 – EXECUTION

3.1 EQUIPMENT:

A. Each piece of equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

B. Each piece of equipment shall be installed to be free of noise and vibration. Provide vibration isolators as per manufacturer's recommendations and/or as herein specified.

C. Deliver equipment to the site in manufacturer's original packaging. Clearly mark each item with the proper identification number. Store in accordance with the requirements of Section 15010.

3.2 WARRANTY:

A. Each chiller shall be provided with a five year warranty for both parts and labor by the manufacturer. In addition each chiller shall be provided with an extended four-year compressor parts only warranty. The manufacturer's warranty shall cover items found to be defective in material and workmanship and does not include routine maintenance or service.

END OF SECTION 15550

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15763 - AIR HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this section.

B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. The air handler has already been bid directly to the manufacturers for a direct purchase arrangement. The scope of work for this project consists of installing the air handler, and providing a warranty as indicated herein for the air handler and its installation. Extent of air handling unit work is indicated by drawings and schedules, and by requirements of this section.

B. Types of air handling units required for project include the following:

1. Factory fabricated variable volume air handling unit.

C. Refer to other Division-15 sections for piping; ductwork; and testing, adjusting and balancing of air handling units; not work of this section.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications for air handling units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.

1. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.

2. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Handle air handling units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged air handling units or components; replace with new.

B. Store air handling units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with manufacturer's rigging and installation instructions for unloading air handling units, and moving them to final location.

1.5 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air handlers, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:

C. Air-Conditioning and Refrigeration Institute (ARI):

1. 430-78 Standard for Central Station Air Handling Units. Directory of Certified Applied Air Conditioning Products

D. Air Moving and Conditioning Association (AMCA):

1. 99-83 Standards Handbook

2. 300-67 Test Code for Sound Rating

3. 301-76 Methods for Calculating Fan Sound Ratings from Laboratory Test Data

E. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):

1. 68-78 Method of Testing In-Duct Sound Power Measurement Procedure for Fans

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

1. C423-77 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

2. D3359-83 Measuring Adhesion by Tape Test

3. E84-81* Surface Burning Characteristics of Building Materials

4. E90-81* Airborne-Sound Transmission Loss of Building Partitions, Laboratory Measurement

5. E413-73* Sound Transmission Class, Classification for Determination

6. G23-81 Operating Light-Exposure Apparatus

G. Anti-Friction Bearing Manufacturer's Association, Inc. (AFBMA):

1. 9-1978 Load Ratings and Fatigue Life for Ball Bearings

H. National Fire Protection Association (NFPA):

1. 90A-1985 Installation of Air Conditioning and Ventilating Systems

PART 2 - PRODUCTS

2.1 FACTORY FABRICATED AIR HANDLING UNIT

A. Standards and Certification Compliance:

1. Standards: ARI 430.

2. Certification: ARI Directory of Certified Applied Air Conditioning Products.

3. Operating limits: AMCA 99 (Class A, B, C, as defined by Standard 1401-66).

4. Sound power level ratings: AMCA 300 and 301, or ASHRAE 68.

B. Casings: Double wall, 16 guage stainless steel, or equivalent strength construction, fastened to a steel support frame. Provide reinforced support points for setting or hanging the unit.

1. All steel shall be mill-galvanized, or phosphatized and coated inside and out with minimum two coats, corrosion resistant enamel paint. Manufacturers paint and paint system shall meet the minimum specifications of ASTM D3359 adhesion.

2. Coil and fan casings shall have removable panels for servicing or replacement of components. These removable panels are not to be construed as inspection or access panels.

a. Unit inspection doors shall be a minimum of 6 inches high by 6 inches wide in each end of fan sections and in other locations shown on the drawings. Doors shall be double wall, insulated, hinged and provided with heavy duty latches. Doors shall be designed to open against the unit static pressure unless properly safety latched and gasketed to prevent air leakage.

b. Unit access doors shall be provided, as shown on drawings. Access doors shall be double wall, insulated, hinged and provided with heavy duty latches. Minimum door width shall be 12 inches. Door height shall be full height as determined by unit casing but not to exceed 6'-0". Doors shall be hinged to open against fan operating pressure unless properly safety latched and gasketed to prevent air leakage.

c. Airway access sections with hinged and latched access doors shall be provided as shown on drawings. Sections shall be provided with access doors on each side unless otherwise indicated on drawings. Access sections located downstream of the cooling coil shall be insulated as specified for unit casing.

C. Fan: Double width, double inlet airfoil type, factory balanced. The maximum allowable noise generation is indicated on the drawings. The vibration tolerance is specified in Section, NOISE AND VIBRATION CONTROL. Provide self-aligning, pillow block or flanged type, regreaseable, ball type bearings selected for 200,000 hours average life, per AFBMA Standard 9. Extend grease lines for interior fan or motor bearings to the outside of the casing. Internally mounted motors and drives do not require a separate drive guard.

1. Fan motor and drive: Furnish from the factory with the air handling unit.

2. Flexible connection: Provide for units with internally mounted motor and drive.

D. Fan Section Construction: Fan, motor and drive assembly shall be factory mounted on an isolation frame supported on springs with 1-1/2 inches minimum deflection. Provide thrust restraint spring for fans with horizontal discharge. External vibration isolation, and flexible connections to ductwork and in piping to and from coils are required in addition to the internal isolation.

E. Coils:

1. Tubes: Seamless copper tubing - .025” nominal thickness.

2. Fins: 0.0055 inch aluminum or 0.0045 inch copper mechanically bonded or soldered or helically wound around tubing. Provide copper fins for sprayed coil applications.

3. Headers: Copper, welded steel or cast iron.

4. "U" Bends, Where Used: Machine die formed, silver brazed to tube ends.

5. Coil Casing: l6 gage Type 304 syainless steel with tube supports at 48-inch maximum spacing. Construct casing to eliminate air bypass and moisture carry-over. Provide duct connection flanges.

6. Protection: Unless protected by the coil casing, provide cardboard, plywood, or plastic material at the factory to protect tube and finned surfaces during shipping and construction activities.

7. Vents and Drain: Coils that are not vented or drainable by the piping system shall have capped vent/drain connections extended through coil casing. Construct of red brass (non-ferrous) material.

8. Condensate Drain Pan: Condensate drain pan shall be constructed of Type 304 stainless steel and shall be sloped at 1/8" per foot to the outlet. Extend under cooling coil and header. Provide outlet connection. Insulate pan with not less than 1/2-inch thick, rigid, water impervious insulation of sprayed or foamed-in-place type. Insulation adhesive and inner coating shall comply with NFPA 90A flame spread and smoke generation requirements.

9. Filter Box: Provide for type of filters shown.

10. Internal Insulation:

    a. Materials shall meet NFPA 90A flame spread and smoke generation requirements.

    b. Fiberglass: Provide 2 inch thick. 1-1/2 PCF insulation between the outer casing and the inner liner, factory applied with adhesive and mechanical fasteners. Apply sealant to all visible raw edges and butt joints of insulation. Provide full uncompressed insulation 2” thick under condensate drain pan. Provide additional insulation under coil section with additional protective metal liner if required to meet this specification.

F. Manufacturer: Subject to compliance with requirements, provide air handling units of one the following. Air handlers and chillers will be of the same manufacturer::

1. Carrier
2. McQuay
3. Trane
4. York

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify that coils, filters, motors, drives and other components are matched with the proper air handling unit.

B. Assemble air handling unit components following manufacturer's instructions for handling, testing and operation. Repair damaged galvanized areas, and paint.

C. Vacuum clean interior of air handling units prior to operation.

D. Repair air leaks from or into casing that can be heard or felt during normal operation.

3.2 WARRANTY

A. Provide a five-year parts and labor warranty for the air handling unit.

END OF SECTION 15763

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15830 - TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other related Specification sections, apply to work of this section.

B. Division- 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extend of terminal unit work is indicated by drawings and schedules, and by requirements of this section.

B. Types of terminal units required for project include the following:

1. Electric duct heaters

C. Refer to other Division- 15 sections for piping; ductwork; HVAC controls, and testing, adjusting and balancing of terminal units; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of terminal units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications for terminal units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.

1. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.

2. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings

in maintenance manuals; in accordance with requirements of the specifications.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components; replace with new.

B. Store terminal units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with manufacturer's rigging and installation instructions for unloading terminal units, and moving them to final location.

PART 2 - PRODUCT

2.1 Electric Duct Heaters:

A. Voltage, size, KW, steps and control voltage shall be as scheduled. Three phase heaters shall have balanced phases.

1. Heaters shall be UL Listed for zero clearance and shall meet all NEC requirements.

2. Type: Heaters shall be of the following configuration:

3. For Duct Mounting . . . . . All Slip-in or Flanged

4. For Air Handling Unit Coils . . . . . .All Slip-in or Flanged

5. Element terminals shall be stainless steel; insulators and bracket bushings shall be nonporous ceramic and securely positioned. Terminals shall be machine crimped to elements.

6. Elements for Finned Tubular heaters shall have steel fins brazed to copper plated sheath. Element wire shall be 80/20 Nichrome. Elements shall be protected against corrosion by a high-temperature aluminum coating.

7. Terminals shall be sealed with silicone rubber to protect against moisture.

8. Frame shall be constructed of heavy gauge galvanized steel with galvanized steel brackets, stiffening ribs and gussets spot-welded to the frame.

9. Terminal box shall be spot welded construction with solid, hinged cover, totally enclosed, without louvers or grilles per the UL Standard.

10. Recessed terminal box to be provided when coils are installed in ducts with internal insulation or obstruction greater than 1".

11. Direction of airflow: heaters shall be interchangeable for horizontal left or right or vertical up airflow except when position sensitive mercury contactors or SCR's are built-in. In these cases, airflow direction shall be as scheduled.

12. Safety devices: a disc-type automatic reset thermal cutout shall be furnished for primary over-temperature protection. For secondary protection, a sufficient number of replaceable thermal cutouts in the power lines shall de-energize elements if the primary cutout fails. All safety devices shall be serviceable through the terminal box without removing the heater from the duct.

13. Wiring diagrams: a unique wiring diagram shall be furnished for each heater. Diagram shall include recommended supply wire gauges per NEC and fuse sizes. Typical wiring diagrams are not acceptable.

14. Built-in components shall include safety interlocking disconnect switch, disconnecting break magnetic contactors, transformer with primary fusing per UL, pressure-type airflow switch set at .05" WC, supplementary circuit fuses per NEC (one set of fuses per 48 amp circuit), and separate load and control terminal blocks to accept conductors as shown on the electrical plan.

15. Manufacturer to provide two-year limited warranty for heating elements; other components and accessories to be warranted for one year.

B. Manufacturer: Subject to compliance with requirements, provide electric duct heaters of one the following:

1. Brasch

2. Indeeco

3. Qmark

4. Warren Technology

5. Dell-Heatrix

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRIC DUCT HEATERS:

A. General: Install electric duct heaters as indicated, and in accordance with manufacturer's installation instructions.

B. Locate electric duct heaters as indicated. Coordinate the location of the terminal unit with the building structure, ductwork, lighting fixtures, and other obstructions to ensure that conflicts are avoided.

C. Install ductwork as indicated. Conform to the installation requirements and recommendations of the manufacturer.

3.3 ELECTRICAL WIRING:

A. General: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

B. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.4 ADJUSTING AND CLEANING:

A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean coils and inside of cabinets.

END OF SECTION 15830

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15841 - LOW PRESSURE DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of low pressure ductwork is indicated on drawings and in schedules, and by requirements of this section. Low pressure ductwork is hereby defined as ductwork subjected to velocities of 2500 fpm or less, and operating pressure of 2" w.g. or less, positive or negative.

B. Types of low pressure ductwork required for project include the following:

1. Heating supply and return air systems.

2. Air-conditioning supply and return air systems.

3. Fresh air supply systems.

4. Mechanical exhaust systems.

5. Air relief systems.

C. Refer to Division-15 insulation sections for external insulation required in conjunction with low pressure ductwork; not work of this section.

1.3 QUALITY ASSURANCE:

A. SMACNA Standards: Comply with SMACNA "HVAC Duct Construction Standards – Metal and Flexible, 1995" for fabrication and installation of low pressure ductwork.

B. NFPA Compliance: Comply with ANSI/NFPA 90A "Standard for the Installation of Air-Conditioning and Ventilating Systems".

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications on manufactured products and factory-fabricated ductwork, used for work of this section.

B. Shop Drawings: Submit dimensioned layouts of ductwork, showing both the accurately scaled ductwork and its relation to space enclosure. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.

C. Record Drawings: At project closeout, submit record drawings of installed ductwork, duct accessories, and outlets and inlets; in accordance with requirements of Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS:

A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.

B. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphatized for exposed locations.

C. Stainless Steel Sheet: Fume hood exhaust ductwork and as otherwise indicated, fafricate ductwork from stainless steel complying with ANSI/ASTM A 167; AISI type 304 with No. 4 directional polish where exposed to view in occupied spaces. Provide welded seams. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

2.2 MISCELLANEOUS DUCTWORK MATERIALS:

A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to

comply with ductwork system requirements including proper connection of ductwork and equipment.

B. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

C. Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.

D. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

E. Except where space is indicated as "High Humidity" area, interior support materials of not less than 1/4" diameter or 3/16" thickness may be plain (not galvanized).

2.3 FABRICATION:

A. Shop fabricate ductwork in 4, 8, 10 or 12-foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for re-assembly and coordinated installation.

B. Shop fabricate ductwork of gages and reinforcement complying with SMACNA "Low Pressure Duct Standards - 5th Edition".

C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.

D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-15 section "Duct Accessories" for accessory requirements.

E. Fabricate ductwork with perforated steel duct liner in each section of duct where indicated. Provide a continuous polyethylene liner on the acoustical liner to

isolate the liner material from the airstream. Provide a perforated steel inner liner for strength and sound absorption.

2.4 FACTORY-FABRICATED DUCTWORK:

A. General: At installer's option, provide factory-fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.

B. Material: Galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating, mill phosphatized.

C. Gage: 28 ga. minimum for round and oval ducts and fittings, 4" through 24" diameter.

D. Elbows: One piece construction for 90° and 45° elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.

E. Divided Flow Fittings: 90° tees, constructed with saddle tap spot welded and bonded to duct fitting body.

F. Manufacturer: Subject to compliance with requirements, provide factory-fabricated ductwork of one of the following:

1. Lindab

2. United Sheet Metal Div., United McGill Corp.

PART 3 - EXECUTION

3.1 INSTALLATION OF DUCTWORK:

A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (5% leakage) and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.

B. Seal ductwork, after installation, to seal class recommended, and method prescribed in SMACNA "HVAC Duct Construction Standards - 1995 - 2nd Edition".

C. Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.

D. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

E. Electrical Equipment Spaces: Do not run ductwork through transformer vaults and their electrical equipment spaces and enclosures.

F. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct-plus insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2".

G. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

H. Support ductwork in manner complying with SMACNA "Low Pressure Duct Standards - 5th Edition" hangers and supports section.

3.2 CLEANING AND PROTECTION:

A. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.

C. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

3.3 BALANCING:

A. Refer to Division-15 section "Testing, Adjusting, and Balancing" for air distribution balancing of low pressure ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 15841

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15860 - CENTRIFUGAL FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of centrifugal fans work required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Types of centrifugal fans required for project include the following:

1. Upblast Centrifugal Fans.

C. Refer to other Division-15 sections for vibration control used in conjunction with centrifugal fans; not work of this section.

D. Refer to Division-15 sections for testing, adjusting, and balancing work required in conjunction with centrifugal fans; not work of this section.

E. Refer to other Division-15 control systems sections for control work required in conjunction with centrifugal fans; not work of this section.

F. Refer to Division-16 sections for the following work; not work of this section.

1. Power supply wiring from power source to power connection on fan motor. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

2. Interlock wiring between fan units; and between fans and field-installed control devices.

3. Interlock wiring specified as factory-installed work this section.

G. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections:

1. Control wiring between field-installed controls, indicating devices, and fan starters.

2. Control wiring specified as work of Division-15 for Automatic Temperature Controls is work of that section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of centrifugal fans, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:

1. AMCA Compliance: Provide centrifugal fans bearing the AMCA Certified Ratings Seal. Sound rate centrifugal fans in accordance with AMCA 300 "Test Code for Sound Rating Air Moving Devices".

2. ASHRAE Compliance: Test and rate centrifugal fans in accordance with ASHRAE 51 (AMCA 210) "Laboratory Methods of Testing Fans for Rating".

3. UL Compliance: Provide centrifugal fan electrical components which have been listed and labeled by UL.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for centrifugal fans, including specifications, capacity ratings, fan performance curves with operating point clearly indicated, gages and finishes of materials, dimensions, weights, accessories furnished, and installation instructions.

B. Shop Drawings: Submit assembly-type shop drawings showing fan dimensions, required clearances, construction details, and field connection details.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to fan units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

D. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in maintenance manuals; in accordance with requirements of Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver centrifugal fans with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.

B. Handle centrifugal fans carefully to avoid damage to components, enclosures, and finish. Do not install damaged components; replace and return damaged components to centrifugal fan manufacturer.

C. Store centrifugal fans in clean dry place and protect from weather and construction traffic.

D. Comply with manufacturer's rigging and installation instructions for unloading centrifugal fans, and moving them to final location.

PART 2 - PRODUCTS

2.1 UPBLAST CENTRIFUGAL FANS:

A. General: Provide inline centrifugal fans of sizes and arrangement as indicated, and of capacities and having accessories as scheduled.

B. Housing: Aluminum split housing, constructed of spun aluminum, with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Provide direct drive motor with sealed bearings.

D. Wheel: Provide aluminum air foil blades on aluminum hub.

E. Accessories: Provide the following accessories as indicated and/or scheduled:

1. Volume Control Damper: Provide manual controlled volume damper in fan outlet with quadrant and lock.

2. Companion Flanges: Provide matching flanges on inlet and outlet to connect ductwork to fan.

3. Fan Guards: Provide guards on inlets and outlets not connected to ductwork, constructed of expanded metal in removable frame.

F. Manufacturer: Subject to compliance with requirements, provide inline centrifugal fans of one of the following:

1. Acme Engineering and Manufacturing Corp.

2. Cook (Loren) Co.

3. Greenheck

4. Strobic Air Corp.

5. Penn Ventilator Co.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which centrifugal fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF CENTRIFUGAL FANS:

A. General: Install centrifugal fans where indicated, in accordance with manufacturer's installation instructions, and with recognized industry practices, to ensure that centrifugal fans comply with requirements and serve intended purposes.

B. Access: Provide access and service space around and over centrifugal fans as indicated, but in no case less than that recommended by manufacturer.

C. Isolation: Set centrifugal fans on vibration isolators, fasten in accordance with manufacturer's installation instructions.

D. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

E. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable to centrifugal fan Installer.

F. Ductwork Connections: Refer to Division 15 "Ductwork" sections. Provide flexible connections on inlet and outlet duct connections.

3.3 FIELD QUALITY CONTROL:

A. Upon completion of installation of centrifugal fans, and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

3.4 ADJUSTING AND CLEANING:

A. Start-up, test, and adjust centrifugal fans in presence of manufacturer's authorized representative.

3.5 SPARE PARTS:

A. None.

END OF SECTION 15860

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15910 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.

B. Types of ductwork accessories required for project include the following:

1. Dampers.
2. Low pressure manual dampers.
3. Control dampers.
4. Counterbalanced relief dampers.
5. Fire dampers.
6. Turning vanes.
7. Duct hardware.
8. Duct access doors.
9. Flexible connections.

C. Refer to other Division-15 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:

1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".

2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.

3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".

4. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of ductwork accessory showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components.

C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 DAMPERS:

A. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

B. Control Dampers: Provide dampers with parallel blades for 2-position control, or opposed blades for modulating control. Construct blades of 16-ga. steel, provide heavy-duty molded self-lubricating nylon bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up. Provide locking quadrant damper operators.

C. Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-ga. aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.

D. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:

1. Air Balance, Inc.
2. Airguide Corp.
3. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
4. Louvers & Dampers, Inc.
5. Penn Ventilator Co.
6. Ruskin Mfg. Co.

2.2 FIRE DAMPERS:

A. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga. galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 to 165°F (71 to 74°C) unless otherwise indicated. Dampers shall be installed out of the air stream so that there is no restriction imposed upon the flow of air. Provide damper with positive lock in closed position, and with the following additional features:

1. Damper Blade Assembly: Curtain type.
2. Blade Material: Steel, match casing.

B. Manufacturer: Subject to compliance with requirements, provide fire and smoke dampers of one of the following:

1. Air Balance, Inc.
2. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
3. Louvers and Dampers, Inc.
4. Penn Ventilator Co.

5. Phillips-Aire.

6. Ruskin Mfg. Co.

2.3 TURNING VANES:

A. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.

B. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

C. Manufacturer: Subject to compliance with requirements, provide turning vanes of one of the following:

1. Aero Dyne Co.

2. Airsan Corp.

3. Anemostat Products Div.; Dynamics Corp. of America.

4. Barber-Colman Co.

5. Duro Dyne Corp.

6. Environmental Elements Corp.; Subs. Koppers Co., Inc.

7. Hart & Cooley Mfg. Co.

8. Register & Grille Mfg. Co., Inc.

9. Souther, Inc.

2.4 DUCT HARDWARE:

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.

2. Quadrant Locks: Provide for each damper (including dampers at spin-in duct take-offs), quadrant lock device on one end of shaft; and end bearing plate on other end. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork. Provide extensions for

all damper operators for volume control dampers located above hard ceilings with no access.

B. Manufacturer: Subject to compliance with requirements, provide duct hardware of one of the following:

1. Ventfabrics, Inc.

2. Young Regulator Co.

2.5 DUCT ACCESS DOORS:

A. General: Provide where indicated, duct access doors of size indicated.

B. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

C. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:

1. Air Balance Inc.

2. Duro Dyne Corp.

3. Register & Grille Mfg. Co., Inc.

4. Ruskin Mfg. Co.

5. Ventfabrics, Inc.

6. Zurn Industries, Inc.; Air Systems Div.

2.6 FLEXIBLE CONNECTIONS:

A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

B. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:

1. American/Elgen Co.; Energy Div.
2. Duro Dyne Corp.
3. Flexaust (The) Co.
4. Ventfabrics, Inc.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF DUCTWORK ACCESSORIES:

A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install turning vanes in square or rectangular 90º elbows in supply and exhaust air systems, and elsewhere as indicated.

C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install access doors adjacent to all fire dampers to allow maintenance and inspection of each fire damper. Minimum size of access doors shall be 12 inches square.

D. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.3 ADJUSTING AND CLEANING:

A. Adjusting: Adjust ductwork accessories for proper settings.

B. Label access doors in accordance with Division-15 section "Mechanical Identification".

C. Final positioning of manual dampers is specified in Division-15 section "Testing, Adjusting, and Balancing".

D. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 15910

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15932 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.

B. Types of air outlets and inlets required for project include the following:

1. Ceiling air diffusers and grilles.

2. Louvers.

C. Refer to other Division 15 sections for ductwork and duct accessories required in conjunction with air outlets and inlets; not work of this section.

D. Refer to other Division 15 sections for balancing of air outlets and inlets; not work of this section.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".

2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".

3. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.

2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.

3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections on data.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.

B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS:

A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Diffuser Dampers: Fire Damper: Combination adjustable opposed blade damper and fusible link fire damper with UL approved link and assembly designed to meet requirements of NFPA 90A.

E. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as listed on diffuser schedule.

F. Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:

1. Anemostat Products Div.; Dynamics Corp. of America.

2. Carnes Co.; Div. of Wehr Corp.

3. Krueger Mfg. Co.

4. Metalaire

5. Titus Products Div.; Philips Industries, Inc.

2.2 LOUVERS:

A. General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.,

B. Performance: Provide louvers that have minimum free area, and maximum pressure drop for each type as listed in manufacturer's current data, complying with louver schedule.

C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.

D. Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T52. Weld units or use stainless steel fasteners. Coordinate color with the Architect.

E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.

F. Manufacturer: Subject to compliance with requirements, provide louvers of one of the following:

1. Airline Products Co.
2. Airolite Co.
3. American Warming & Ventilating, Inc.
4. Arrow United Industries, Inc.
5. Construction Specialties, Inc.
6. Dowco Corp.
7. Industrial Louvers, Inc.
8. Louvers & Dampers, Inc.
9. Safe-Air Inc.
10. Snyder (E.G.) Co., Inc.
11. Vent Products Co., Inc.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.

B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.

3.3 SPARE PARTS:

A. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION 15932

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15950 - HVAC CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of the Specifications, and Division 1 Specifications sections apply to this work.

B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 GENERAL REQUIREMENTS:

A. Examine other Sections of the Specifications for requirements that affect work of this Division whether or not such work is specifically mentioned in this Division.

B. Coordinate work with that of other trades affecting, or affected by work of this Division. Cooperate with those trades to assure steady progress of work under contract. It is this controls sub-contractor's responsibility to neatly "line item" work and responsibilities in their bid, of other subcontractors described in this section that are required for a complete HVAC controls system.

1.3 DESCRIPTION OF WORK:

A. Provide a new control system as manufactured by Johnson Control in conformance with these specifications and the requirements of the drawings.

B. Controls applicable to this section include, but are not limited to temperature and humidity sensors, automatic water valves with electric actuators, automatic dampers, control relays, flow meters, and related devices. Work of this Contractor includes installation in conduit, wiring, wells, and enclosures necessary to provide a complete and operable system of controls.

C. The programmable controllers shall be programmed by the controls sub-contractor to be compatible with the building automation systems software. Systems shall communicate via IP/IXP protocol.

D. Extent of the direct digital control and energy management systems work required by this section is indicated on drawings and schedules, and by requirements of this section.

E. Control sequences and control point list are specified on the drawings as “Sequence of Operation”.

F. Refer to other Division-15 sections for installation of instrument wells, valves, and dampers in mechanical systems. Coordinate and communicate with the general contractor that this is not work of this section.

G. Refer to Division-16 sections for power supply wiring for power source to power connection on controls and/or unit control panels. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.4 CONTROLS SUB-CONTRACTOR QUALIFICATIONS:

A. Acceptable manufacturers of control equipment are Johnson Control. The controls sub-contractor is to be in the exclusive business of installing and factory-representing the above manufacturers. The controls sub-contractor shall have a minimum of five (5) years' experience in the programming, installation and service of commercial DDC control systems. Upon request, the controls sub-contractor shall provide the names and qualifications of the following, who assigned to this project.

1. controls programmer

2. controls equipment installer

3. controls system analyst

B. The controls sub-contractor shall retain the services of a Professional Engineer registered in Florida for performing the functions described below as they apply to the temperature control system.

C. Responsibilities regarding field equipment start-up and checkout

1. Provide support to the contractor to insure all control devices are properly interfaced with HVAC equipment.

2. Perform a point-to-point operational check of each analog and digital point with owner representative present.

3. Power up the panels and verify correct power operation.

4. Verify communications line integrity.

5. Write all software programs and database.

6. Install all software and database in the system.

7. Verify operation of all operating software.

8. Calibrate/adjust/setup field devices as necessary in the order to provide a complete and proper operating system.

9. Notify engineer of any problems related to the design within two (2) working days of find.

10. Work with the engineer to validate operation and final completion of the project.

11. Work with the test and balance agency in balancing and adjusting the HVAC system.

D. Acceptance of the installation

1. Once the job is installed and the controls sub-contractor has thoroughly checked it, then it will be necessary to demonstrate to the Engineer that the project specifications have been met. The controls sub-contractor shall prepare technical demonstrations to the Engineer requiring a random test of not less than 50% of the system points. A representative of the owner must be invited to observe and given 48 hours prior notice prior to the demonstration. The demonstration will occur concurrent with the substantial completion inspection for the project.

2. The controls sub-contractor will provide the necessary data at the time of the demonstration, such that the Engineer can certify the project as complete.

3. The owner will accept the project as substantially complete only after the complete control system has been certified, in writing complete by the engineer and the system has been successfully demonstrated in accordance with the above criteria.

E. Record Drawing Responsibilities

1. The responsibility of the controls sub-contractor to see that the owner receives three (3) complete sets of record drawings and controls program. Provide digital copy of record drawings in PDF. Any and all changes in the project design package shall be reflected in the owner's record drawings before sign off and acceptance by the owner. As-built changes made in the field shall also be reflected in the record drawings.

1.5 DESCRIPTION OF RESPONSIBILITIES PROVIDED BY CONTROLS SUB-CONTRACTOR:

A. Provide to the owner a complete CAD generated point-to-point submittal wiring diagrams and sequences of operation based on the owner's standard. The controls sub-contractor shall include the following information:

1. Location on the drawings of critical control devices such as control panels, auxiliary control panels, static pressure sensors, room temperature sensors, water temperature sensors/wells.
2. Location of all 120/1/60 power sources for the control devices.
3. Control valve sizing (valve CV and pressure drops). Valve schedules.
4. Complete bill of material.
5. Room schedule.
6. Homerun connections between panels.
7. Communication trunk line layout.
8. Lightning protection devices (quantity and location).
9. Surge protection devices (quantity and location).
10. Room temperature sensors
11. Duct temperature sensors
12. Insertion temperature sensors
13. Outside air temperature sensor
14. Pressure sensors (air and water)
15. Differential pressure switches (air and water)
16. Control dampers (installed by sheet metal contractor)
17. Control valves (installed by mechanical contractor)
18. Damper actuators
19. Damper linkages
20. Valve actuators

21. Outboard gear panels (auxiliary panels)
22. Name plates (engraved type)
23. Control relays
24. Varistors
25. Flow meters (installed by the mechanical contractor)
26. Terminal strips
27. Control fuse blocks
28. Power supplies
29. Humidity sensors
30. Transducers
31. Pressure switches
32. End switches
33. Submittal literature on all control devices provided
34. 120/24VAC transformers
35. Warranty
36. Installation of DDC controllers
37. Installation of all electric temperature control devices not in-line
38. Power wiring from junction box at each control panel to power supplies
39. Installation of all power supplies
40. Install all system grounding

B. The programmable controllers shall be programmed by controls sub-contractor to be compatible with existing software and point naming conventions.

1.6 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR:

A. Install all in-line control devices (such as valves, dampers, flow meters, water temperature sensors, air flow control devices, wells, flow switches, differential pressure switches across pumps).

B. Provide operation and maintenance manuals of HVAC equipment purchased.

C. Start-up and check-out of all HVAC equipment.

D. Install copper line connections to in-line devices.

1.7 QUALITY ASSURANCE:

A. All control conduit and wiring shall meet the requirements of Division 16 for materials and installation. All electrical system components shall comply with NEMA and UL standards.

B. Electrical Standards: Provide electrical components of systems which comply with NEMA and UL standards.

C. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for control systems.

D. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

1.8 PRE-INSTALLATION SUBMITTALS:

A. Submit product data in accordance with the requirements of Section 15010 - Basic Mechanical Requirements, and requirements of Division 1.

B. Provide complete control diagrams and sequence of operations.

C. Submit the following product data: manufacturer's detailed information for each piece of equipment used, identifying each item used. Catalog sheets for each item as specified in the control diagrams. Identify specific model and accessories being used in the control diagram, when two or more devices or models are shown.

D. Provide the following information for each item and device: Proper system label, indication of coordination with submitted catalog information, proper settings and adjustments of instruments, physical dimensions of devices and accessories, and the normal condition of device, such as normally open or closed dampers, valves, and relays.

E. Submit automatic control damper information including amount of leakage, airflow characteristics, and construction of all components. Submit a damper and control valve schedule that shall include sizes, locations and pertinent

information required for approval and coordination with the mechanical contractor and sheet metal subcontractor.

F. Maintenance Data: Submit maintenance instructions and spare parts lists for each type of control device. Include product data and shop drawings in maintenance manual; in accordance with requirements of Division 1.

1.9 NETWORK AND APPLICATION SPECIFIC CONTROL PANEL SPECIFICATIONS:

A. The Control System shall be capable of integrating multiple building functions including equipment supervision and control alarm management energy management and historical data collection and archiving.

B. The facility management system shall consist of the following:

1. Stand-alone DDC panels

2. Stand-alone application specific controllers (ASCs)

3. Integration via Open protocol to 3rd Party equipment to include:

4. Network Handheld Terminals

C. System architectural design shall eliminate dependence upon any signal device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control alarm management operator I/O and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

D. Stand-alone DDC panels shall be able to access any data from or send control commands and alarm report directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device. Stand-alone DDC panels shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

1.10 NETWORKING / COMMUNICATIONS:

A. The control system shall have network operator workstations and Stand-alone DDC panels. Inherent in the system's' design shall be the ability to expand or modify the network either via the local area network or autodial telephone line modem connections or via a combination of the two networking schemes. The operator workstations shall be located as shown on the drawings.

1.11 LOCAL AREA NETWORK:

A. Workstation / DDC Panel Support: DDC panels shall directly reside on a local area network such that communications may be executed directly between controllers directly between workstations and between controllers and workstations on a peer-to-peer basis.

B. Dynamic Data Access: All operator devices and network resident panels shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the local area network. Access to data shall be based upon logical identification of building equipment.

C. Access to system data shall not be restricted by the hardware configuration of the facility management system. The hardware configuration of the FMS network shall be totally transparent to the user when accessing data or developing control programs.

D. General Network Design: Network design shall include the following provisions:

E. High speed data transfer rates for alarm reporting quick report generator from multiple controllers and upload/download efficiency between network devices. The minimum baud rate shall be 1 Megabaud.

1. Support of any combination of controllers directly connected to the local area network. A minimum of 50 devices shall be supported on a single local area network.

2. Detection and accommodation of single or multiple failures of either workstations, DDC panels or the network media. The network shall include provisions for automatically reconfiguring itself to allow all operation equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.

a. Message and alarm buffering to prevent information from being lost.

b. Error detection, correction, and retransmission to guarantee data integrity.

c. Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.

d. Commonly available, multiple sourced, networking components and protocols shall be used to allow the BAS to coexist with other

networking applications such as office automation. Ethernet is the acceptable technology.

e. Use of an industry standard IEEE 802.x protocol. Communications must be of a deterministic nature to assure calculable performance under worst-case network loading.

f. Synchronization of the real-time clocks in all DDC panels shall be provided.

1.13 MASTER DDC CONTROL PANEL:

A. General: Stand-alone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each stand-alone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. A sufficient number of controllers shall be supplied to fully meet the requirements of this specification and the point list.

B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases including:

1. Control processes

2. Energy Management applications

3. Alarm Management

4. Historical / Trend Data for all points

5. Maintenance Support applications

6. Custom processes

7. Operator I/O

8. Manual Override monitoring

a. Point Types: Each DDC panel shall support the following types of point inputs and outputs:

9. Digital inputs for status/alarm contacts

10. Digital outputs for on/off equipment control

11. Analog inputs for temperature, pressure, humidity, flow, and position measurements

12. Analog outputs for valve and damper position control, and capacity control of primary equipment

13. Pulse inputs for pulsed contact monitoring

C. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators.

D. Serial Communication Ports: Stand-alone DDC panels shall provide at least two RS serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC workstations, and panel-mounted or portable DDC panel operator's terminals. Stand-alone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.

E. Hardware Override Switches: As indicated in the point schedule, the operator shall have the ability to manually override automatic or centrally executed commands at the DDC panel via local, point discrete, onboard hand/off/auto operator override switches for binary control points and gradual switches for analog control type points. These override switches shall be operable whether the panel is powered or not.

F. Hardware Override Monitoring: DDC panels shall monitor the status or position of all overrides, and include this information in logs and summaries to inform the operator that automatic control has been inhibited. DDC panels shall also collect override activity information for daily and monthly reports.

G. Integrated On-Line Diagnostics: Each DDC panel shall continuously perform self- diagnostics, communication diagnosis and diagnosis of all subsidiary equipment. The DDC panel shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each DDC panel, and shall not require the connection of an operator I/O device.

H. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

I. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database

or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for emergency power to the controllers and reduces the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS.

J. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.

1.14 SYSTEM SOFTWARE FEATURES:

A. General: All necessary software to form a complete operating system as described in this specification shall be provided. The person machine interface software shall operate on a true Windows based operating system. OS/2, UNIX or any other operating systems shall not be acceptable.

B. The software programs specified in this section shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher level computer for execution.

1.15 CONTROL SOFTWARE DESCRIPTION:

A. Pre-tested Control Algorithms: The DDC panels shall have the ability to perform the following pre-tested control algorithms:

1. Two position control

2. Proportional control

3. Proportional plus integral control

4. Proportional, integral, plus derivative control

5. Automatic control loop tuning

B. Equipment Cycling Protection: Control software shall include a provision for limiting the number of times each piece of equipment may be cycled within any one-hour period.

C. Heavy Equipment Delays: The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commends to heavy electrical loads.

D. Powerfail Motor Restart: Upon the resumption of normal power, the DDC panel shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling, and turn equipment on or off as necessary to resume normal operation.

E. Energy Management Applications: DDC panels shall have the ability to perform any or all of the following energy management routines:

1. Time of day scheduling
2. Calendar based scheduling
3. Holiday scheduling
4. Temporary schedule overrides
5. Optimal start
6. Optimal stop
7. Night setback control
8. Enthalpy switchover (economizer)
9. Peak demand limiting
10. Temperature compensated load rolling
11. Fans speed / cfm control
12. Heating / Cooling interlock
13. Cold deck reset
14. Hot deck reset
15. Hot water reset
16. Chilled water reset
17. Condenser water reset
18. Chiller sequencing
19. All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow user customization. Programs shall be applied to building equipment as described in the Execution portion of this specification.

F. Custom Process Programming Capability: DDC panels shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

G. Process Inputs and Variables: It shall be possible to use any of the following in a custom process:

1. Any system-measured point data or status
2. Any calculated data
3. Any results from other processes
4. User-defined constants
5. Arithmetic functions (+,-,*,/,square root, exp, etc.)
6. Boolean logic operators (and, or, exclusive or, etc.)
7. On-delay / Off-day / One-shot timers

H. Process Triggers: Custom processes may be triggered based on any combination of the following:

1. Time interval
2. Time of day
3. Date
4. Other processes
5. Time programming

I. Events (e.g., point alarms)

J. Dynamic Data Access: A single process shall be able to incorporate measured or calculated data from any and all other DDC panels on the local area network. In addition, a single process shall be able to issue commands to points in any and all other DDC panels on the local are network.

K. Advisory / Message Generator: Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device, buffer the information in a follow-up file, or cause the execution of a dial-up connection to a remote device such as a printer or pager.

L. Custom Process Documentation: The custom control programming feature shall be self-documenting. All interrelationships defined by this feature shall be documented via graphical flowcharts and English language descriptors.

M. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms form being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC workstation or local I/O device, or communications with other panels on the network.

N. Point Change Report Description: All alarm or point change reports shall include the point's English language description, and the time and date of occurrence.

O. Prioritization: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Each DDC panel shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.

P. The user shall also be able to define under which conditions point changes need to be acknowledged by an operator, and/or sent to follow-up files for retrieval and analysis at a later date.

Q. Report Routing: Alarm reports, messages, and files will be directed to a user-defined list of operator devices, or PC's used for archiving alarm information. Alarms shall also be automatically directed to a default device in the event a primary device is found to be off-line.

R. Alarm Messages: In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 65-character alarm message to more fully describe the alarm condition or direct operator response. These alarm messages shall be utilized to perform the beeper interface alarm messaging.

S. Each stand-alone DDC panel shall be capable of storing a library of at least 250 alarm messages. Each message may be assignable to any number of points in the panel.

T. Auto-Dial Alarm Management: In Dial-up applications, only critical alarms shall initiate a call to a remote beeper. In all other cases, call activity shall be minimized by time-stamping and saving reports until an operator scheduled time,

a manual request, or until the buffer space is full. The alarm buffer must store a minimum of 50 alarms.

U. Historical Data and Trend Analysis: A variety of historical data collection utilities shall be provided to automatically sample, store, and display system data in all of the following ways.

V. Continuous Point Histories: Stand-alone DDC panels shall store point history files for all analog and binary inputs and outputs.

W. The point history routine shall continuously and automatically sample the value of all analog inputs at half-hour intervals. Samples for all point shall be stored for the past 24 hours to allow the user to immediately analyze equipment performance and all problem-related events for the past day. Point history files for binary input or output points and analog output points shall include a continuous record of the last ten status changes or commands for each point. Continuous histories shall be provided on all points.

X. Control Loop Performance Trends: Stand-alone DDC panels shall also provide high resolution sampling capability with an operator-adjustable resolution of 10-300 seconds in one-second increments for verification of control loop performance.

Y. Extended Sample Period Trends: Measured and calculated analog and binary data shall also be assignable to user-definable trends for the purpose of collecting operator-specified performance data over extended periods of time. Sample intervals of 1 minute to 2 hours, in one-minute intervals, shall be provided. Each stand-alone DDC panel shall have a dedicated buffer for trend data, and shall be capable of storing a minimum of 5000 data samples.

Z. Data Storage and Archiving: Trend data shall be stored at the stand-alone DDC panels, and uploaded to hard disk storage when archival is desired. Uploads shall occur based upon either user-defined interval, manual command, or when the trend buffers become full. All trend data shall be available in zip drive form for use in 3rd party personal computer applications.

AA. Runtime Totalization: Stand-alone DDC panels shall automatically accumulate and store runtime hours for binary input and output points as specified in the Execution portion of this specification

1. The Totalization routine shall have a sampling resolution of one minute or less.

2. The user shall have the ability to define a warning limit for Runtime Totalization. Unique, user-specified messages shall be generated when the limit is reached.

BB Analog / Pulse Totalization: Stand-alone DDC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.

1. Totalization shall provide calculation and storage of accumulations of up to 99,999.9 units (e.g. kWh, gallons, KBTU, tons, etc.).

2. The Totalization routine shall have a sampling resolution of one minute or less.

3. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

CC. Event Totalization: Stand-alone DDC panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event Totalization shall be performed on a daily, weekly, or monthly basis.

1. The Event Totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.

2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

1.16 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS:

A. Each stand-alone DDC controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).

B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases, including:

1. Control Processes

2. Energy Management Applications

3. Operator I/O (Portable Service Terminal)

D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation, or any PC or portable operator's terminal connected to any DDC panel in the network. Provide a portable operator terminal connection to the network at every air handling unit mechanical room. This connection shall allow the operator the capability to access the system information as well as the entire facility. Refer to the specifications on the network terminal below. The network terminal shall operate off of the same passwords as on the workstation.

E. Application specific controllers shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include, but not be limited to, the following:

1. Display temperatures
2. Display status
3. Display setpoints
4. Display control parameters
5. Override binary output control
6. Override analog setpoints
7. Modification of gain and offset constants
8. Entire Network Information

F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be store such that a power failure of any duration does not necessitate reprogramming the controller.

1.17 APPLICATION DESCRIPTIONS:

A. VV Box Unit Controllers: VV box unit controllers shall support, but not be limited to, the control of the following configurations of VV boxes to address current requirements as described in the Execution portion of this specification, and for future expansion:

1. Single Duct Only
2. Supply / Exhaust

B. VV box unit controllers shall support the following types of point inputs and outputs:

1. Proportional Cooling Outputs

2. Box Heating Outputs

3. Fan Control Output (On/Off Logic, or Proportional Series Fan Logic)

C. The modes of operation supported by the VV box unit controllers shall minimally include, but not be limited to, the following:

1. Day/Weekly schedules

2. Comfort/Occupancy mode

3. Economy mode (standby mode, unoccupied, etc.)

4. Temporary Override mode

D. Occupancy-Based Standby/Comfort Mode Control: Each VV box unit controller shall have a provision for occupancy sensing override. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the VV box unit controller shall automatically select either Standby or Comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.

E. Continuous Zone Temperature Histories: Each VV box unit controller shall automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.

F. Alarm Management: Each VV box unit controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

G. The controller itself shall consist of 3 individual components; the controller, the actuator / velocity pressure transducer, and the temperature sensor.

H. Power Failure: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for

emergency power to the controllers and reduced the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS only.

I. Unitary Controllers: Unitary controllers shall support, but not be limited to, the following types of systems to address specific applications described in the Execution portion of this specification, and for future expansion:

1. Vents (ASHRAE Cycle I, II, III, or W)
2. Pumps
3. Fan Coils (four-pipe)
4. Variable Air Volume Boxes

J. Unitary controllers shall support the following types of point inputs and outputs:

1. Drybulb
2. Outdoor Air Enthalpy
3. Differential Temperature
4. Binary Input from a separate controller
5. Heating and Cooling Outputs
6. Fan Output, On/Off Logic Control

K. Unitary controllers shall support the following library of control strategies to address the requirements of the sequences described in the Execution portion of this specification, and for future expansion:

1. Daily/Weekly schedules
2. Comfort/Occupancy mode
3. Standby mode available
4. Unoccupied not available
5. Shutdown
6. Lighting Logic Interlock to Economy Mode

L. Occupancy-Based Standby / Comfort Mode Control: Each unitary controller shall have a provision for occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the unitary

controller shall automatically select either Standby or Comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.

M. Continuous Zone Temperature Histories: Each unitary controller shall automatically and continuously, maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance of the past 24 hours. A minimum of two samples per hour shall be stored.

N. Alarm Management: Each unitary controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

O. Power Failure: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for emergency power to the controllers and reduces the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS only.

P. Air Handler Controllers: AH controllers shall support, but not be limited to, the following configurations of systems to address current requirements as described in the Execution portion of this specification, and for future expansion:

1. Large air handlers
2. Mixed air-single path
3. Mixed air-dual path
4. Single path
5. Dual path

Q. AH controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally stand-alone fashion.

R. AH controllers shall have a library of control routines and program logic to perform the sequence of operation as specified in the Execution portion of this specification.

S. Occupancy-Based Standby / Comfort Mode Control: Each AH controller shall have a provision of occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the AH controller shall automatically select either Standby or Comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.

T. Continuous Zone Temperature Histories: Each AH controller shall automatically and continuously, maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be store.

U. Alarm Management: Each AH controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

V. Power Failure: In the event of the loss of normal power there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for emergency power to the controllers and reduces the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS only.

W. Open Protocol Application Controller: The BAS shall support open-protocol communications with other vendors equipment to minimize redundant automation networks with the facility and eliminate multiple user interfaces. Connectivity to third party controllers shall be through integrator panels that reside on the BAS network and have down-loadable drivers for accommodation of a specific equipment manufacturers protocol. Interfaces shall be required for the items described in the General Products description of this section. Hardwired interfaces or non-factory supported software gateways shall not be acceptable.

1.18 POINTS LIST SUMMARY AND AS SHOWN ON THE DRAWINGS:

A. Chillers:

1. Water setpoint

2. Water control point

3. Entering chilled water

4. Leaving chilled water

5. Entering condenser water
6. Leaving condenser water
7. Evaporator refrigerant temperature
8. Evaporator pressure
9. Condenser refrigerant temperature
10. Condenser pressure
11. Discharge temperature
12. Bearing temperature
13. Motor winding temperature
14. Oil sump temperature
15. Oil pressure transducer
16. Oil differential pressure
17. Base demand limit
18. Active demand limit
19. Line voltage percent
20. Line voltage actual
21. Compressor motor load
22. Compressor motor current
23. Compressor motor amps
24. Target Vane position
25. Actual van position
26. Total compressor starts
27. Starts in 12 hours
28. Compressor ontime
29. Service ontime

30. Compressor motor kW
31. Demand limit 4-20 mA
32. Temperature Reset 4-20 mA
33. Common CHWS sensor
34. Common CHWR sensor
35. Occupied 0-no, 1-yes
36. Alarm state 0-ok, 1-alarm
37. Chiller start/stop 0-stop, 1-start
38. Hot gas bypass relay 0-no, 1-yes
39. Chilled water pump 0-no, 1-yes
40. Chilled water flow 0-no, 1-yes
41. Condenser water pump 0-no, 1-yes
42. Condenser water flow 0-no, 1-yes
43. Compressor start relay 0-no, 1-yes
44. Compressor start contact 0-no, 1-yes
45. Compressor run contact 0-no, 1-yes
46. Starter Fault contract 0-no, 1-yes
47. Pressure trip contact 0-no, 1-yes
48. Single cycle dropout 0-no, 1-yes
49. Oil pump relay 0-no, 1-yes
50. Oil heater relay 0-no, 1-yes
51. Motor cooling relay 0-no, 1-yes
52. Tower fan relay 0-no, 1-yes
53. Compressor shunt trip relay 0-no, 1-yes
54. Alarm relay 0-no, 1-yes

55. Remote contacts input 0-no, 1-yes

1.19 OPERATOR INTERFACE:

A. Basic Interface Description: Command entry/menu selection process; operator workstation interface software shall minimize operator training through the use of English language prompting, English language point identification, and industry standard PC application software.

B. The operator interface shall minimize the use of a typewriter style keyboard through the use of a mouse or similar pointing device, and "point and click" approach to menu selection. Users shall be able to start and stop equipment or change setpoints from graphical displays through the use of a mouse or similar pointing device.

C. Graphical and Text-Based Displays: At the option of the user, operator workstations shall provide consistent graphical or text-base displays of all system point and application data described in this specification. Point identification, engineering units, status indication, and application naming conventions shall be the same at all workstations.

D. Password Protection: Multiple-level password access protection shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as he deems appropriate for each user, based upon an assigned password.

E. Passwords shall be exactly the same for all operator devices, including portable or panel-mounted network terminals. Any additions or changes made to password definition shall automatically cause passwords at all DDC panels on a network to be updated and downloaded to minimize the task of maintaining system security. Users shall not be required to update passwords for DDC panels individually.

1. A minimum of five levels of access shall be supported.

a. Level 1 - Data access and display

b. Level 2 = Level 1 + Operator Overrides

c. Level 3 = Level 2 + Database Modification

d. Level 4 = Level 3 + Database Generation

e. Level 5 = Level 4 + Password Add/Modification

2. A minimum of 20 passwords shall be supported at each DDC panel.

F. Operators will be able to perform only those commands available for their respective passwords. Menu selections display at any operator device, including portable or panel- mounted devices, shall be limited to only those items defined for the access level of the password used to log on.

G. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving devices on-line.

H. Operator Commands: The operator interface shall allow the operator to perform commands including, but not limited to, the following:

1. Start-up or shutdown selected equipment
2. Adjust setpoints
3. Add/Modify/Delete time programming
4. Enable/Disable process execution
5. Lock/Unlock alarm reporting for each point
6. Enable/Disable Totalization for each point
7. Enable/Diable Trending for each point
8. Override PID Loop setpoints
9. Enter temporary override schedules
10. Define Holiday schedules
11. Change time/date
12. Enter/Modify analog alarm limits
13. Enter/Modify analog warning limits
14. View limits
15. Enable/Disable Demand Limiting for each meter
16. Enable/Disable Duty Cycle for each load

I. Logs and Summaries: Reports shall be generated automatically or manually, and directed to either LCD displays, printers, or disk files. As a minimum, the system shall allow the user to easily obtain the following types of reports:

1. A general listing of all points in the network

    a. List all points currently in alarm

    b. List of all off-line points

    c. List all points currently in override status

    d. List of all disable points

    e. List all points currently locked out

    f. List of all items defined in a "follow-up" file

    g. List all weekly schedules

    h. List all holiday programming

    i. List of limits and deadbands

2. Operator transaction file to include person and action performed.

J. Summaries shall be provided for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration of the facility management system. Under no conditions shall the operators need to specify the address of hardware controller to obtain system information.

K. System Configuration and Definition: All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.

L. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently perform the following functions:

1. Add / Delete / Modify Stand-alone DDC Panels

2. Add / Delete / Modify Operator Workstations

3. Add / Delete / Modify Application Specific Controllers

4. Add / Delete / Modify points of any type, and all associated point parameters, and tuning constants

5. Add / Delete / Modify alarm reporting definition for each point

6. Add / Delete / Modify control loops

7. Add / Delete / Modify energy management applications

8. Add / Delete / Modify time and calendar based programming

9. Add / Delete / Modify Totalization for every point

10. Add / Delete / Modify Historical Data Trending for every point

11. Add / Delete / Modify custom control processes

12. Add / Delete / Modify dial-up telecommunication definition

13. Add / Delete / Modify all operator passwords

14. Add / Delete / Modify alarm messages

M. Programming Description: Definition of operator device characteristics, DDC panels, individual points, applications, and control sequences shall be performed through fill-in-the- blank templates and graphical programming approach.

N. Graphical programming shall allow the user to define the software configuration of DDC control logic for HVAC system control sequences, fan interlocks, pump interlocks, PID control loops, and other control relationships through the creation of graphical logic flow diagrams.

O. Graphical Programming: Control sequences are created by using a mouse input device to draw interconnecting lines between symbols depicting inputs, operators, (comparisons and mathematical calculations), and outputs of a control sequence. As a minimum, graphic symbols shall be used represent:

1. Process inputs, such as temperature, humidity, or pressure values, status, time, date, or any other measured or calculated system data.

2. Mathematical process operators, such as addition, subtraction, multiplication, or greater than, equal to, less than, etc.

3. Logical process operators such as and, or, exclusive or, not, etc. time delays.

4. Process control outputs such as start/stop control point, analog adjust points, etc.

5. Process calculation outputs

6. Text file outputs and advisories

P. Network-Wide Strategy Development: Inputs and outputs for any process shall not be restricted to a single DDC panel, but shall be able to include data from any and all other DDC panels to allow the development of network-wide control strategies. Processes shall also allow the operator to use the results of one process as the input to any number of other processes (cascading).

Q. Sequence Testing and Simulation: A software tools shall be provided, which allows a user to simulate control sequence execution to test strategies before they are actually applied to mechanical systems. Users shall be able to enter hypothetical input data, and verify desire control response and calculation results via graphical displays and hard copy printouts.

R. System Definition / Control Sequence Documentation: All portions of system definition shall be self-documenting to proved hard copy printouts of all configuration and application data. Control process and DDC control loop documentation shall be provided in logical, graphical flow diagram format to allow control sequences to be easily interpreted and modified at any time in the future.

S. Database Save / Restore / Back-up: Back-up copies of all stand-alone DDC panel databases shall be stored in at least one personal computer workstation.

T. Continuous supervision of the integrity of all DDC panel data bases shall be provided. In the even that any DDC panel on the network experiences a loss of its data base for any reason, the system shall automatically download a new copy of the respective data base to restore proper operation. Data base back-up / download shall occur over the local are network without operator intervention. User shall also have the ability to manually execute downloads of any or all portions of a DDC panel's data base.

U. The DDC panel operator terminal shall simultaneously display a minimum of 6 points with full English identification to allow an operator to view single screen dynamic displays depicting entire mechanical systems.

V. The operator functions provided by the DDC panel operator terminal shall include, but not be limited to, the following: As the system is distributed, the information shall be available form any single location of the entire network.

1. Start and stop points

2. Modify setpoints

3. Modify PID loop setpoints

4. Override PID control

5. Change time/date

6. Add / Modify Start / Stop weekly scheduling

7. Add / Modify setpoint weekly scheduling

8. Enter temporary override schedules

9. Define holiday schedules

10. View analog limits

11. Enter / Modify analog warning limits

12. Enter / Modify analog alarm limits

13. Enter / Modify analog differentials

14. View point history files

1.20 DELIVERY, STORAGE AND HANDLING:

A. Provide factory shipping cartons for each piece of equipment and control device. Maintain cartons while shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

1.21 RECORD DOCUMENTS:

A. Provide operation and maintenance manuals.

B. Furnish and install plastic encased charts and flow diagrams in each equipment room.

C. One copy of the control system record drawings, submitted as part of the project close-out package. Submission shall be in AutoCAD and PDF format on disk and 3 hard copies, to include the following information:

1. Point-to-point wiring diagrams and sequences of operation

2. Location on the drawings of critical control devices such as control panels, auxiliary control panels, static pressure sensors, room temperature sensors, water temperature sensors/wells.

3. Location of all 120/1/60 power sources for the control devices.

4. Control valve sizing (valve CV and pressure drops). Valve schedules.

5. Complete bill of material.

6. Room schedule.

7. Phone line or internet location for remote system access.

8. Homerun connections between panels.

9. Communication trunk line layouts.

10. Lightning protection devices (quantity and location).

11. Surge protection devices (quantity and location).

1.22 WARRANTY:

A. Provide full parts and labor warranty on all control devices, panels, and wiring installed during this project for one (1) year from the date of substantial acceptance of the project.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

A. Low Temperature Detector: Provide manually reset freezestats on outside air AH's with a minimum of 20 foot vapor tension element. Interlock to AH starter to shut unit off in either hand or auto position. Acceptable manufacturers are Johnson Controls A70.

B. Static Pressure Transmitters: Provide electronic supply duct static pressure transmitter as required. Transmitter shall sense the differential between the supply duct and the space pressure. Sensing point shall be located 2/3 downstream in the longest ductwork run. Output shall be 4-20 mA proportional to pressure increase. Accuracy to be ±2% of full range. Acceptable manufacturers are Johnson Controls DPT-2641-6.

C. Water Flow Measurement: The sensor shall be a 4-20 mA output type, with the repeatability of ±.1% of value. Shall incorporate back-lit display and keypad on the meter. Flowmeter shall utilize Vortex shedding technology with a turndown of 20:1. Temperature limits: -40.0ø to 80.0øC. Material is dependent upon that of the size and type of pipe material. Manufacturer: Johnson Yokogawa Yewflow Vortex Flowmeter.

D. Control Valves Normally Open Two-Way and Three-Way Control Valves: Provide fully proportioning two-way control valves with equal percentage modulating plugs for normally open applications. Valves shall be sized for 3 to 5

psi pressure flow at maximum flow rate. Valves shall have stainless steel stems and spring-loaded Teflon packing. Leakage shall not exceed 0.05 percent of valve CV. Utilize existing pneumatic valves where possible otherwise. Use electric with manual override capability similar to Johnson Controls actuator type M9100 series.

1. Up to 2 Inch: Valves shall be cast brass, screwed ends, ANSI Class 125.

2. 2½ to 6 Inch: Valves to be cast iron, flanged ends, ANSI Class 125.

J. Manufacturers: Johnson Controls.

K. Butterfly Valves: Provide two-way butterfly valves rated per ANSI 150 with fully tapped and threaded lugs and carbon steel body. Valves shall have field replaceable elastomer resilient seats. Disc shall be fabricated from aluminum or manganese bronze and shaft shall be 416, 316 or 17-4PH stainless steel. Manufacturer: Bray Valves or Keystone.

L. Control Dampers: Provide automatic control dampers. Installation by Division 15 contractor per specification section "Ductwork Specialties". Provide damper for low leakage, parallel blade type. Blades to be a minimum 16 gauge galvanized steel of single unit design or 22 gauge galvanized sheet steel of double unit construction. Damper blades shall be 6 inches wide and a maximum length of 60 inches with square block pins of zinc-plated steel. Frames shall be 13 gauge galvanized sheet metal with non-ferrous sleeve type bearings. Dampers shall have solid stops with edge seals so that the blade edges shall interlock with neoprene seals. Leakage shall not exceed 6.3 cfm per square foot with the damper closed against 4 inches w.g. static pressure.

2.2 CURRENT TRANSFORMERS:

A. Current transformers shall be Independent Transformer model 500 or 600 or approved equal.

2.3 CURRENT TRANSDUCER:

A. Current transducer shall be Kele model 4CTV or approved equal.

2.4 CONTROL CONDUCTORS AND CONDUIT:

A. Provide control conductors that meet the BAS manufacturer's requirements and by control diagrams, not less than number 18 AWG stranded copper for all digital signal / control and not less than 18 AWG stranded and shielded copper conductors between controllers. Provide MTW controls conductors within

enclosures and number 12 AWG stranded copper (minimum) THHN or THWN power conductors.

B. In unburied indoor concealed locations, provide EMT conduit with compression type fittings in normally cooled / conditioned spaces. Provide aluminum IMC with cast type aluminum screwed fittings in non-cooled / conditioned spaces, including mechanical rooms. Plenum rated cable may be used in plenums only.

C. In unburied outdoor locations, provide weather-tight galvanized steel IMC with cast type galvanized screwed fittings. Provide liquid-tight flexible metallic conduit (18 inches minimum length, 6 feet maximum) for connections to all vibrating equipment. Provide insulated grounding bushings at conduit connections to all boxes and panels. Seal water-tight all conduit penetrations.

D. Conduit buried outdoors and below slabs shall be PVC, in accordance with Division 16 of the specifications.

E. Provide UL approved components and located for accessibility to NEC requirements. Plenum cable on separate supports mounted on vertical walls of the plenum shall be acceptable, provided it is tagged and bundled. Plenum cables where exposed or in walls shall be in Flex, EMT, or Wiremold per NEC. Plenum cable bundles shall not be supported from ductwork or pipes.

F. All control wiring, whether in conduit or bare, shall be home runs without splices.

G. Conduit Markings: In the mechanical rooms and any other location where the conduit is exposed, mark junction boxes to identify controls conduit.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the engineer.

3.2 INSTALLATION OF CONTROL SYSTEMS:

A. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.

B. The control equipment and connecting wiring shall be installed in a neat and workman-line manner by trained mechanics on staff and under direct supervision of the controls sub-contractor, conforming to all applicable state and local codes.

C. Provide all communications accessories for an operable energy management/direct digital control system.

D. Provide all components, accessories, installation adjustment and testing necessary for an operational system.

E. Provide temperature and humidity sensors, automatic water valves with actuators, control wiring, panels, and other auxiliaries and appurtenances necessary to obtain satisfactory control of mechanical systems and as specified in the control diagrams. Coordinate with Air Distribution System installer for control air requirements. Provide electronic system components necessary to accomplish the automatic control requirements of the mechanical work.

F. Provide conductors and conduit for control systems. Installation shall meet requirements of Division 16.

G. Coordinate and work with Test and Balance Agency to insure proper system adjustments of all control components and control devices such as dampers, valves, etc. Provide the necessary assistance labor to the Test and Balance agency during start-up and check-out periods.

H. All panels shall be installed in accessible locations, free of obstructions from pipes, conduits, ductwork, etc. Unless otherwise shown on contract documents all panels shall be reached from the floor without the use of ladders. Panels that are found to be in violation of these requirements shall be relocated at no cost to the owner.

3.3 LIGHTNING & ELECTROMAGNETIC SUPPRESSION:

A. All interbuilding (building to building) communications shall be over 62/125 X EE-6 meter wavelength fiber installed by Division 16. Fiber optic tranceivers shall be provided by the Controls Installer. Fiber patch panel at hub locations to be provided by Division 16.

B. For protection of the Hayes 1200 Baud Modem Telephone, incorporate a Surge Protector Model PDS-11-Electronic Specialists, Natick, Massachusetts 01760.

3.4 CONTROL WIRING:

A. Install control wiring, without splices between terminal points, color coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code.

B. All wiring and piping shall be run straight, parallel to building lines and structure. All wires shall be bundled and independently supported when not in conduit. Flexible wireways shall be limited to six feet long. Reroute wires as directed by engineer when not in compliance with this paragraph.

C. All control points shall be homeruns with no splices and as shown on the control diagrams.

D. All control point wiring shall land at the controller end on a terminal strip, either a separate strip or the I/O strip.

E. Splices shall not be permitted in wireways or AUX cabinets.

F. Wiring shall conform to the manufacturers recommend installation practices including transient suppression on I/O circuit.

G. Wiring shall be labeled to match the control shop drawings.

H. Electrical contractor will provide a 120 VAC junction box at each DDC panel. Controls sub-contractor shall provide all other necessary power and control wiring to all control devices including valves, dampers, variable air volume terminals, and wiring to damper operators, valves, etc.

I. Provide communications accessories for an operable energy management/direct digital control system.

J. Coordinate input and output requirements between controller and remote devices/sensors.

K. Coordinate and work with the general contractor and Test and Balance Agency to insure proper system adjustments of all control components and control devices, such as dampers, valves, etc.

L. Secure controls conduit to building structure. Do not substitute attachments to work of other trades (such as pipes, ducts, other conduits). Provide accessory steel supports, as required. Refer to Division 16 specifications and details for methods of neat and secure support of cables and conduit.

M. Locate control instruments or accessories on insulated/covered casings/pipes/ducts on the finished surfaces of the covering. Seal penetrations to assure no leaks are present around stems that penetrate into the air or water systems.

N. Provide thermowells for all pipe mounted sensors.

O. Identification: Provide engraved laminated plates and valve disks for identification of each: control valve, controls damper, controls panel, flow sensor, display gauge, and sensor (not internal panel gauges). Label all nonpanel devices (as well as instruments mounted in face of panels) to indicate system function.

P. Provide a room temperature sensor for each occupied space and as indicated on the drawings.

Q. Provide CT's on all chiller power supplies and provide monitoring of current (power) use.

3.5 TESTS:

A. Test piping during and after installation.

END OF SECTION 15950

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15955 - LAB EXHAUST CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of the Specifications, and Division 1 Specifications sections apply to this work.

B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 GENERAL REQUIREMENTS:

A. Examine other Sections of the Specifications for requirements that affect work of this Division whether or not such work is specifically mentioned in this Division.

B. Coordinate work with that of other trades affecting, or affected by work of this Division. Cooperate with those trades to assure steady progress of work under contract. It is this controls contractor's responsibility to neatly "line item" work and responsibilities in their bid, of other subcontractors described in this section that are required for a complete HVAC controls system.

1.3 DESCRIPTION

A. A laboratory airflow control system shall be furnished and installed to control the airflow into and out of laboratory rooms. The exhaust flow rate of a laboratory fume hood shall be precisely controlled to maintain a constant average face velocity into the fume hood at either a standard/in-use or standby level based on an operator being present in front of the fume hood. The laboratory control system shall vary the amount of make-up/supply air into the room to operate the laboratories at the lowest possible airflow rates necessary to maintain temperature control, achieve minimum ventilation rates, and maintain laboratory pressurization in relation to adjacent spaces (positive or negative).

1.4 ACCEPTABLE MANUFACTURERS

A. The plans and specifications for the laboratory airflow control system are based on systems and equipment manufactured by Phoenix Controls Corporation.

B. The laboratory airflow system provider shall be an entity that designs, develops, manufactures and sells products and services to control the environment and

airflow of critical spaces using a Quality Management System registered to ISO 9001:2000.

C. In strict accordance with this specification, alternative laboratory airflow control systems and equipment shall only be considered for approval provided that the equipment be equal in every respect to the operational characteristics, capacities, and intent of control sequences specified herein. Approval to bid does not relieve the laboratory airflow control system supplier from complying with the minimum requirements or intent of this specification.

D. The engineer and owner shall be the sole judges of quality and equivalence of equipment, materials, methods, and life cycle cost.

E. Only those systems specifically named in this specification or by addendum shall be considered for approval. Other systems submitted after the bid opening will be returned without review.

F. Manufacturer's Qualifications: Firms regularly engaged in manufacture of lab control systems, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.5 PREVENTIVE MAINTENANCE

A. The laboratory airflow control system supplier, whose system incorporates any of the listed devices, shall provide at no additional cost to the owner during and after the warranty period, five years of required preventive maintenance on all airflow sensors (e.g., pitot tube, flow cross, orifice ring, air bar, hot wire, vortex shedder, side wall sensors, etc.), and flow transducers provided under this section. Airflow sensors shall be removed, inspected and cleaned annually during the five-year period to prevent inaccuracies due to long-term buildup from corrosion, lab tissues, wet or sticky particles, or other materials that foul the sensor. The airflow sensors shall be accessed without removal of the air valve or providing duct access doors. The transducer shall be checked and recalibrated annually to ensure long-term accuracy. Note that auto-zero recalibration of transducers is not acceptable as a substitute for annual recalibration.

1.6 WARRANTY PERIOD

A. Parts and labor warranty shall commence upon the date of substantial completion and extend for a period of five years whereupon any defects in materials or laboratory airflow control system performance shall be repaired and calibrated by the supplier at no cost to the owner. Substantial completion inspection shall be done with owner staff representative.

PART 2 - SYSTEM PERFORMANCE REQUIREMENTS

2.1 AIRFLOW CONTROL SYSTEM DESCRIPTION

A. Each laboratory shall have a dedicated laboratory airflow control system.

B. The laboratory airflow control system shall employ individual average face velocity controllers that directly measure the area of the fume hood sash opening and proportionally control the hood's exhaust airflow to maintain a constant face velocity over a minimum range of 20 to 100% of sash travel. The corresponding minimum hood exhaust flow turndown ratio shall be 5 to 1.

C. The hood exhaust airflow control device shall respond to the fume hood sash opening by achieving 90% of its commanded value within one second of the sash reaching 90% of its final position (with no more than 5% overshoot/undershoot) of required airflow. Rate of sash movement shall be between 1.0 to 1.5 feet per second.

D. The hood exhaust airflow control device shall be automatically switched between in-use and standby levels based on operator presence immediately in front of the hood. A presence and motion sensor shall activate the switching. The airflow control device shall achieve the required in-use commanded value in less than one second from moment of detection with no more than a 5% overshoot or undershoot.

E. The laboratory airflow control system shall maintain specific airflow (± 5% of signal within one second of a change in duct static pressure) regardless of the magnitude of the pressure change (within 0.6" to 3.0" wc), airflow change or quantity of airflow control devices on the manifold.

F. The laboratory airflow control system shall use volumetric offset control to maintain room pressurization. The system shall maintain proper room pressurization polarity (negative or positive) regardless of any change in room/system conditions such as the raising and lowering of any or all fume hood sashes or rapid changes in duct static pressure. Systems using differential pressure measurement or velocity measurement to control room pressurization are unacceptable.

G. The laboratory airflow control system shall maintain specific airflow (± 5% of signal) with a minimum 16 to 1 turndown to insure accurate pressurization at low airflow and guarantee the maximum system diversity and energy efficiency.

H. The owner shall be given minimum of 8 hours of training on how to calibrate the airflow control system.

PART 3 - MATERIALS

3.1 USAGE BASED CONTROL EQUIPMENT

A. For variable air volume (VAV) systems, a sash sensor shall be provided to measure the height of each vertically-moving fume hood sash. A sash sensor shall also be provided for horizontal overlapping sashes. Control systems employing sidewall mounted velocity sensors shall be unacceptable.

B. A presence and motion sensor shall be provided to determine an operator's presence in front of a hood by detecting the presence and/or motion of an operator, and to command the laboratory airflow control system from an in-use operating face velocity (e.g., 100 fpm) to a standby face velocity (e.g., 60 fpm) and vice versa.

1. The sensor shall define a detection zone that extends approximately 20" (50 cm) from the front of the fume hood. If the sensor does not detect presence and/or motion in its detection zone within five seconds, it shall command the system to the user adjustable standby face velocity. When the sensor detects the presence and/or motion of an operator within the detection zone, it shall command the system to the in-use face velocity within 1.0 second.

2. The sensor shall have a control circuit that adapts to its specific surroundings and automatically adjusts for inanimate objects placed within its detection zone. It shall map the area into memory and, after a period of five minutes, nullify the image of the inanimate object and return to a standby mode. Operators shall enter and leave the zone with the unit automatically adjusting between in-use and standby modes. If the inanimate object is moved or taken out of the zone, the unit shall automatically re-map the area.

3. Wide area motion detectors (on the hood or room level) shall be unacceptable.

C. The airflow at the fume hood shall vary in a linear manner between two adjustable minimum and maximum flow set points to maintain a constant face velocity throughout this range. A minimum volume flow shall be set to assure flow through the fume hood even with the sash totally closed.

D. A fume hood monitor shall be provided to receive the sash sensor output and presence and/or motion signal. This same monitor shall generate an exhaust airflow control signal for the appropriate airflow control device in order to provide a constant average face velocity. Audible and separate visual alarms shall be

provided for both flow alarm and emergency exhaust conditions. The monitor shall be provided with digital indication of the fume hood face velocity.

3.2 AIRFLOW CONTROL DEVICE—GENERAL

A. The airflow control device shall be a venturi valve.

B. The valve assembly manufacturer's Quality Management System shall be registered to ISO 9001:2000.

C. The airflow control device shall be pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change or quantity of airflow controllers on a manifolded system.

D. The airflow control device shall maintain accuracy within ± 5% of signal over an airflow turndown range of no less than 16 to 1. No minimum entrance or exit duct diameters shall be required to ensure accuracy and/or pressure independence.

E. The airflow control device shall be constructed of one of the following three types:

1. Class A—The airflow control device for non-corrosive airstreams such as supply and general exhaust shall be constructed of 16 gauge aluminum. The device's shaft and shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal mounting link shall be made of aluminum. The pressure independent springs shall be a spring grade stainless steel. All shaft bearing surfaces shall be made of a Teflon, or polyester, or PPS (polyphenylene sulfide) composite.

    a. Sound attenuating devices used in conjunction with general exhaust or supply airflow control devices shall be constructed using 24 gauge galvanized steel or other suitable material used in standard duct construction. No sound absorptive materials of any kind shall be used.

2. Class B - The airflow control device for corrosive airstreams such as fume hoods and biosafety cabinets shall have a baked-on corrosion resistant phenolic coating. The device's shaft shall be made of 316 stainless steel with a Teflon coating. The shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal mounting link shall be made of 316 or 303 stainless steel. The pressure independent springs shall be a spring grade stainless steel. The internal nuts, bolts and rivets shall be

stainless steel. All shaft bearing surfaces shall be made of a Teflon or PPS (polyphenylene sulfide) composite.

F. Actuation

1. For electrically-actuated VAV operation, a UL 916 listed electronic actuator shall be factory mounted to the valve. Loss of main power shall cause the valve to position itself in an appropriate failsafe state. Options for these failsafe states include: normally open-maximum position, normally closed-minimum position, or last position. This position shall be maintained constantly without external influence, regardless of external conditions on the valve (within product specifications).

2. Constant volume valves do not require actuators.

G. Certification

1. Each airflow control device shall be factory calibrated to the job specific airflows as detailed on the plans and specifications using NIST traceable air stations and instrumentation having a combined accuracy of no more than ± 1% of signal over the entire range of measurement. Electronic airflow control devices shall be further calibrated and their accuracy verified to ± 5% of signal at a minimum of eight different airflows across the full operating range of the device.

2. All airflow control devices shall be individually marked with device specific and factory characterization data. As a minimum, it should include: tag number, serial number, model number, characterization information (for electronic devices), and quality control inspection numbers. All information shall be stored by the manufacturer. Job related information, such as tag number, serial number and model number, shall be stored by the manufacturer for use with as-built documentation.

H. Airflow control devices that are not venturi valves, and airflow measuring devices (e.g., pitot tube, flow cross, air bar, orifice ring, vortex shedder, etc.) shall only be acceptable provided they meet all the performance and construction characteristics as stated throughout this specification and:

1. The airflow control device employs transducers manufactured by Rose-mount, Bailey, Bristol, or Foxboro. Accuracy shall be no less than ± 0.15% of span (to equal ± 5% of signal with a 15 to 1 turndown) over the appropriate full scale range including the combined effects of nonlinearity, hysteresis, repeatability, drift over a one year period, and temperature effect. 316L stainless steel materials shall be provided for all exhaust

applications. The use of 304 stainless steel materials shall be provided for all make-up air applications.

2. Airflow sensors shall be of a multi-point averaging type, 304 stainless steel for all supply and general exhaust applications, 316L stainless steel for all fume hood, canopy, snorkel, and biosafety cabinet applications. Single point sensors are not acceptable.

3. Suppliers of airflow control devices or airflow measuring devices requiring minimum duct diameters shall provide revised duct layouts showing the required straight duct runs upstream and downstream of these devices. Coordination drawings reflecting these changes shall be submitted by the supplier of the laboratory airflow control system. In addition, suppliers shall include static pressure loss calculations as part of their submittals. All costs to modify the ductwork, increase fan sizes and horsepower, and all associated electrical changes shall be borne by the laboratory airflow control supplier.

3.3 EXHAUST AND SUPPLY AIRFLOW CONTROL DEVICE

A. The airflow control device shall use closed loop control to linearly regulate airflow based on a 0 to 10 volt control signal. The device shall generate a 0 to 10 volt feedback signal that is linearly proportional to its airflow.

3.4 LABORATORY CONTROL UNIT

A. A laboratory control unit shall control the supply and/or general exhaust airflow control devices to maintain proper room pressurization polarity (positive or negative). Each individual laboratory shall have a dedicated laboratory control unit.

B. The control unit shall be electronic. The inputs shall accept linear feedback signals from fume hood, canopy, snorkel, biosafety cabinet, and office supply airflow control devices. The output signals shall control supply, general exhaust/return airflow control devices and/or variable frequency drives with signals that are linearly proportional to the desired supply or exhaust airflows.

C. The control unit shall maintain a constant design offset between the sum of the room’s total exhaust and make-up/supply airflows. This offset shall be field adjustable and represents the volume of air that will enter (or exit) the room from the corridor or adjacent spaces.

D. The control unit shall provide linear signals that are proportional to all airflow sources, sash sensors, and flow alarms. The signals shall be available for hard-

wired connection to the facility's direct digital control (DDC) system, or through an integrated control unit that interfaces directly into the facility's DDC system.

E. The laboratory control unit may be either panel or valve mounted.

F. Refer to the DDC Control specification for the required input/output summary for the necessary points to be monitored and or controlled.

G. Each laboratory shall have a dedicated 120 Vac line connection to power the laboratory's airflow control system power supply.

H. Provide surge suppression devices for protection of all low voltage control and communications circuits. Devices shall be by EDCO, DiTek, Joslyn, or control system manufacturer approved equal, and selected for the appropriate clamping voltage and surge energy capacity for each application.

PART 4 - EXECUTION

4.1 INSTALLATION

A. The automatic temperature controls (ATC) contractor shall install the sash sensors, interface boxes, presence and motion sensor, and fume hood monitor on the fume hood under initial supervision of the laboratory airflow control system supplier. Reel-type sash sensors and their stainless steel cables shall be hidden from view. Bar-type sash sensors shall be affixed to the individual sash panels. Sash interface boxes with interface cards shall be mounted in an accessible location.

B. The ATC contractor shall install the laboratory control unit (if panel-mounted) and wall-mounted power supply (as required) in an accessible location in the designated laboratory room.

C. The ATC contractor shall install 24 VAC/14AWG Class 2 service to all airflow control devices, except for constant volume devices.

D. The ATC contractor shall terminate and connect all cables as required (refer to the chart below). In addition, integrated laboratory control unit connectors shall be furnished by the ATC.

E. The mechanical contractor shall install all airflow control devices in the ductwork and shall connect all airflow control valve linkages.

F. The mechanical contractor shall provide and install all reheat coils and transitions.

G. The mechanical contractor shall provide and install insulation as required.

H. The electrical contractor shall wire a dedicated, single-phase 120 Vac power circuit to the laboratory control unit or power supply.

4.2 SYSTEM START-UP AND TRAINING

A. System start-up shall be provided by a factory-authorized representative of the laboratory airflow control system manufacturer. Start-up shall include calibrating the fume hood monitor and any combination sash sensing equipment as required. Start-up shall also provide electronic verification of airflow (fume hood exhaust, supply, make-up, general exhaust, or return).

B. The balancing contractor shall be responsible for final verification and reporting of all airflows.

C. The laboratory airflow control system supplier shall furnish a minimum of eight hours of owner training by factory trained and certified personnel. The training will provide an overview of the job specific airflow control components, verification of initial fume hood monitor calibration, general procedures for verifying airflows of air valves, and general troubleshooting procedures.

D. Operation and maintenance manuals, including as-built wiring diagrams and component lists, shall be provided for each training attendee.

END OF SECTION 15955

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 15990 - TESTING, BALANCING, AND COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, of this specification division and Division 1 specification sections apply to work of this Section.

1.2 TESTING, BALANCING, AND COMMISSIONING OF HVAC SYSTEMS:

A. Selection: The Contractor shall procure the services of, and have a contract with, an independent Test, Balance, and Commissioning Test and balance sub-contractor (Test and balance sub-contractor), which specializes in the balancing, testing, and commissioning of heating, ventilating, and air conditioning systems. The Test and balance sub-contractor shall balance, adjust, and test all water circulating and air moving equipment, air distribution, and exhaust systems, and temperature control equipment as herein specified and shown on the drawings.

B. The Contractor shall award the test, balance and commissioning contract to the Test and balance sub-contractor as soon as possible to allow them to schedule the work in cooperation with other trades and to meet the completion date. The contractor shall prepare a critical path schedule, coordinated with all subcontractors, so as to accomplish all tasks required of the Test and balance sub-contractor as scheduled herein.

C. Work performed under those sections in Division 15 is herein referred to as the Installer. Refer to specific items of work provided by each installer, and outlined in this section, "MECHANICAL CONTRACTORS RESPONSIBILITIES". Installers shall cooperate with the Test and balance sub-contractor as required during execution of the work under this section.

D. The Test and balance sub-contractor shall inspect all work under the above sections as it relates to work under this section and report in writing to the Contractor and Engineer any deviations from plans and specifications that will affect the performance of the systems. All correspondence (written, fax, electronic mail, and the like) is to be copied to the owner.

1.3 TEST AND BALANCE SUB-CONTRACTOR QUALIFICATIONS:

A. The Test and balance sub-contractor shall be a member in good standing with The Associated Air Balance Council (AABC) or National Environmental

Balancing Bureau (NEBB) and shall provide AABC National Project Certification Performance Guaranty, or equivalent, to the owner upon request. The Test and balance sub-contractor must be totally independent, having no affiliation with any contractor, design engineer, or equipment manufacturer/supplier of HVAC related equipment.

B. The Test and balance sub-contractor shall have a fully staffed office within fifty (50) miles of the site and have been regularly engaged in the testing, balancing, and commissioning of heating, ventilating, and air conditioning systems.

C. The Test and balance sub-contractor shall provide proof that personnel performing work has successfully completed at least five (5) completed projects of similar size and scope, with at least three (3) completed projects with the City of Tampa. A complete list of reference projects, including name and phone number of contacts, shall be submitted with the bid.

D. The Test and balance sub-contractor shall have a Florida Registered Professional Engineer on its staff.

E. All instruments used shall be accurately calibrated within six months of balancing and maintained in good working order. If requested, the test shall be conducted in the presence of the Engineer and/or his representative.

1.4 TEST AND BALANCE SUB-CONTRACTOR SUBMITTALS:

A. Provide a plan review within thirty days upon receipt of contract. The plan review should include comments and recommendations on any discrepancies that may hinder balancing. This plan review shall be transmitted directly to the Contractor.

B. Submit to Contractor, equipment start-up forms. After receipt from the contractor of the submittal data, forms will be transmitted by the Test and balance sub-contractor to the Mechanical Contractor for use in equipment start-up. The completed forms will be turned over to the Test and balance sub-contractor prior to the beginning of the test and balance phase.

C. Submit agenda of test procedures for each system, describing balancing standards for the testing, balancing, and commissioning of the air conditioning, heating, and ventilating systems for the approval of the Engineer. This agenda shall include all forms for each system and component, with specified data from the project plans and specifications included on the forms.

D. The final Testing, Balancing, and Commissioning Report with the Engineer's letter of acceptance, must be received at lease tone week prior to the proposed date of the Substantial Completion Inspection.

1.5 TEST AND BALANCE SUB-CONTRACTOR INSPECTIONS AND TESTS:

A. Make inspections of the systems during construction for proper installation of balancing devices and general construction as related to the test and balance work.. The number of inspections will vary with size and complexity of the project, but a minimum of two inspections are required: one at 50% completion of ductwork installation, the second at 80% completion of ductwork installation. A written report of each job visit shall be sent to the Construction Manager for transmittal to the Engineer.

B. Perform Final Test & Balance work associated with the HVAC system as described herein.

C. A minimum of one after-occupancy inspection shall be made within 90 days of the final test and balance. At this time, any minor adjustments shall be made for occupant comfort. Major problems, which will require major readjustments, shall be addressed to the Architect / Engineer prior to any readjustments. Any alterations to the final test and balance report shall be transmitted as a revised report to the Construction Manager for transmittal to the Engineer..

D. Provide for checking balance during opposite season (if tested in winter, recheck and update data during summer and vice versa). Send Opposite Season Report containing new and revised to the Construction Manager for distribution to the Engineer.

1.6 TEST AND BALANCE SUB-CONTRACTOR WARRANTY AND REPORTS:

A. Provide AABC National Project Certification Performance Guarantee or equivalent.

B. Include a one year warranty commencing on the date of substantial completion date of the entire project or commencing on the date of the final Testing, Balancing, Commissioning Report, whichever is later. During the Warranty period, the owner may request a recheck or resetting of any equipment or device listed in test report.

C. Provide five copies of tabulated report in neatly organized typed form with AABC approved minimum data, within fifteen working days after completion of test. Report will include start-up reports and drawings to coincide with the test report.

All commissioning tests will be included in a separate report format. In addition, all reports shall incorporate a summary page(s) which shall include:

1. General description of project (building type, system type, equipment description, etc.)

2. A descriptive list of all equipment and test results (sorted building by building) which do NOT meet plans and specifications. All equipment and test data NOT listed on the above mentioned summary page(s) will be considered to perform within 10% of design requirements.

3. Copies of reduced plan drawings that uniquely identify and cross reference air devices, VAV boxes, dampers, equipment, etc.

4. HVAC equipment approved submittals.

5. Duct pressure test/leakage reports.

6. Commissioning Reports.

7. Copies of all correspondence (written, fax, electronic mail and the like) between the Test and balance sub-contractor, Construction Manager, Subcontractor(s), Architect, Engineer, etc.

D. The Owner reserves the right to provide verification of the test and balance reports and such verification shall be by a second independent test and balance sub-contractor. Reports found to be inaccurate will be disallowed and the test and balance test and balance sub-contractor will be required to repeat operations under the supervision of the second independent test and balance sub-contractor until accurate reports are completed and agreed upon. The cost of initial checking will be borne by the Contractor/Owner, unless the report is found to be inaccurate. In such case, the costs of the verification test and balance and all subsequent costs of supervision in order to secure acceptable reports will be borne by the test and balance test and balance sub-contractor.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES:

A. Final testing, balancing and commissioning of the HVAC systems shall be performed as specified above. It is the responsibility of the Mechanical Contractor to be completely familiar with all the provisions and responsibilities of the Test and balance sub-contractor, and to provide such certification, cooperation, and support required.

B. HVAC systems will not be accepted as complete, or the project accepted as substantially complete, until such time as the Test and balance sub-contractor reports that the HVAC systems are operating within acceptable limits, are in accordance with the contract documents, and are in receipt of approved duct leakage reports.

C. The Contractor shall repair all deficiencies noted by the Test and balance sub-contractor in a timely manner. The Test and balance sub-contractor will notify the contractor in writing, on a daily basis, of any deficiencies discovered and Contractor will notify the Test and balance sub-contractor in writing upon completion of the repairs. The cost for extra re-testing by the Test and balance sub-contractor due to un-repaired items that were certified as repaired, will be the responsibility of the Contractor.

D. The Contractor shall:

1. Allow adequate time in the construction schedule to perform the Testing & Balancing and Commissioning work.

2. Notify the Construction Manager and the Test and balance sub-contractor immediately upon commencement of work related to the HVAC system.

3. Provide required shop drawings and all equipment data to the Architect / Engineer and to the selected Test and balance sub-contractor, with a copy of the transmittal letter sent to the Architect / Engineer.

4. Provide test openings as required for testing and balancing HVAC systems.

5. Provide updated job schedule and timely notice prior to scheduled events.

6. Provide test openings and temporary end caps or otherwise seal off ends of ductwork to permit leakage testing prior to installation of diffusers, grilles, and similar devices.

7. Make preliminary tests to establish adequacy, quality, safety, completed status, and satisfactory operation of HVAC systems and components. The systems shall be free of electrical grounds and short circuits.

8. Perform duct leakage tests, in the presence of the test and balance sub-contractor, on all supply, return, outside air make-up, and exhaust air systems.

9. Within the intent of the contract documents, provide, at the request of the Test and balance sub-contractor, all equipment, material, supplies, workmen, and supervisions necessary to provide a satisfactory, operating system.

10. During the test and balance period, operate all HVAC equipment as necessary to permit systems to be tested and balanced as fully operating, functional systems.

11. Work harmoniously with the Test and balance sub-contractor, providing all courtesies normally extended to professional consultants.

12. Perform all work necessary to make ceiling space plenums air-tight and functional.

13. Remove and replace ceilings as necessary to permit test and balance operations.

14. Remove and replace equipment, lights, or other items which obstruct testing and balancing operations. Where equipment, lights, or other items will interfere with future adjustments of the HVAC system, such equipment, lights, or other items shall be relocated as directed by the Architect / Engineer.

15. Provide completed start-up forms on each piece of equipment.

16. Replace belts and drives as required for proper balancing. Drives shall be adjusted and aligned to prevent abnormal belt wear and vibration.

17. Adjust fan speed to full load motor amperage, but, not over full load.

18. Open all manually adjustable dampers and test dampers for smooth, vibration-free operation.

19. Verify that all controls are installed and operating in accordance with the control sequence of operation.

20. Before requesting final testing and balancing, submit signed statement that HVAC systems are installed, adjusted, fully lubricated, operating satisfactorily, and are ready for use.

21. Duct Leakage Report: The Mechanical Contractor to make all the supply, return, outside air, and exhaust duct systems operationally air-tight, to be no more than 2% leakage for duct systems rated at 2" w.c. pressure class, and 1% leakage for systems exceeding 2" w.c. pressure class. Leakage test to be performed with all air device openings and fan connections sealed airtight. Test the systems prior to applying any insulation or concealing in soffits or chases. Use a portable fan capable of producing a static pressure equal or greater than the duct test pressure. This fan to have a flow measuring assembly consisting of a straight section of duct with an orifice plate, pressure taps, and a calibrated performance curve for determining leakage rates.

22. Test each section equal to the external static pressure indicated for that fan or air handler with the portable fan assembly. After the fan achieves that steady state design pressure, record the air flow quantity across the orifice and the percent of design air flow. If the test fails, the contractor shall reseal and retest at no additional cost to the contract.

23. Repair all duct leaks that can be heard or felt, even if the system has passed the leakage test.

24. Submit duct leakage reports to the Test and balance sub-contractor and the Engineer for their review and approval.

3.2 TEST AND BALANCE SUB-CONTRACTOR'S RESPONSIBILITIES:

A. Air Balance: The Test and balance sub-contractor shall perform the following tests, and balance system in accordance with the following requirements:

1. Record minimum data required by AABC forms.

2. Test and adjust fan rpm to design requirements.

3. Test and record motor full load amperage/voltage and operating amperage/voltage.

4. Make pitot tube traverse of main supply, return, OA and exhaust ducts and obtain design cfm at fans (where possible).

a. The air flow in rectangular ducts shall be traversed and measured using the log-Tchebycheff method and round duct shall be measured with the log-Linear method (a.k.a. log-Tchebycheff), no exceptions. Refer to the AABC's 1989 National Standards manual Chapter 8; NEBB's latest Procedural Standards, Section 10; and ASHRAE's 2001 Fundamentals Handbook, Chapter 14.

5. Test and adjust system for design cfm recirculated air.

6. Test and adjust system for design cfm outside air.

7. Test and record system static pressure profile.

8. Adjust all main supply and return air ducts to proper design cfm.

9. Adjust all zones to proper design cfm, supply, return, and exhaust.

10. Adjust all VV terminals to design minimum,, maximum and/or heat cfm and record controller setpoint.

11. Provide suggestion/corrective measures pertaining to performance related issues.

12. Test and adjust each diffuser, grille, and register to within 10% of design requirements.

13. Each grille, diffuser, and register shall be identified as to the location, area, and system.

14. Test and adjust fan to within 100%-110% of design.

15. Test and adjust kitchen hoods and fume hoods. Traverse exhaust duct. Seal test holes through the duct access panel woth flat head bolts inserted from inside the duct.

B. Size, AK catalog factors of diffusers, grilles, registers, and all tested equipment shall be identified and listed.

C. Readings and test of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm, and and test resultant cfm after adjustments. When direct cfm measuring instruments are used, velocities are not required.

D. In cooperation with the controls contractor, set adjustments of automatically operated dampers to operate as specified, indicated, and / or noted.

E. Check all controls for proper calibrations, and list all controls requiring adjustment by control installers. A software point by point check-out and test, along with verification forms, will be required.

F. All diffusers, grilles, and registers shall be adjusted to minimize drafts in all areas.

G. Witness and record the testing of the ductwork for leakage to insure proper sealing. The Test and balance sub-contractor shall randomly select sections of the completed duct system for testing. The sections selected shall not exceed more than 20% of the measured linear footage of supply, return, exhaust or plenum duct length. All selected ductwork shall be leak tested in accordance with SMACNA. Maximum allowable leakage at any tested section shall not exceed 2% of the total air. If any of the selected duct sections exceed the specific leakage allowance, those sections shall be repaired by the Mechanical Contractor and retested by the Test and balance sub-contractor. If initial testing exceeds specification allowance, testing of all remaining duct ductwork shall be required at the Mechanical Contractor's expense. All additional costs for duct leak repair and retesting shall be the responsibility of the Mechanical Contractor.

H. Advise Mechanical Contractor in writing of all ductwork that shall be repaired to reduce air leakage. Retest to confirm minimum allowable leakage. The cost of retest of failed systems will be the responsibility of the Mechanical Contractor.

I. Water Balance: The Test and balance sub-contractor shall prepare the water systems for balancing in the following manner:

1. Open all valves to full open position. Close all bypass valves. Set modulating valve to full coil flow.

2. Check all strainers where gauge taps are provided, and if required, direct Mechanical Contractor to clean same.

3. Examine water in system and determine if the water has been treated and cleaned. If water has mud or other entrained matter, test and balance work shall stop and Mechanical Contractor shall clean system as specified in other sections of this Division 15 specification.

4. Check pump rotation.

5. Check expansion tanks to determine that they are not air bound and that the system is completely full of water.

6. Check all air vents at high points of water systems and determine all are installed and operating freely.

7. Check coils for counterflow or parallel flow as called for by design.

8. Set all temperature controls so all coils are calling for full cooling or heating. This should close all automatic bypass valves at coils.

9. Check operation of automatic bypass valves.

10. Check and have control contractor set operating temperatures of chillers / boilers to design requirements.

11. Complete air balance must have been accomplished before actual water balance is complete.

J. Chilled Water / Hot Water:

1. Check water temperature at inlet side of coils.

2. Proceed to balance each water coil. Upon completion of flow readings and adjustments at coils, mark all settings and record data.

3. All flow devices to be balanced to within +10% of design.

4. Record and check the following items at each cooling / heating element:

5. Test and record entering air temperature (DB heating and cooling).

6. Test and record entering air temperatures (WB cooling).

7. Test and record leaving air temperatures (DB heating and cooling).

8. Test and record leaving air temperatures (WB cooling).

9. Entering and leaving water temperature.

10. Pressure drop of each coil or vessel.

11. Calculate gpm.

12. Calculate total cooling and heating coil capacities.

13. If test conditions are not within design tolerance, then convert the test conditions to design conditions, or re-test when conditions are closer to design (i.e. opposite season test).

K. Controls Testing: Test and record control temperature or pressure readout of each device and compare to actual measured condition. Include in report.

1. Test Each Sequence Of Operation for all systems to verify proper operation. Include description of operation in report.

2. Record The Dry Bulb Temperature in each space and in addition, record a wet bulb temperature at each thermostat or sensor.

L. Deficiencies: All deficiencies shall be noted by the Test and balance sub-contractor in a field report and submitted to Contractor and the Architect on a daily basis.

M. Upon Correction Of The Deficiency, the Contractor shall notify the Test and balance sub-contractor in writing that the problem is resolved. If the deficiency is not corrected, the Contractor will be responsible for the cost of additional re-testing.

N. Equipment: All information required as shown, but not limited to, shall be compiled in a neat, orderly, itemized format on 8½" x 11" test forms. The following data shall be submitted to the Owner through the Contractor. This data is the minimum required data except where specified standard (i.e. AABC) requires additional data. In addition, any HVAC equipment specified for the project, but not indicated below, is required per AABC form.

O. Air Handlers, Fan Coils, And Duct-mounted Coils:

1. Mark number

2. Unit manufacturers and model number

3. Total supply air cfm and rpm - specified and actual

4. Return air cfm - specified and actual

5. Outside air cfm - specified and actual

6. Unit static pressure profile, including total fan static

7. Specified total and external static pressure

8. Water gpm flow, coil pressure drop, and entering and leaving temps - specified and actual

9. Coil - entering and leaving air DB deg F and WB deg F - specified and actual

10. Outside air DB deg F and WB deg F at time of test

11. Voltage, phase, and cycle specified load conditions
12. Btu per hour at test conditions
13. Btu per hour when converted to specified load conditions
14. gpm by means of heat transfer test

R. Fans:

1. Mark number
2. Manufacturer and model number
3. Total cfm supply and rpm - specified and actual
4. Static pressure (discharge static - suction static)
5. Full load amperage - specified and actual
6. Voltage, phase, and cycles - specified and actual

S. Air Devices (grilles, Registers, Diffusers, and Louvers):

1. Mark number
2. Room number
3. cfm - specified and actual
4. Size
5. Effective area
6. Velocity FPM - specified and actual

T. Variable Volume Boxes:

1. Mark number
2. Unit manufacturer and model number
3. Location and room number
4. Air handler number
5. Maximum / minimum and heating supply cfm - specified and actual

6. For DDC controls: measure and record computer readout and calibration factor at design conditions.

END OF SECTION 15990

SECTION 16050 - BASIC METHODS AND REQUIREMENTS (ELECTRICAL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.

B. Furnish and install all electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, cable, panelboards, etc., and arrangement for specified items in general are shown on drawings.

C. All ampacities herein specified or indicated on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are not permitted.

1.2 MINIMUM REQUIREMENTS

A. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in NEC.

B. The rules and regulations of the Federal, State, local, civil authorities and utility companies in force at the time of execution of the contract shall become a part of this specification. In addition, the following codes and standards shall apply:

1. 2010 Florida Building Code (FBC).

2. 2010 Florida Fire Prevention Code (FFPC): This code also includes the Florida specific versions of NFPA 1 and NFPA 101.

3. 2008 National Electrical Code, NFPA-70

C. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.

D. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.

E. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner shall be final.

1.3 SPECIFICATIONS AND DRAWINGS

A. Plans show location of fixtures and equipment and are intended to depict the general intent of the work in scope, layout and quality of workmanship. They are not intended to show in minute detail every or all accessories intended for the purpose of executing the work, but it is understood that such details are a part of this work.

B. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Engineer for clarification. All changes from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to conform to the rules of authorities having jurisdiction, shall be made by the Contractor at his own expense.

C. Keep a record of the locations of concealed work and of any field changes in Contract Drawings and Specifications for each trade and, upon completion of the job, supply "As-Built" Drawings and Specifications showing all changes and revisions red-lined on a hard copy (Xerox, black-line) set of drawings, including any deviations from the original Drawings, and indicating in the Specifications each manufacturer's name underlined or inserted whose product was used on the job. These Drawings shall indicate dimensions of buried utility lines from building walls. One set of xerox reproducibles of the original drawings will be furnished upon request for this purpose. The Engineer will transfer these mark-ups to the CAD files and provide hard copy Xerox sets of drawings and specifications. Five hard copies and AutoCAD and PDF electronic files are required, and will be provided by the Engineer.

1.4 STANDARDS

A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory.

Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed: Equipment is "listed" if of a kind mentioned in a list which:

   a. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.

   b. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

2. Labeled: Equipment is labeled if:

   a. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.

   b. The laboratory makes periodic inspections of the production of such equipment.

   c. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

3. Certified: Equipment is "certified" if:

   a. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.

   b. Production is periodically inspected by a nationally recognized testing laboratory.

   c. It bears a label, tag, or other record of certification.

4. Nationally recognized Testing Laboratory: A testing laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

1.5 QUALIFICATIONS (PRODUCTS AND SERVICES)

A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least five years, unless otherwise noted elsewhere in the specifications or on the drawings.

B. Product Qualification:

1. Manufacturer's product shall have been in satisfactory operation on three installations of similar size and type, as this project, for approximately three years.

2. The Owner reserves the right to require the contractor to submit a list of installations where the products have been in operation before approval of said products.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.6 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts should be available. Items not meeting this requirement, but which otherwise meet technical specifications, and merits of which can be established through reliable test reports or physical examination of representative samples, will be considered.

B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:

1. All components of an assembled unit need not be products of the same manufacturer, however, the assembled unit shall be the responsibility of a single manufacturer and warranted as such.

2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.

3. Components shall be compatible with each other and with the total assembly for the intended service.

4. Constituent parts which are similar shall be the product of a single manufacturer.

D. All factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

1.7 EQUIPMENT REQUIREMENTS

A. Equipment voltage ratings shall be in accordance with the requirements indicated on the drawings or as specified.

B. Prior to bid, written approval shall be obtained by the Contractor for any equipment that differs from those specified on the drawings and specifications. The Contractor shall be prepared to submit samples of the equipment when requested at no cost to the Engineer.

1. The Contractor shall furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required to determine that the equipment is equivalent in quality and function to the equipment specified.

2. Approval by the Engineer of the equal equipment does not relieve the Contractor of the responsibility of furnishing and installing the equipment at no additional cost to the Owner.

3. Any other items required for the satisfactory installation of the equal equipment shall be furnished and installed at no additional cost to the Owner. This includes but shall not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and correlation with other work, subject to the jurisdiction and approval of the Engineer.

C. Catalogue numbers, where given, are intended to give a basis for design, quality and function. Any other incidental equipment needed for a complete and functional installation shall be provided at no additional cost.

D. EQUIPMENT PROTECTION: Equipment and material shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.

E. During installation, equipment, controls, controllers, circuit protective devices, etc., shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing, operating and painting.

F. Damaged equipment shall be, as determined by the Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

G. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.

H. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.8 WORK PERFORMANCE

A. Arrange, phase and perform work to assure electrical service for other buildings at all times.

B. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions.

C. Coordinate location of equipment and conduit with other trades to minimize interferences.

D. Obtain and pay for all required installation inspections and deliver certificates approving installations to the Owner unless directed otherwise.

1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS

A. Equipment location shall be as close as practical to locations shown on the drawings. Where architectural, structural or other existing features govern location of work, make minor adjustments in location and notify the Engineer.

B. Working spaces shall not be less than specified in the National Electrical Code for all voltages specified.

C. Inaccessible Equipment:

1. Where the Owner/Engineer determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner.

2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.

D. Equipment and Material:

1. New equipment and material shall be installed, unless otherwise specified.

2. Equipment and material shall be designed to assure satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements shall apply to the installation in areas requiring special protection such as explosion-proof, watertight and weatherproof construction.

E. Utility Services:

1. Determine utility connection requirements and include in the base bid all costs to the Owner for utility service.

2. Include all costs for temporary service, temporary routing of service or any other requirements of a temporary nature associated with the utility service.

F. Continuity of Service:

1. No service shall be interrupted or changed without permission from the Engineer and the Owner. Written permission shall be obtained before any work is started.

2. When interruption of services is required, all persons concerned shall be notified and a prearranged time agreed upon.

G. Concrete Work:

1. Provide all cast-in-place concrete shown on the documents unless noted otherwise. Concrete work shall conform to all applicable Division 2 and 3 specification sections.

2. Provide all anchor bolts, metal shapes and templates required to be cast in concrete or used to form concrete for support of electrical equipment.

1.10 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the National Electrical Code, install an identification nameplate which will clearly indicate information required for use and maintenance of items such as switchboard, panelboards, cabinets, safety switches, separately enclosed circuit breakers, motor starters, communications systems cabinets, control devices and other significant equipment.

B. Nameplates shall be laminated white phenolic resin with a black core with engraved lettering, a minimum of 3/16-inch high. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions. Hand written marker is not acceptable.

1.11 SHOP AND ERECTION DRAWINGS AND SAMPLES

A. The Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.

B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

C. Shop and erection drawing submittals shall conform to the requirements of the General Conditions and Division-1 specifications except as modified herein.

D. Submit required and/or requested shop and erection drawings, for review by Engineer before ordering or installing any equipment or material. Equipment or material ordered or installed before Engineer review may not be accepted and may have to be removed from the project if deemed unacceptable.

E. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature which shall clearly indicate the construction, material, physical dimensions, wiring diagrams and complete operating data clearly marked for each item. Data of general nature will not be accepted.

F. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.

G. Make submittals for the equipment and materials in accordance with the following:

1. Mark the submittals, "SUBMITTED UNDER SECTION_____".

2. Submittals shall be marked to show specification reference including the section and paragraph numbers.

3. The submittals shall include the following:

a. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required. Provide any additional information specifically requested in the individual specification section or on the drawings.

b. Elementary and interconnection wiring diagrams for fire alarm, and other communication systems and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.

c. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.

I. Shop drawings on paper 11”X17” or smaller in size shall be submitted in tabbed and indexed three ring binder. The binder shall not exceed 11-5/8” height. Partial submittals are unacceptable. The index shall indicate the related specification section number.

K. The Contractor will certify that all electrical shop drawings are in conformance with the plans and specifications. Deviations from the plans and specifications

shall be noted, and the specific area of the deviation clouded and in contrasting color (green) with a complete explanation for the reasons for the deviation. Any redesign of the system that becomes required due to a deviation will be the responsibility of the Contractor, include any associated design, architectural, and engineering fees.

L. Carefully examine all shop drawings and mark-up as necessary before submitting to the Engineer for review. The Engineer will only consider shop drawings bearing the contractor's stamp of approval.

M. The engineer's review shall not relieve the contractor from the responsibility for deviations from drawings and specifications. The engineer's review shall be construed to apply only to general arrangement and shall not relieve the contractor from the responsibility for the correctness of details and dimensions and provision of the correct equipment.

N. The contractor shall retain copies of all reviewed shop drawings on the job site for reference.

O. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.12 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT

A. Provide openings and excavation required for the installation of the electrical work. Patch work and backfill as required. Finished work shall match the existing adjoining work.

B. Verify all conditions affecting the work to be performed under this contract.

C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, and hangers as required. No columns, beams, joists, building foundations nor any other structural building component shall be cut, drilled or disturbed in any way. Conflicts shall immediately be brought to the attention of the Engineer.

D. All excavation on sites containing existing buildings and existing services, shall be done with hand shovel to avoid damage to existing services. Where hand shovel is not practical extreme caution shall be taken when performing excavation. The contractor will be responsible for locating any existing utilities.

Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Engineer at no cost to the Owner and with no extension of time limitation.

1.13 EXPERIENCE

A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project. The Contractor shall, upon request, show evidence of at least three jobs of similar character and size installed within the preceding five years.

1.14 REMOVAL OF RUBBISH

A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Engineer. The site must be cleaned daily. This is critical when working in off hours when lab workers will be present following the workers. Refer to Section 01700 for more requirements.

1.15 QUIET OPERATION AND VIBRATION

A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.

B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.16 CLEANING AND ADJUSTMENTS

A. Upon completion of the work, Contractor shall clean and re-lamp all light fixtures, clean and identify all equipment, adjust and test all equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.

B. During construction protect all conduit and equipment from damage and dirt. Cap the open ends of all conduit and equipment.

1.17 STORAGE OF MATERIALS

A. All materials stored on site shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.

B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.

C. Provide continuous protection for all equipment already installed.

1.18 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.

B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.19 TESTS

A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Engineer. Provide all instruments, labor and services necessary to conduct tests.

1.20 INSTRUCTIONS

A. Fully instruct Owner's personnel in the care and operation of electrical systems, including all lighting systems and furnish a letter to the Engineer advising the particular person(s) who have received such instruction.

1.21 GUARANTEE

A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a minimum period of one year from date of final acceptance. Any defects appearing within this year period shall be repaired without additional cost to the Owner.

1. Provide longer warranty periods where specifically listed in other specification sections, or when the manufacturer's standard warranty is longer, the longer period shall apply.

1.22 ACCEPTANCE

A. Before requesting final inspection:

1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.

2. Submit statement that equipment is properly installed, adjusted, tested and operation is satisfactory.

3. Certify in writing to the Engineer that the Owner's representative has been instructed as to the care and operation of the system and that catalog service and maintenance information has been turned over to the Engineer.

4. Submit copy of written guarantee.

5. Submit copy of other data as may be outlined in these specifications.

B. Copies of the above data shall be submitted to the Engineer prior to requesting final inspection.

1.23 SINGULAR NUMBER

A. Where any device or part of equipment is referred to in these specifications in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.24 PHASING

A. All electrical work shall be coordinated with the phased construction of the project. All electrical systems shall be maintained operational in all operating areas during all phases. Phasing requirements shall be coordinated with all trades prior to bidding and again prior to construction. All systems and wiring shall be protected during each phase of construction to maintain operation of all essential systems at all times.

B. Review all existing building and site conditions prior to demoltion and prior to any demolition, digging or cutting to ascertain the routing of any existing utilities to existing buildings and systems that are to remain. Any concerns with existing systems or wiring shall be brought to the attention of the Engineer for discussion.

C. Note that the existing pad mounted transformer in the chiller yard is to remain. This transformer is a City owner transformer and fed from the plant primary electrical system. Provide all required electrical work to shutdown the transformer as required for the phasing of the work.

1.25 DEMOLITION

A. All electrical demolition shall be provided as required for the phase construction and installation of new work. Coordinate and take care to protect existing systems that are to remain. Any and all existing raceway, wire, devices and equipment shall be removed if it has been rendered out of service by this project. Obtain prior approval from the Owner for any sutdown or any system (power, lighting, communications system) a minimum of 72 hours prior.

1.26 EXISTING ELECTRICAL SYSTEMS

A. Existing power, lighting and low voltage systems that are to remain shall be protected during construction and shall remain in operation while the building is occupied. Any and all areas that are occupied during construction shall have operational systems, including TV, fire alarm, security and voice/data cabling infrastructure system. Any damage to any existing systems shall be repaired or replaced as necessary to place it back into acceptable operational condition. All electrical systems are deemed to be operational and in satisfactory condition. At the contractors option, the following systems may be fully tested prior to any work in the building and any existing problems or trouble on these systems shall be reported to the Owner in writing. Any new problems discovered during or after construction that are not documented will be the responsibility of the Contractor to correct at no additional cost to the Owner.

1. Security

2. Fire Alarm System

3. Voice and Data Network system, including fiber backbone.

4. Existing voice/data cabling is being reused where the existing lab casework is being replaced. Special care will be required to protect the existing cabling and re-connect it to the new communications outlets to be

installed in the new casework. Provide testing of the existing cabling after installation of the new lab casework to ensure proper operation.

1.27 PHASING OF POWER AND SYSTEMS

A. Existing power, voice/data network system, fire alarm, and security systems may need to be phased. These systems shall be operational when the building is occupied and the project is under construction. All costs for labor and materials necessary to accomplish any required phasing shall be included. Any downtime required for the transition from the old system to the new system shall be coordinated with the Owner and approved by the Owner. Costs for any necessary overtime and use of the Owner's custodial staff after hours shall be prior approved and included in the bid.

B. Provide all required temporary power, control and low voltage wiring as necessary to maintain operation of these systems during phasing of the construction.

END OF SECTION 16050

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-16 section making reference to electrical raceways specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of raceway work is indicated by drawings and schedules. Types of raceways specified in this section include the following:

1. Electrical metallic tubing (EMT).

2. Liquid tight flexible metal conduit.

3. Rigid metal conduit, including rigid aluminum

4. Flexible metal conduit.

5. Rigid non-metallic conduit.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical raceway work similar to that required for this project.

C. Codes and Standards:

1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to raceways.

2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide

raceway products and components which have been UL-listed and labeled.

3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of raceway systems.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. General: Provide metal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thicknesses) for each service indicated.

B. Rigid Steel or Aluminum Conduit: Provide rigid steel, zinc-coated, threaded type conforming to FS WW-C-581, ANSI C80.1 and UL 6. Provide rigid aluminum conduit where indicated, UL 6A.

C. Rigid Metal Conduit Fittings: Cast malleable iron, galvanized or cadmium plated, conforming to FS W-F-408, ANSI C80.4. Use rigid aluminum fitting for aluminum raceways.

1. Use compression type fittings for raintight connections.

2. Use compression type fittings for other miscellaneous connections.

D. Electrical Metallic Tubing (EMT): FS WW-C-563, ANSI C80.3 and UL 797.

E. EMT Fittings: FS W-F-408, ANSI C80.4. Die cast or malleable iron.

1. Use compression fittings for raintight connections.

2. Use compression type for concrete type connections.

3. Use compression type fittings for miscellaneous connections.

F. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coat with liquid-tight jacket of flexible polyvinyl chloride (PVC). Shall be Sealtite or equal.

G. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or non-insulated throat.

H. Flexible Metal Conduit: FS WW-C-566 and UL 1. Formed from continuous length of spiral wound, interlocked zinc-coated strip steel.

I. Flexible Metal Conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type.

1. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

2. 45o or 90o Terminal Angle Connectors: Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

2.2 NONMETALLIC CONDUIT

A. General: Provide nonmetallic conduit, ducts, and fittings of types, sizes, and weights for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements which comply with provisions of NEC for raceways.

B. Electrical Plastic Conduit:

1. Heavy Wall Conduit: Schedule 40, 90 C, UL-rated, construct of polyvinyl chloride and conforming to NEMA TC-2, for direct burial, or normal above ground use, UL-listed and in conformity with NEC Article 347, ANSI C33.91.

C. PVC Conduit and Tubing Fittings: NEMA TC 3, mate and match to conduit or tubing type and material.

2.3 MANUFACTURERS

A. Subject to compliance with requirements, provide conduit bodies of one of the following:

1. Appleton Electric; Div of Emerson Electric Co.

2. Arrow-Hart Div; Crouse-Hinds Co.

3. Bell Electric Div; Square D Co.

4. Gould, Inc.

5. Killark Electric Mfg. Co.

6. O-Z/Gedney Div; General Signal Co.

7. Spring City Electrical Mfg. Co., or equivalent.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF RACEWAYS

A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation". Install units plumb and level, and maintain manufacturer's recommended clearances.

B. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.

3.3 INSTALLATION OF CONDUITS

A. General: Install concealed conduits in new construction work, either in walls, slabs, or above hung ceilings. Run conduits concealed in existing work where practical or specifically indicated on the drawings..

1. Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings, and cabinets to provide electrical continuity and firm mechanical assembly.

2. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.

3. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways every 200' linear run or wherever structural expansion joints are crossed.

B. Conduit Installation: Follow minimum requirements in all areas as follows:

1. Use rigid steel galvanized conduit in crawl spaces, service splines, where exposed to weather or subject to saturation with liquids. Also use rigid steel galvanized conduit for all underground conduit elbows greater than 45 degrees, except as allowed for conduits used for communications systems. RGS elbows shall be provided with factory applied bitumastic paint (or applied at shop – not in field).

    a. Use rigid aluminum conduit in all exposed locations in and around the plant.

2. Steel EMT may be used above hung ceilings in classrooms, offices, corridors, toilets, lab areas and other areas where rigid steel or pvc is not required.

3. Use flexible conduit for final 24" of connection to motors, control items or any equipment subject to movement or vibration.

4. Use liquid-tight flexible conduit where subjected to one or more of the following conditions:

    a. Exterior location.

    b. Moist or humid atmosphere where condensate can be expected to accumulate.

    c. Corrosive atmosphere.

    d. Subjected to water spray or dripping oil, water, or grease.

5. Use rigid aluminum conduit where conduit is routed outdoors or in anyway exposed to weather.

6. Electrical contractor will be responsible for the following for all underground conduits:

    a. Trenching and Excavation

    b. Backfill

c. Compaction

C. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.

D. Field bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.

E. Minimum conduit size shall be 1/2" unless noted otherwise. Homeruns shall be a minimum 3/4".

F. Fasten conduit terminations in sheet metal enclosures by two (2) locknuts, and terminate with bushings. Install locknuts inside and out side enclosure.

G. Conduits are not to cross pipe shafts, or ventilating duct openings.

H. Keep conduits a minimum distance of 6" from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.

I. Use of running threads at conduit joints and terminations is prohibited. Where required, use 3-piece union or split coupling.

J. Complete installation of electrical raceways before starting installation of cables/wires within raceways.

K. Install conduits so as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.

L. Exposed Conduits:

1. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of buildings and structures.

2. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.

3. Support all conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed following: up to 1": 6'-0"; 1-1/4" and over: 8'-0". All conduits shall be adequately supported to prevent any noticable deflection, vibration or rattle.

4. Run conduits for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.

M. Conduit Fittings:

1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.

2. Bushings for terminating conduits smaller than 1- 1/4" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.

3. Install insulated type bushings for terminating conduits 1-1/4" and larger. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.

4. All bushings of standard or insulated type to have screw type grounding terminal.

5. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs to be specifically designed for their particular application.

6. All fittings exposed to weather or in unconditioned spaces shall be stainless steel, or aluminum type.

N. Concealed Conduits:

1. Metallic raceways installed underground or in floors below grade, or outside are to have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure watertightness.

2. Conduit in concrete slabs: Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond. Conduits must have a minimum of three-quarter inch (3/4") concrete cover.

3. Embedded conduit diameter is not to exceed one-third (1/3) of slab thickness. Conduit shall not be run in slabs less than 3 inches thick.

O. Underground Duct Banks and Underground Conduits: All underground conduits shall be installed per the National Electrical Code, in accordance with standard industry practices and in accordance with other sections of these specifications. Conduits in duct banks shall be neatly and securely installed in straight lines with manufactured elbows used for all turns and bends. Provide all required trenching, excavation, backfill, compaction, supports, manholes, etc. for a

complete installation. Backfill in accordance with Section 125.8 Standard Specifications for Florida Department of Transportation Road Construction.

3.4 INSTALLATION OF RACEWAYS AND WIREWAYS

A. General: Mechanically assemble metal enclosures, and raceways for conductors to form continuous electrical conductor, and connect to electrical boxes, fittings and cabinets as to provide effective electrical continuity and rigid mechanical assembly.

1. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat all surfaces with corrosion inhibiting compound before assembling.

2. Install expansion fittings in all raceways wherever structural expansion joints are crossed.

3. Make changes in direction of raceway run with proper fittings, supplied by raceway manufacturer. No field bends of raceway sections will be permitted.

4. Properly support and anchor raceways for their en tire length by structural materials. Raceways are not to span any space unsupported. Supporting conduits from ceiling grid, other conduits, ductwork or other non-structural members will not be permitted.

5. Use boxes as supplied by raceway manufacturer wherever junction, pull or devices boxes are required. Standard electrical "handy" boxes, etc. shall not be permitted for use with surface raceway installations.

6. All boxes exposed to the weather or in unconditioned spaces shall be cast aluminum weatherproof FS type or approved equal, unless specifically noted on the drawings.

END OF SECTION 16110

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-16 section making reference to electrical wires and cables specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of electrical wire and cable work is indicated by drawings and schedules.

B. Types of electrical wire, cable, and connectors specified in this section include the following:

1. Copper conductors.
2. Fixture wires.
3. Flexible cords and cables.
4. Wirenut connectors.

C. Applications of electrical wire, cable, and connectors required for project are as follows:

1. For motor-branch circuits.
2. For power distribution circuits
3. For lighting circuits
4. For appliance and equipment circuits

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing electrical wiring and cabling work similar to that required for this project.

C. NEC Compliance: Comply with NEC requirements as applicable to construction, installation and color coding of electrical wires and cables.

D. UL Compliance: Comply with applicable requirements of UL Std 83, "Thermoplastic-Insulated Wires and Cables", and Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors".

E. UL Compliance: Provide wiring/cabling and connector products which are UL-listed and labeled.

F. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std Pub/ No.'s WC 5, "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy", and WC-30, "Color Coding of Wires and Cables", pertaining to electrical power type wires and cables.

G. IEEE Compliance: Comply with applicable requirements of IEEE Stds 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring systems.

H. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D-753. Provide copper conductors with conductivity of not less than 98% at 20ºC (68ºF).

PART 2 - PRODUCTS

2.1 AVAILABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Wire and Cable:

   a. American Wire and Cable Co.

   b. Anaconda-Ericsson Inc; Wire and Cable Div.

   c. Belden Div; Cooper Industries

2. Connectors:

a. AMP, Inc.

b. Appleton Electric Co.

c. Burndy Corporation

d. Thomas and Betts Corp.

2.2 WIRES, CABLES, AND CONNECTORS

A. General: Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20ºC (68ºF).

B. Building Wires: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following UL types, those wires with construction features which fulfill project requirements:

1. Type THWN, THHW, XHHW, THHN/THWN: Unless otherwise indicated, all conductors for wet or dry locations requiring a conductor temperature rating of 75oC (167oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.

2. Type THHN, THHW, XHHW: Unless otherwise indicated, all conductors for dry locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.

3. Type XHHW-2: Unless otherwise indicated, all conductors for wet locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.

4. Conductors for use at 600 volts or below shall be 600 volt rated. Wire No. 12 and smaller shall be solid and wire No. 10 and larger shall be stranded only. Stranded conductors shall terminate in crimp type lugs.

5. Motor circuit branch wiring and associated control wiring: Provide type THHN insulation in dry and damp locations. Provide type THHW insulation in wet locations. All motor wiring to be stranded copper.

6. Wiring in fluorescent fixture channels: Provide conductors with a 90°C temperature rating, type THHN or TFFN insulation.

7. When applicable, wiring from remote H.I.D. ballasts shall be rated for the voltage applied and shall be the size and insulation type recommended by the fixture manufacturer. This wiring shall be installed in accordance with the National Electrical Code.

C. Cables: Provide UL-type factory-fabricated cables of sizes, ampacity ratings, and materials and jacketing/sheathing as indicated for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements, NEC and NEMA standards. MC cable is not permitted.

D. Connectors:

1. General: Provide UL-type factory-fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following, those types, classes, kinds, and styles of connectors to fulfill project requirements:

a. Type: Pressure.

b. Class: Insulated.

c. Kind: Copper (for Cu to Cu connection).

d. Style: Butt connection.

e. Style: Elbow connection.

f. Style: Combined "T" and straight connection.

g. Style: "T" connection.

h. Style: Split-bolt parallel connection.

i. Style: Tap connection.

j. Style: Pigtail connection.

k. Style: Wirenut connection.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRES AND CABLES

A. General: Install electrical cables, wires, and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, Ul, and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate wire/cable installation work including electrical raceway and equipment installation work, as necessary to properly interface installation of wires/cables with other work.

C. Pull conductors simultaneously where more than one conductor is being installed in the same raceway.

D. Use pulling compound or lubricant, where necessary; compound used must not deteriorate conductor or insulation.

E. Use pulling means including, fish tape, cable, rope and basket weave or wire/cable grips which will not damage cables or raceway. Any cable damaged during installation shall be completely replaced.

F. Keep conductor splices to minimum. No joints shall be made in conductor except at outlet boxes or splice boxes. Newly installed conductors shall not be spliced unless specifically noted on the drawings.

G. Install splices and tapes which possess equivalent-or-better mechanical strength and insulation ratings than conductors being spliced. Below grade splices shall be prohibited unless impossible to avoid. Any allowable below grade splice shall be completely watertight and shall utilize a splice method UL listed for wet locations.

H. Use splice and tap connectors which are compatible with conductor material.

I. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A and B.

J. At least eight inches (8") of slack wire shall be left in every outlet box whether it be in use, or left for future use.

K. Color code wiring as follows:

1. 120/208 volt, 3 phase, 4 wire: phase A-black, phase B-red, phase C-blue, neutral-white; ground conductor-green.

2. 277/480 volt, 3 phase, 4 wire: phase A-brown, phase B-orange, phase C-yellow, neutral-gray; ground conductor-green.

L. Wire and cable boxes and reels shall bear the date of manufacture and must not bear dates by more than one year preceeding contract date.

M. Minimum conductor sizes, except as specifically identified on the drawings, shall be as follows:

1. No. 12 - Branch circuits of any kind, except as specified otherwise below.

2. No. 14 - Signal systems, fire alarm system, unless specifically noted otherwise.

3. No. 10 - Exit light circuits, emergency circuits, security lighting, security systems circuits and exterior light circuits.

3.2 FIELD QUALITY CONTROL

A. Prior to energization, test wires and cables for electrical continuity and for short-circuits.

END OF SECTION 16120

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SECTION 16135 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is a part of each Division-16 section making reference to electrical wiring boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.

B. Types of electrical boxes and fittings specified in this section include the following:

1. Outlet boxes
2. Junction boxes
3. Pull boxes
4. Floor boxes
5. Bushings
6. Locknuts
7. Knockout closures
8. Manholes and handholes

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.

C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.

D. UL Compliance: Comply with applicable requirements UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Stds/Pub No.'s OS1, OS2, and Pub 250 pertaining to outlet and device boxes, covers, and box supports.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS

A. Outlet Boxes: Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.

1. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cableclamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

B. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.

1. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions,

switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering outlet boxes which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric;
2. Bell Electric;
3. Eagle Electric Mfg. Co.; Inc.
4. Midland-Ross Corp.
5. OZ/Gedney; General Signal Co.
6. Pass and Seymour, Inc.
7. RACO Div.; Harvey Hubbell Inc.
8. Thomas & Betts Co.

D. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.

1. All boxes exposed to the weather or in unconditioned spaces shall be cast aluminum weatherproof FS type or approved equal, unless specifically noted on the drawings.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering raintight outlet boxes which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric;
2. Crouse-Hinds Co.
3. Bell Electric;
4. Harvey Hubbell, Inc.

5. OZ/Gedney; General Signal Co.

6. RACO Div.

F. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes; with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering junction and pull boxes which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric; Emerson Electric Co.

2. Arrow-Hart Div.; Crouse-Hinds Co.

3. Bell Electric; Square D Company

4. OZ/Gedney; General Signal Co.

5. Spring City Electrical Mfg. Co.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering floor boxes which may be incorporated in the work include, but are not limited to, the following:

1. Arrow-Hart Div.; Crouse-Hinds Co.

2. Harvey Hubbell, Inc.

3. Midland-Ross Corp.

4. Spring City Electrical Mfg. Co.

I. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connections, of types and sizes, to suit respective installation requirements and applications.

J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering bushings, knockout closures, locknuts, and connectors which may be incorporated in the work include, but are not limited to, the following:

1. Arrow-Hart Div.; Crouse-Hinds Co.

2. Appleton Electric Co.; Emerson Electric Co.

3. Bell Electric; Square D Co.

4. Midland-Ross Corp.

5. OZ/Gedney Co.; General Signal Co.

K. Manholes and Handholes: Manholes and handholes for exterior use shall be pre-cast concrete with steel traffic rated covers, as manufactured by Brooks or equal. Manholes and handholes shall be the size necessary for the number of conduits and conductors indicated on the drawings which will enter the enclosure, plus the necessary capacity for the spare conduits and the associated estimated conductor fill. Provide manholes with the appropriate drainage and knockouts for conduits and other necessary access. Traffic covers shall be engraved with the appropriate identification, such as "ELECTRIC". Composite type “Quazite” boxes are acceptable where not directly installed in vehicular roadways.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.

C. Provide weathertight boxes and fittings for interior and exterior locations exposed to weather or moisture.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.

F. Avoid installing boxes back-to-back in walls. Provide not less than 24" (600 mm) separation.

G. Position recessed outlet boxes accurately to allow for surface finish thickness.

H. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

I. Each circuit in pull box shall be marked with a tag guide denoting panels which they connect to.

J. Manholes and handholes shall be installed for all underground conduit installations. The minimum number of manholes and handholes shall be as indicated on the drawings, but he contractor shall provide any additional handholes or manholes necessary for ease of installation, code compliance or due to voluntary or required re-routing of the underground conduits at no additional cost to the Owner. Actual box locations shall be adjusted in the field to coordinate with existing conditions, existing systems, and ease of raceway routing. Final box locations shall be indicated on the as-built drawings.

END OF SECTION 16135

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SECTION 16142 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to electrical connections for equipment specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.

B. Applications of electrical power connections specified in this section include the following:

1. To lighting fixtures, including any contactors.

2. To grounds including earthing connections.

C. Electrical connections for equipment, not furnished as integral part of equipment, are specified in other Division-16 sections, and are work of this section.

D. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division-16 sections, and are work of this section.

E. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division-16 sections, and are work of this section.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors and terminals, of types and ratings required, and ancillary connection materials, including electrical insulating tape, soldering fluxes, and cable ties, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 2 years of successful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.

C. NEC Compliance: Comply with applicable requirements of NEC as to type products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters, and disconnect switches.

D. IEEE Compliance: Comply with Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to connections and terminations.

E. ANSI Compliance: Comply with applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.

F. UL Compliance: Comply with UL Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL-listed and labeled.

G. ETL Compliance: Provide electrical connection products and materials which are ETL-listed and labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. AMP Incorporated
2. Appleton Electric Co.
3. Arrow-Hart Div., Crouse-Hinds Co.
4. Burndy Corporation
5. General Electric Co.
6. Gould, Inc.
7. Harvey Hubbell Inc.

8. Square D Company

9. Thomas and Betts Corp.

2.2 MATERIALS AND COMPONENTS

A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wirenuts, and other items and accessories as needed to complete splices and terminations of types indicated.

B. Metal Conduit, Tubing, and Fittings:

1. General: Provide metal conduit, tubing, and fit tings of types, grades, sizes, and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements and comply with NEC requirements for raceways. Provide products complying with Division-16 basic electrical materials and methods section "Raceways", and in accordance with the following listing of metal conduit, tubing, and fittings:

a. Rigid steel conduit.

b. Rigid metal conduit fittings.

c. Electrical metallic tubing.

d. EMT fittings.

e. Liquid-tight flexible metal conduit.

f. Liquid-tight flexible metal conduit fittings.

g. Flexible metal conduit.

h. Flexible metal conduit fittings.

C. Wires, Cables, and Connectors:

1. General: Provide wires, cables, and connectors complying with Division-16 basic electrical materials and methods section "Wires and Cables".

2. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and

ratings, of wires/cables which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 20ºC (68ºF).

3. Connectors and Terminals: Provide electrical con nectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL CONNECTIONS

A. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC, and NECA's "Standard of Installation", to ensure that products fulfill requirements.

B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.

C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

D. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner, or Engineer. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been successfully accomplished, remove, relocate, or abandon existing wiring as indicated.

E. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors

being spliced. No new conductors shall be spliced unless specifically noted on the drawings.

F. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.

G. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing, and maintenance.

H. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.

I. Provide flexible conduit for motor connections, and other electrical equipment connections, where subject to movement and vibration.

J. Provide liquid-tight flexible conduit for connection of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:

1. Exterior location.

2. Moist or humid atmosphere where condensate can be expected to accumulate.

3. Corrosive atmosphere.

4. Water spray.

5. Dripping oil, grease, or water, including kitchen areas.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

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END OF SECTION 16142

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SECTION 16143 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-16 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK

A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.

B. Types of electrical wiring devices in this section include the following:

1. Receptacles, including surge suppression type if applicable.

2. Ground-fault circuit interrupters

3. Switches

4. Wallplates

5. Plugs and connectors

6. Time Switches / Time Clocks

7. Occupancy Sensors and Digital Time Switches

1.3 QUALITY ASSURANCE

A. Installer's Qualifications: Firm with at least 2 years of successful installation experience on projects utilizing wiring devices similar to those required for this project.

B. NEC Compliance: Comply with NEC as applicable to installation and wiring of electrical wiring devices.

C. UL Compliance: Comply with applicable requirements of UL 20, 486A, 498, and 943 pertaining to installation of wiring devices. Provide wiring devices which are UL-listed and labeled.

D. IEEE Compliance: Comply with applicable requirements of IEEE Std 241, "Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to electrical wiring systems.

E. NEMA Compliance: Comply with applicable portions of NEMA Stds Pub/No. WD 1, "General-Purpose Wiring Devices", WD 2, "Semiconductor Dimmers for Incandescent Lamps", and WD 5, "Specific,-Purpose Wiring Devices".

F. FS Compliance: Comply FS W-C-596 (Series) and FS W-S-896 (Series) pertaining to electrical power connectors and toggle switches.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on electrical wiring devices.

1. Receptacles, including surge suppression type if applicable.
2. Ground-fault circuit interrupters
3. Switches
4. Wallplates
5. Plugs and connectors
6. Time Switches / Time Clocks
7. Occupancy Sensors and Digital Time Switches, including manufacturers layout drawings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide wiring devices of one of the following (for each type and rating of wiring device):

1. Hubbell
2. Arrow-Hart Div.
3. Eagle Electric Co.

4. Leviton

5. Pass - Seymour

6. Time Switches: Tork, Intermatic or Paragon

2.2 FABRICATED WIRING DEVICES

A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds Pub/No. WD 1. Provide ivory color devices and brushed satin finish stainless steel coverplates, except as otherwise indicated; all color selections to be verified by Contractor with Architect/Engineer prior to ordering.

B. Receptacles:

1. Heavy-Duty Duplex: Provide specification grade duplex receptacles, 2-pole, 3-wire, grounding, 20-amperes, 125-volts, with metal plaster ears, design for side and back wiring with spring loaded, screw activated pressure plate, with NEMA configuration 5-20R unless otherwise indicated. Hubbell or equal.

2. Ground-Fault Interrupters: Provide "feed-thru" type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of protecting connecting downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and indication; with 5 milliamperes ground-fault trip level; equip with NEMA configuration 5-20R. Device must have a positive trip identification and reset. Provide ivory colored device.

3. Special Receptacles: Special configuration receptacles shall be standard NEMA plug configuration as specified on the drawings or as required. Provide heavy duty, specification grade receptacles, with black nylon face and brushed satin stainless steel cover plate.

4. Receptacles for computers (all receptacles adjacent to data outlets) shall be ivory with a brushed satin stainless steel cover plate.

C. Switches:

1. Snap: Provide specification grade, general-duty flush single-pole, quiet type toggle switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handle, and side-wired screw terminals.

2. 2-way: Provide specification grade, general-duty flush double-pole AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.

3. Three-way: Provide specification grade, general-duty flush 3-way AC quiet type switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, lock type switch handles, sidewired screw terminals, with break-off tab features, which allows wiring with separate or common feed.

4. Four-way: Provide specification grade, general-duty flush 4-way AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.

5. Touch Snap: Provide soft-touch snap switches, cap able of effortless-fingertip operation; single-pole AC quiet, with lighted rocker switch hangles; sidewired screw terminals for connecting copper-clad aluminum wire, 20-amperes, 120-277 volts rating. Equip with plaster ears.

6. Switches to be ivory with satin finish stainless steel coverplate.

D. Combination Devices: Provide specification grade, general-duty 3-way quiet switch, 20-amperes, 120-277 volts AC, with toggle switch handle, and 3-wire grounding receptacle, 20 amperes, 120-volts, equip with plaster ears, and with break-off tab feature which allows wiring with separate or common feed, with NEMA configuration 5-20R.

E. Incandescent Lamp Dimmers: Provide branch lighting solid-state AC dimmer controls for incandescent fixtures; wattage as indicated.

F. Time Switches, Time Clocks: Timeclocks shall be Intermatic Model ET70115C or similar model for the number of circuits required, unless otherwise specifically noted on the drawings. Provide with a positive manual on-off switch, voltage as required or specified on the drawings, minimum fully rated 20 amps per pole. Provide additional poles as required or specified on the drawings. Time switches shall be Intermatic or equal by Tork or Paragon.

2.3 WIRING DEVICE ACCESSORIES

A. Wallplates: Provide wallplates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as required. Select plates which mate

and match wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates. Provide plates possessing the following additional construction features:

1. Material and Finish: 0.04" thick, type 302 satin finished stainless steel.

B. Floor Service Outlets: Provide flush type floor service receptacle outlets and fittings of types and ratings indicated. Construct of die cast aluminum, satin finish and of the size necessary for the slab thickness provided. Provide one or two gang box as indicated on the drawings with 20-ampere, 125-volt, duplex receptacle, NEMA configuration 5-20R for power, unless indicated otherwise. Provide data or telephone outlets as indicated with a 3/4" diameter bushed hole for data and a standard telephone outlet for telephone. Boxes shall be sized as required for the number of outlets and number of conductors to enter and leave the box. Provide brass cover plate with snap cover which shall be a protective cover which will prevent breakage of the installed wiring devices. Provide brass tile or carpet flange as required. See device legend on drawings for more floor box requirements.

C. Outdoor receptacles that are in locations without protection from the weather shall be provide with a UL listed and approved “in-use” weatherproof cover, and shall be GFI protected.

2.4 OCCUPANCY SENSORS AND DAYLIGHT SENSORS

A. Occupancy sensors shall be dual technology type. Provide occupancy sensors in all spaces indicated on the drawings, and provide ceiling or switch type mounted where indicated. Sensors shall be the type suited for the location. Adjust locations and sensor type for proper performance and as needed to correct any nuisance on or off actions. Sensors shall have contacts for future monitoring connection from the Building EMS HVAC control system. Sensors shall have adjustable sensitivity, adjustable time periods for on/off, and a test mode. Sensor shall be set at 30 minutes. Wattstopper DT-300 (or as required for wider range) or equal by Sensorswitch, Leviton or Hubbell.

B. Digital timer switches shall be Wattstopper TS-400, or or equal by Sensorswitch, Leviton or Hubbell.

2.5 TELEPHONE OUTLETS

A. See Section 16650.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

A. Install wiring devices as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.

C. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.

D. Install galvanized steel wallplates on any exposed surface mounted devices.

E. Install wallplates after painting work is completed.

F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B. Use properly scaled torque indicating hand tool.

G. Contractor to provide ground fault protective type receptacles for any location within 2'-0" of sinks or other source of water. Feed through protection from one ground fault protected receptacle on a circuit is not acceptable.

H. Mounting height of boxes for devices as shown on legend, unless otherwise noted on the plan. Refer to architectural drawings to avoid interferences with millwork. Where two or more devices are shown at the same location, use gang box and one face plate. Verify all device locations with Owner prior to rough-in. Exact device locations may be adjusted by the Owner to avoid interferences or for general convenience at no additional cost to the Owner.

I. Floor boxes shall be installed flush with the slab and shall strictly follow manufacturer's installation instructions. Boxes shall be installed at right angles to the building lines and multiple boxes shall be in-line straight and even. Boxes observed to be installed crooked shall be removed and reinstalled.

3.2 PROTECTION OF WALLPLATES AND RECEPTACLES

A. Upon installation of wallplates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

3.3 GROUNDING

A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL Std 486 A to assure permanent and effective grounds.

3.4 TESTING

A. Prior to circuitry, test wiring for electrical continuity, for short-circuits and for grounding. Ensure proper polarity of connections is maintained. Prior to energization, test wiring devices to demonstrate compliance with requirements.

3.5 WARRANTY

A. All wiring devices, including dimmers and any dimming system, shall have a minimum one year parts and labor warranty.

END OF SECTION 16143

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16150 - MOTOR CONTROLLERS AND CONTACTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Division 1 Specification Sections, apply to work of this section.

1.2 SCOPE

A. The work, apparatus and materials which shall be furnished under these specifications and accompanying drawings shall include all items specified hereinafter and shown on the drawings. All other materials necessary for the complete installation shall be furnished and installed by the Contractor to provide complete electrical systems as indicated on the drawings and as specified herein.

B. Coordinate all required interlocks with Division 15. Motor starters shall contain the necessary auxiliary contacts and control coil voltage to interface with the HVAC temperature control system and fire alarm control system.

1.3 DESCRIPTION OF WORK

A. Extent of motor controller work is indicated by drawings and schedules. Types of motor controllers specified in this section include the following:

1. Manual motor starters.

2. Combination disconnect/FVNR motor starters.

1.4 QUALITY ASSURANCE

A. Manufacturers: General Electric, Square D, Allen Bradley.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical motor controller work similar to that required for this project.

C. Codes and Standards:

1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to motor controllers.

2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to motor controllers. Provide motor controllers and components which have been UL-listed and labeled.

3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of motor controllers.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of motor controller required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.1 INDIVIDUAL MOTOR CONTROLLERS

A. Manual motor starters for 115 volts, single phase motors one horsepower and smaller, shall be single pole, horsepower rated switches with thermal overload units and heaters. Starters shall be Allen-Bradley Bulletin 609, General Electric CR-101 or Square D Class 2510 with stainless steel cover plates.

B. Magnetic full voltage starters for three phase motors shall be three pole, horsepower rated, magnetically operated with three electronic overloads sized for the specific motors supplied. Overload “heaters” are not permitted. Starters shall be Allen-Bradley Bulletin 509, General Electric CR-306 or Square D Class 8536. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and three overload heaters with reset button. Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.

C. Combination magnetic, full voltage starters for three phase motors shall be three pole horsepower rated, magnetically operated contacts, with three electronic overloads sized for the specific motors supplied. Overload “heaters” are not permitted. A three pole horsepower rated, fusible disconnect switch shall also be included integral within the enclosure. Provide fuses sized as recommended by the motor manufacturer. Starters shall be Allen-Bradley Bulletin 512, General Electric CR-308 or Square D Class 8538. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and three overload

heaters with reset button. Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.

D. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be interlocked so the door cannot be opened without turning the unit off. This interlock shall be capable of being defeated by properly trained personnel.

E. Provide phase failure relay for all three phase motors. Relay shall be fully adjustable to open the contacts when any phase to phase or phase to ground voltage is above or below 20% nominal. The relay drop out point shall be adjustable from 0% to 50%. Relay shall be provided with an adjustable time delay of 0 to 120 seconds before opening to avoid nuisance outages. Relay shall be full automatic to open and fully automatic to reset.

PART 3 - EXECUTION

3.1 MOTOR CONTROLLERS, CONTACTORS AND ASSOCIATED CONTROLS

A. Unless otherwise indicated, motor controllers shown on the drawings shall be furnished and installed under this section. The full load current and starting characteristics of each motor shall be verified for proper selection of motor over load devices. The Contractor shall furnish and install all steel shapes, etc., necessary for a support of all motor controllers.

B. Unless otherwise indicated, all control devices, such as thermostats, firestats, etc., shall be installed in place and wired under other sections of the specifications. Coordinate required starter auxiliary contacts and coil voltages for a properly operational system.

C. Motor controllers shall be installed in accordance with all applicable NEC installation requirements.

3.2 IDENTIFICATION OF EQUIPMENT

A. Identification shall be provided for all motor controllers installed by the Contractor. Identification shall consist of white laminated plastic plates with black engraved letters.

END OF SECTION 16150

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16170 - CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods section, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of circuit and motor disconnect switch work is indicated by drawings and schedules.

B. Types of circuit and motor disconnect switches in this section include the following:

1. Equipment disconnects.

2. Appliance disconnects.

3. Motor-circuit disconnects.

C. Wires/cables, raceways, and electrical boxes and fittings required in connection with circuit and motor disconnect work are specified in other Division-16 Basic Electrical Materials and Methods sections.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.

C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.

D. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead-Front Switches". Provide circuit and motor disconnect switches which have been UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub No. KS 1, "Enclosed Switches" and 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)".

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on circuit and motor disconnect switches.

B. Wiring Diagrams: Submit power and control wiring diagrams for circuit and motor disconnects including connections to power and control panels, and feeders.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering circuit and motor disconnects which may be incorporated in the work include the following:

1. General Electric Co.

2. Square D Company

3. ITE/Seimens

2.2 FABRICATED SWITCHES

A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, sheet-steel enclosed safety switches, of types, sizes and electrical characteristics indicated; fusible or non-fusible type as indicated, amperes as indicated, 60 Hz, 3-blades, 4-poles, solid neutral; and incorporating quick-make, quick-break type switches; construct so that switch blades are visible in OFF position with door open. Equip with operating handle which is integral part of enclosure base and whose operating position is easily recognizable, and is padlockable in OFF position; construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA Type 3R enclosures, where applicable. Provide grounding kit. Provide 240 volt rated switches for 208Y/120 volt systems and 600 volt rated switches for 277Y/480 volt systems.

1. Fuses: Provide fuses for safety switches, sized as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

PART 3 - EXECUTION

3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES

A. Install circuit and motor disconnect switches as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate circuit and motor disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.

C. Install disconnect switches for use with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.

D. Provide a nameplate indicating the equipment served and protected.

3.2 GROUNDING

A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches where indicated.

3.3 FIELD QUALITY CONTROL

A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.

B. Painting: repair all scratches to factory painted and primed finish with factory supplied touch-up paint.

END OF SECTION 16170

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16180 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-16 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of overcurrent protective device work is indicated by drawings and schedules.

B. Types of overcurrent protective devices in this section include the following:

1. Circuit Breakers:

a. Air, molded-case, for installation in panels.

b. Air, molded-case, for individual, separately enclosed mounting.

c. For installation in existing panels.

2. Fuses:

a. Class RK5, dual-element time-delay.

C. Refer to other Division-16 sections for cable/wire and connector work required in conjunction with overcurrent protective devices; not work of this section.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of overcurrent protective devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: Qualified with at least 5 years of successful installation experience on projects with electrical installation work similar to that required for project.

C. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of overcurrent protective devices.

D. UL Compliance: Comply with applicable requirements of UL 489, "Molded-Case Circuit Breakers and Circuit-Breaker Enclosures", and UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide overcurrent protective devices which have been UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. AB 1, AB 2, and SG 3 pertaining to molded-case and low-voltage power type circuit breakers.

F. FS Compliance: Comply with Federal Specification W-C-375B/GEN pertaining to molded-case circuit breakers.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: amperes, voltages and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time-current trip characteristics curves, and mounting requirements.

B. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses spare fuses. Provide five (5) of every type of fuse. For all three phase devices or equipment, provide two (2) sets of each type.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:

1. Circuit Breakers:

a. General Electric Co.

b. Square D Co.

c. ITE/Seimens

d. Breaker shall be compatible with the existing switchgear, MCC or panel.

2. Fuses:

a. Bussmann Div.; McGraw-Edison Co.

b. Gould, Inc.

c. Cefco

2.2 CIRCUIT BREAKERS

A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings, and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.

B. Molded-Case Circuit Breakers: Provide factory assembled, molded-case circuit breakers of frame size indicated; rated 600 volts or 240 volts as required, 60 Hz, 3-poles with interrupting ratings as shown on drawings. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Handle ties are not permitted. Provide push-to-trip button on cover for mechanical tripping circuit breakers. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40^{o}C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated. Circuit breakers shall have the short circuit interrupting rated indicated on the drawings or as required for the short circuit current available.

C. Molded-Case Circuit Breakers for Installation in Panelboards or Switchboards: Shall meet the same specifications as in Part B above. Shall be manufactured by the same manufacturer as the panelboard or switchboard. When the existing panel or switchboard style is obsolete and the existing circuit breaker type is not available the contractor shall provide a circuit breaker of similar type as existing. The breaker shall be provided with all the required mounting hardware to mount the breaker in the existing space. The breaker shall meet or exceed the ratings of the existing breakers.

D. Provide all accesories indicated on the drawings, including accesories indicated on the panel schedules, such as shunt trips, ground fault protection, undervoltage trips, etc. Accessories shall be manufactured by the same manufacturer as the circuit breaker.

2.3 FUSES

A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time/current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.

B. Class RK5 Dual-Element Time-Delay Fuses: Provide UL Class RK-5 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting motors.

C. Class RK1 Dual-Element Time-Delay Fuses: Provide UL Class RK-1 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting service entrance or as otherwise noted.

2.4 EXISTING EQUIPMENT

A. Circuit breakers to be installed in existing equipment shall be manufactured by the existing equipment manufacturer and shall have short circuit interrupting ratings equal to or greater than the existing breakers. Provide all required mounting hardware and filler plates and update all panel schedules and nameplates.

PART 3 - EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

A. Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.

C. Fasten circuit breakers without causing mechaincal stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.

E. Install fuses, if any, in fused circuit breakers.

3.2 ADJUST AND CLEAN

A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 16180

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-16 Basic Electrical Materials and Methods section, and is a part of each Division-16 section making reference to electrical supporting devices specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of supports, anchors, sleeves, and seals is indicated by drawings and schedules and/or specified in other Division-16 sections.

B. Types of supports, anchors, sleeves, and seals specified in this section include the following:

1. Clevis hangers
2. C-clamps
3. I-beam clamps
4. One-hole conduit straps
5. Round steel rods
6. Lead expansion anchors
7. Toggle bolts
8. Wall and floor seals

C. Supports, anchors, sleeves, and seals furnished as part of factory-fabricated equipment, are specified as part of that equipment assembly in other Division-16 sections.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of electrical supporting devices.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

A. General: Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified. Where more than one type of supporting device meets indicated requirements, selection is Installer's option.

B. Supports: Provide supporting devices of types, sizes, and materials indicated; and having the following construction features:

1. Clevis Hangers: For supporting 2" rigid metal con duit; galvanized steel; with 1/2" dia. hole for round steel rod; approximately 54 pounds per 100 units.

2. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8"; black steel; approximately 16 pounds per 100 units.

3. C-Clamps: Black malleable iron; 1/2" rod size; approximately 70 pounds per 100 units.

4. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approximately 52 pounds per 100 units.

5. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; galvanized steel; approximately 7 pounds per 100 units.

6. Hexagon Nuts: For 1/2" rod size; galvanized steel; approximately 4 pounds per 100 units.

7. Round Steel Rod: Black steel; 1/2" dia.; approximately 67 pounds per 100 feet.

8. Offset Conduit Clamps: For supporting 2" rigid metal conduit; black steel; approximately 200 pounds per 100 units.

C. Anchors: Provide anchors of types, sizes, and materials indicated, with the following construction features:

1. Lead Expansion Anchors: 1/2", approximately 38 pounds per 100 units.

2. Toggle Bolts: Springhead; 3/16" x 4", approximately 5 pounds per 100 units.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated in the work include, but are not limited to, the following:

1. Abbeon Cal Inc.

2. Ackerman Johnson Fastening Systems, Inc.

3. Elcen Metal Products Co.

4. Ideal Industries, Inc.

5. Joslyn Mfg. and Supply Co.

6. McGraw Edison Co.

7. Rawlplug Co., Inc.

8. Star Expansion Co.

9. Expansion Bolt Co.

E. Sleeves and Seals: Provide sleeves and seals, of types, sizes, and materials indicated, with the following construction features:

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or buting passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

F. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 12-gage hot-dip galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings which mate and match U-channel.

1. Fixture hangers

2. Channel hangers

3. Thinwall conduit clamps

4. Rigid conduit clamps

5. Conduit hangers

6. U-bolts

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:

1. Greenfield Mfg. Co.; Inc.

2. Midland-Ross Corp.

3. OZ/Gedney Div.; General Signal Corp.

4. Power-Strut Div.; Van Huffel Tube Corp.

5. Unistrut Div.; GTE Products Corp.

H. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal: 3" and smaller, 20-gage; 4" to 6", 16-gage; over 6", 14-gage.

2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.

4. Plastic Pipe: Fabricate from Schedule 80 PVC plas tic pipe; remove burrs.

I. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified calking material to ensure watertight seal.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to

insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.

C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

D. All supporting devices exposed outdoors or in unconditioned spaces shall be stainless steel or rigid aluminum, including all fasteners, washers, bolts, nuts, etc. Other materials shall be prior approved.

END OF SECTION 16190

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. Extent of electrical identification work is indicated by drawings and schedules.

B. Types of electrical identification work specified in this section include the following:

1. Electrical power, control, and communication conductors.

2. Operational instructions and warnings.

3. Equipment/system identification signs.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. NEC Compliance: Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.

C. UL Compliance: Comply with applicable requirements of UL Std 969, "Marking and Labeling Systems", pertaining to electrical identification systems.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering electrical identification products which may be incorporated in the work include, but are not limited to, the following:

1. Brady, W.H. Co.

2.2 ELECTRICAL IDENTIFICATION MATERIALS

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

2.3 ENGRAVED PLASTIC-LAMINATE SIGNS

A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, white face and black core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

1. Thickness: 1/8", except as otherwise indicated.

2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.4 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. General Installation Requirements:

1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions and requirements of NEC.

2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.

3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

3.2 OPERATIONAL IDENTIFICATION AND WARNINGS

A. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and doors of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

3.3 EQUIPMENT/SYSTEM IDENTIFICATION

A. General: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/ control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), black lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:

1. Switchboard breakers, panelboards, electrical cabinets, disconnect switches and enclosures
2. Access panel/doors to electrical facilities
3. Transformers
4. Intercom system master station
5. TV/audio monitoring master station
6. Fire alarm master station
7. Each switch in main switchboard
8. Communications systems terminal cabinets; sound, CCTV, clock, telephone, etc.

B. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

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END OF SECTION 16195

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods section apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of grounding work is indicated by drawings and schedules.

B. Types of grounding specified in this section include the following:

1. Solid grounding

C. Applications of grounding work in this section including the following:

1. Underground metal water piping

2. Lighting poles

3. Grounding electrodes

4. Grounding rods

5. Enclosures

6. Equipment

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, ground rods and plate electrodes, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.

C. NEC Compliance: Comply with NEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring. Provide grounding products which are UL-listed and labeled.

D. UL Compliance: Comply with applicable requirements of UL Standards Nos. 467 and 869 pertaining to electrical grounding and bonding.

E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical grounding.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on grounding systems and and accessories.

B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, ground rods, and plate electrodes.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering grounding products which may be incorporated in the work include, but not limited to, the following:

1. Burndy Corp.

2. Crouse-Hinds Co.

3. Electrical Components Div.; Gould Inc.

4. Thomas and Betts Corp.

2.2 GROUNDING SYSTEMS

A. Materials and Components:

1. General: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for complete installation. Where more than one type unit meets indicated requirements, selection is

Installer's option. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE, and established industry standards for applications indicated.

B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.

C. Ground Rods: Copper clad, minimum 3/4" dia. x 10'. Provide longer rods if necessary for required resistivity.

D. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine areas and conditions under which electrical grounding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL GROUNDING

A. General: Install electrical grounding systems where shown, in accordance with applicable portions of NEC, with NECA's "Standard of Installation", and in accordance with recognized industry practices, to ensure that products comply with requirements and serve intended functions.

B. Coordinate with other electrical work as necessary to interface installation of electrical grounding system work with other work.

C. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

D. All ground connections to water service entrance shall be installed to be exposed and visible for inspection at all times. Insulation shall not be installed over ground connections.

E. A water pipe, by itself, is not an adequate grounding electrode and must be supplemented by dual grounding electrodes, a minimum of 8 feet apart, and

effectively bonded together. The supplemental ground shall be per Code with the "Footing type electrode" taking precedence when possible.

F. All ground connections shall be made on surfaces which have been cleaned of all paint, dirt, oil, etc., so that connections are bare metal to bare metal contact. All ground connections shall be tight and shall be made with U.L. listed grounding devices, fittings, bushings, etc.

G. Duplex receptacles of any amperage shall be grounding type and shall have a separate grounding contact. A separate jumper shall be installed between the grounding terminal on the device and the metallic box. The Contractor may provide U.L. listed self-grounding receptacles in lieu of providing the separate jumper.

H. Single and duplex receptacles shall have all grounded metal mechanically bonded together. Pressure bonding only is not acceptable.

I. Single and duplex receptacles will be installed with the grounding contacts down.

J. Hospital grade or high abuse type which will be installed with the ground contacts up.

1. Shop equipment receptacles shall be installed with the ground contacts up.

K. In all cases where flexible metallic conduit, nonmetallic rigid conduit or liquid tight flexible conduit is used, a green wire ground conductor shall be used to provide ground continuity between the equipment of device and the conduit raceway system.

L. Provide a separate green wire ground conductor for each branch circuit originating from each panelboard. This ground shall be used to ground the device or load fed, and shall be bonded to components of the raceway system, such as junction boxes, starter or disconnect switch enclosures, equipment cases, etc. The green wire ground conductor shall terminate in the panelboard at the green wire ground bus. Ground conductors for branch circuits shall be of size indicated in NEC, except minimum size ground conductor shall be No. 12 AWG.

M. Each branch feeder originating at the switchboard(s) shall have a green wire ground conductor originating at the ground bus in the switchboard and terminating at the green wire ground bus in the panelboard. This green wire ground conductor shall be of size indicated in NEC except in no instance smaller than No. 8 AWG.

N. The green wire ground conductor is in addition to the neutral conductor and in no case shall the neutral conductor serve as the grounding means.

O. Multiple conductors in a single lug not permitted. Each grounding conductor shall terminate in its own terminal lug.

END OF SECTION 16450

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. Extent of panelboard, load-center and enclosure work, including cabinets and cutout boxes is indicated by drawings and schedules.

B. Types of panelboards and enclosures in this section include the following:

1. Service-entrance panelboards
2. Power-distribution panelboards
3. Lighting and appliance panelboards

C. Refer to other Division-16 sections for cable/wire, connectors, and electrical raceway work required in conjunction with panelboards and enclosures; not work of this section. Refer to Section 16180 - Overcurrent Protective Devices for circuit breakers to be installed in panelboards.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to that required for this project.

C. NEC Compliance: Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC requirements pertaining to installation of wiring and equipment in hazardous locations.

D. UL Compliance: Comply with applicable requirements of Std No. 67 "Electric Panelboards:, and Stds No.'s 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide units which are UL-listed and labeled.

E. NEMA Compliance: Comply with NEMA Stds Pub/No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum), Pub/ No. PB 1, "Panelboards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".

F. Federal Specification Compliance: Comply with FS W-P-115, "Power Distribution Panel", pertaining to panelboards and accessories.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on panelboards. Data must include a complete panel layout indicating the circuit breakers and corresponding circuit numbers. Include ratings of each circuit breaker including short circuit capability. Indicate all options to be supplied with the panelboard. Indicate overall panelboard bus rating and main type and rating. Show complete dimensional information. Any deviation from dimensions shown on the drawings shall be specifically pointed out in the submittal. Indicate the panelboard short circuit capacity rating and specify if this is fully rated or a series rating. Series ratings shall be completely documented with test results proving series rating capabilities included in the submittal. Clearly indicate the panel name for each submittal.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):

1. Square D Company
2. General Electric Company
3. ITE/Seimens
4. Cutler Hammer

B. All circuit breakers shall be the bolt-on type.

2.2 PANELBOARDS

A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.

B. Power Distribution Panelboards: Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for copper conductors. Select unit with feeder connecting at top of panel. Equip with copper bus bars with not less than 98% conductivity, and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide bolt-on type molded-case main and branch circuit-breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated copper grounding bars suitable for bolting to enclosures. Select flush or surface mounted type enclosures, required on the drawings, fabricated by same manufacturer as panelboards, which mate properly with panelboards. Distribution panels shall be a power distribution type panel, such as Square D I-Line, GE Spectra Series, or equal.

C. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types, and arrangements shown; with anti-burn solderless pressure type lug connectors approved for copper conductors; construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, single-pole or multi-pole circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; provide bare copper uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate properly with panelboards. Loadcenters are not acceptable.,

D. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with wire gutters and without multiple knockouts. Provide fronts with adjustable trim

clamps, doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for flush recessed or surface mounting, as indicated on the drawings. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate properly with panelboards to be enclosed.

E. Panelboard Accessories: Provide panelboard accessories and devices including, but not necessarily limited to, cartridge and plug time-delay type fuses, circuit-breakers, ground-fault protection units, etc., as recommended by panelboard manufacturer for ratings and applications indicated. All panelboards shall be provided with a separate copper ground bus bar.

F. Panelboard Ratings: All branch circuit panelboards shall be fully rated or series rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Service entrance and distribution panelboards shall be fully rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Series ratings will not be acceptable for service entrance or distribution panels. When series ratings are claimed, complete manufacturers data shall be submitted for verification of the series ratings claimed.

G. Breakers for existing panelboards shall be manufactured by the existing panel manufacturer. Breakers shall have the same or higher fault current rating. Provide all required existing panelboard manufacturer supplied mounting hardware and filler plates.

1. Provide filler plates for any existing openings in any existing panelboards. All open breaker or buss spaces shall be closed with a filler plate.

2. Provide keys for handle locks on all existing panels that are not located insode and electrical or mechanical room. See drawings for identified panels.

H. Surge Suppression: Where shown on the drawings, panels shall be provided with a surge suppressor mounted external to the panelboard. Integral or internally mounted TVSS devices will not be accepted.

1. In all cases, all required UL Listings shall be maintained for both the panelboards and the surge suppressors.

2. In all cases, all warranties shall be maintained for both the panelboards and the surge suppressors.

3. In all cases, all National Electrical Code requirements shall be maintained for both the panelboards and the surge suppressors.

4. In all cases, all surge suppressors shall meet the requirements of Specification Section 16680. Entire panel submittal will be subject to rejection based upon this requirement.

5. In all cases above, the panelboards shall meet the requirements of this specification section and shall be furnished by an approved panelboard manufacturer listed in this section.

6. In all cases above, the panelboards and the surge suppression devices shall be submitted for approval as a package at the same time. One will not be approved without the other.

7. Provide a three pole, 30 amp circuit breaker to serve the surge suppressor. Utilize #10 awg conductors for phase, neutral and ground.

8. See Specification Section 16680 for more requirements.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine areas and conditions under which panelboards and enclosures are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF PANELBOARDS

A. General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standard of Installation", and in compliance with recognized industry practices, to ensure that products comply with requirements.

B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.

C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B.

D. Anchor enclosures firmly and securely to walls and structural surfaces, ensuring that they are permanently and mechanically secure and plumb.

E. Provide properly wired electrical connections within enclosures.

F. Provide typewritten circuit directory card in panel door upon completion of installation work.

G. Where panels are mounted flush in the wall, a minimum of three (3) spare 3/4" conduit shall be installed stubbed out a minimum of eight (8) inches above ceiling.

3.3 GROUNDING

A. Provide equipment grounding connections for panelboards as indicated. Tighten connections to comply with tightening torques specified in UL Stds 486A and B to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL

A. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.

B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

C. Prior to energization, check panelboards for electrical continuity of circuits for short-circuits.

D. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

E. Prior to final acceptance completely fill out the circuit directories accurately depicting the equipment connected to each circuit. Circuit directories shall be typewritten.

END OF SECTION 16470

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16510 - INTERIOR BUILDING LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. Extent of interior lighting fixture, also known as luminaire, work is indicated by drawings and schedules.

B. Types of interior lighting fixtures in this section include the following:

1. Fluorescent
2. LED
3. UV Light Fixtures – Existing fixtures shall be cleaned, re-lamped with new lamps, and relocated in new ceiling grid.

C. Applications of interior lighting fixtures required for project including the following:

1. General lighting
2. Supplementary lighting
3. Task lighting
4. Emergency lighting

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of interior lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with interior lighting fixture work similar to that required for project.

C. NEC Compliance: Comply with NEC as applicable to installation and construction of interior building lighting fixtures.

D. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. LE 1 and LE 2 pertaining to lighting equipment.

E. ANSI/IES Compliance: Comply with ANSI 132.1 pertaining to interior lighting fixtures.

F. ANSI/UL Compliance: Comply with ANSI/UL standards pertaining to interior lighting fixtures for hazardous locations.

G. UL Compliance: Provide interior lighting fixtures which have been UL-listed and labeled.

H. CBM Labels: Provide fluorescent-lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on interior building lighting fixtures, lamps and ballasts.

B. Shop Drawings: Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet. If requested by the Engineer, samples shall be submitted to determine compliance and equivalence, at no cost to the owner or architect/engineer. If requested by the Engineer, point-by-point footcandle calculations shall be submitted to determine compliance and equivalence. Criteria for calculations (max/min, reflectances, dirt depreciation, etc., shall be obtained from the Engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers/Catalog Numbers: Subject to compliance with requirements, provide fixtures manufactured by manufacturers as indicated on the fixture schedule. Catalog numbers given on the fixture schedule are intended to provide the general description of the required fixture and its quality. Additional accessories, mounting hardware, options, etc., not specifically described by the catalog number but required for a properly operating and installed fixture or as described by additional notation on the drawings or in the specifications, shall be provided.

2.2 INTERIOR LIGHTING FIXTURES

A. General: Provide lighting fixtures, of sizes, types, and ratings indicated; complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, starters and wiring.

B. Fluorescent-Lamp Ballasts: Provide energy saving high frequency electronic fluorescent-lamp ballasts, capable of operating 32 watt, octic, T-8 lamp types; with high power factor, programmed rapid-start, and low-noise features; Type 1; Class P; sound-rated A, and with internal thermal protection. All flourescent fixture ballasts shall be of the same manufacturer and type. Ballasts shall also meet the following requirements:

1. Operate lamps at 20 KHZ or higher with no detectable flicker.
2. Ballast manufacturer shall have been producing electronic ballasts in the U.S. for more than five years with a low failure rate.
3. Ballasts shall be approved and listed by UL.
4. Ballasts shall comply with all applicable state and federal efficiency standards.
5. Ballasts shall comply with FCC and NEMA limits governing electromagnetic and radio frequency interference and shall not interfere with operation of other normal electrical equipment.
6. Ballasts shall meet all applicable ANSI and IEEE standards regarding harmonic distortion and surge protection, but shall have total harmonic distortion not exceeding 20%.
7. Ballasts shall not be affected by lamp failure and shall yield normal published expected lamp life.
8. Lamp current crest factor shall not exceed 1.7.
9. Ballasts shall operate at an input frequency of 60 HZ and an input voltage of that indicated on the drawings for the fixture voltage.
10. Ballasts shall have a power factor above 0.95.
11. Ballasts shall be manufactured by Phillips, or Osram/Sylvania or approved equal.

C. Fusing all fluorescent ballasts shall be fused. Fuses may be deleted if the ballast is supplied with automatically resetting thermal overloads internal to the ballast.

D. LED Fixtures: LED fixtures shall be fully tested and certified to industry standards, and rated in accordance with LM-79. LED drivers and lamps shall be compatible and the complete fixture system of lamps, driver, and fixture components shall be fully warranted and certified.

E. Lamps: Provide lamps of the wattage and types specified on the drawings. Coordinate lamp type with ballast for a complete operational, energy saving lighting system which will operate for the expected lamp and ballast life.

1. Fluorescent lamps shall be rapid start, T-8, medium bi-pin, 32 watt, 4200°K, 85 CRI, 2,950 initial lumens, 60,000 average rated hours. Lamps shall meet current TCLP requirements. Sylvannia F032T8/841/XP/XL/ECO3 or equal by GE, Phillips or Kumbo.

2. Ballasts shall be programmed rapid start, minimum 0.71 ballast factor, less than 10% THD, greater than 0.98 PF, Sylvannia Quicktronic Prostart Model QTP-X32T8/UNV/PSX-TC or equal by GE or Advance.

3. LED lamps shall be LM-80 rated as a minimum. Color temperatures shall be as specified and shall be consistent throughout all of the fixtures. Drivers shall be compatible with the lamps and shall be provided with a warranty as a system.

F. LED Driver and/or Flourescent Ballast/Lamp Assembly Warranty: Provide a minimum five year ballast/driver guarantee, along with a five year lamp guarantee. This warranty shall be provided as an assembly with the ballast/driver and lamp manufacturer agreeing to provide the required warranty with the associated ballast/driver or lamp. The warranty starts when all phases of the project are substantially complete.

PART 3 - EXECUTION

3.1 INSTALLATION OF INTERIOR LIGHTING FIXTURES

A. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Coordinate with other electrical work as appropriate to properly interface installation of interior lighting fixtures with other work.

C. Fasten fixtures securely to building structural support; and ensure that pendant fixtures are plumb and level. Provide all required mounting hardware and steel channel to supplement structural support where necessary. Fixtures shall not be supported from ductwork, piping, conduits, ceiling grid or any other non-structural building member.

D. Coordinate fixture installation with mechanical duct work, diffusers, return grilles, communication systems devices, etc., to avoid any interferences.

3.2 ADJUST AND CLEAN

A. Clean interior lighting fixtures of dirt and debris upon completion of installation

B. Protect installed fixtures from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

B. At the time of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Architect/Engineer.

3.4 GROUNDING

A. Provide tight equipment grounding connections for each interior lighting fixture installation.

3.5 SPARE PARTS

A. Provide 12 spare T8 fluorescent lamps.

B. Provide two spare induction lamps of the type specified.

END OF SECTION 16510

SECTION 16680 SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes transient voltage surge suppressors for low-voltage (600Volts and below) power equipment

B. Related Sections include the following:

1. Division 16 Section "Wiring Devices" transient voltage surge suppressors.

2. Division 16 Section "Panelboards"

3. Division 16 Section "Switchboards"

1.3 SUBMITTALS

A. Must have ten day prior approval to submit on project.

B. Request for submittals must be in writing and attached with independent documentation of the following items.

C. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection notes, wire size and wiring diagram.

1. SPD’s with dimensions that exceed the available space to mount the device within the required maximum lead lengths will be rejected and not accepted. Verify maximum lead lengths can be met prior to bid.

D. Equipment Manual: The manufacturer shall furnish an installation manual with installation notes, start-up and operating instructions for the specified system. Installation instructions shall clearly state whether the system requires an external overcurrent device to maintain the system’s UL 1449 listing. SPD requiring external overcurrent devices are not acceptable.

E. Verification that all SPD are UL 1449 3rd Edition listed and rated with a 20kA (In) nominal discharge rating for compliance to UL96A Lightning Protection Master

Label and NFPA 780. Also provide UL 1449 3rd Edition VPR showing the following maximum VPR (clamping voltage) as follows:

1. 120Vsystem 600V (L-N)

2. 277Vsystem 1200V (L-N)

F. SPD manufacturer shall provide UL 3rd Edition documentation as part of submittal.

G. Manufacturer's Warranty Statement, showing a 10 year replacment warranty for modules or unit are damaged by transient voltages

1.4 STANDARDS

A. Underwriters Laboratories 1449 - (UL 1449 3rd edition safety standard for surge protection devices – 2009)

B. NEC article 285. National Electrical Code 2008 SPD shall be labeled with a minimum 200kAIC rating.

C. NFPA 780 Standard for the installation of lightning protection systems

D. UL96A - Lightning Protection System Master Label

E. IEEE (Institute of Electrical and Electronic Engineering Inc.) C62.41.1 and C62.41.2 – 2002, IEEE C62.45 – 2002, IEEE C62.33 & C62.35

F. All manufacturers must comply with above listed standards and any additions current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

A. Placing into Service: Do not energize or connect service entrance equipment, panel boards, control terminals, or data terminals to their sources until the surge protective devices are installed and connected.

B. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage (MCOV): Not less than 115 percent

2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).

3. Humidity: 0 to 85 percent, non-condensing.

4. Altitude: Less than 20,000 feet (6000 m) above sea level.

1.7 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

B. Coordinate surge protective devices with Division 16 Section "Panelboards" and “Switchboards”.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer shall provide a product warranty for a period of not less than ten (10) years from date of installation. Warranty shall cover unlimited replacement of SPD modules during the warranty period. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of SPD for not less than five (5) years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. PQ Protection

B. APT

C. Surge Suppression, Inc.

2.2 SERVICE ENTRANCE SUPPRESSORS

Panel Amperage	**≥3,000Amps**	**2500-1600Amps**	**1200-400Amps**
Service Entrance	400kA/Modular	300kA/modular	200kA/modular

A. Provide service entrance rated, UL Type 1 SPD's as shown and indicated on contract drawings.

B. Minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.

C. SPD's shall be a multi-stage parallel connected device.

D. SPD's UL 1449 3rd Edition VPR (clamping voltage) shall be a maximum rating of:

1. 120Vsystem 600V (L-N)

2. 277Vsystem 1200V (L-N)

E. SPD's shall mount external to the panel; internally mounted SPD's are not acceptable.

F. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.

G. SPD shall be modular design with field replaceable modules per phase and per mode.

H. SPD shall have redundant status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.

I. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.

J. SPD's relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.

K. SPD's that are limited to being connected to breaker whether or not an integral disconnect switch is supplied do not meet the intent of this specification.

L. SPD's shall have an UL "In" rating (nominal discharge) of 20kA.

M. SPD shall have dry contacts for remote monitoring via the Campus security system (Ademco panels). Coordinate the required contact type with the existing security panels.

N. Service Entrance SPD's shall have audible alarms and surge counters.

O. SPD's shall have a metal, NEMA 4 rated enclosure.

P. SPD shall be designed and equipped with integral disconnecting means.

Q. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

2.3 DISTRIBUTION, BRANCH PANEL AND/OR AUXILLARY PANELS

Panel Amperage	**1200-800A**	**600A**	**400-100A**
Distribution	200kA	200kA	200kA
Branch Panels		100kA	100kA

A. Provide UL Type 2 SPD's as shown and indicated on contract drawings. Any panel indicated to be 600 amp or larger, and any panel that is the service disconnect panel for the building shall be considered a "Distribution" type.

B. SPD's minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.

C. SPD's shall be a multi-stage parallel connected device.

D. SPD's shall mount external to the panel; internally mounted SPD's are not acceptable.

E. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.

F. SPD shall be a compact, non-modular design

G. SPD shall have per phase status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.

H. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.

I. SPD's relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.

J. SPD's shall have an UL "In" rating (nominal discharge) of 20kA.

K. SPD shall have dry contacts for remote monitoring capabilities.

L. SPD's shall have a metal, NEMA 4 rated enclosure

M. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Review all installation information in manufacturer's installation manual prior to installing SPD's.

B. Verify all voltages before connecting to avoid injury and damage to equipment.

C. The SPD's shall be installed external to switchboard, distribution and panelboard.

D. Internally mounted SPD's will not be accepted.

E. The service entrance/switchboard/switchgear SPD's shall be installed with the shortest lead length possible and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.

F. The distribution, panelboard and auxiliary SPD's shall be installed with the shortest lead length possible from the panel it is protecting and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.

G. Ground resistance shall be 5 Ohms or less.

H. Refer to manufacturer's installation manual for further installation details.

3.2 FIELD QUALITY CONTROL

A INSTALLATION

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with manufacturers' installation instruction requirements and recommendations.

B MANUFACTURERS FIELD SERVICE

1. Engage a factory authorized service representative to inspect equipment installation. Report results in writing

2. Verify that electrical wiring installation complies with manufacturer's installation requirements.

END OF SECTION 16680

DAVID L. TIPPIN WATER TREATMENT FACILITY

LABORATORY HVAC REPLACEMENT

SECTION 16721 - FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. An addressable fire alarm and smoke detection and supervisory system.

1.2 REFERENCES (FIRE ALARM SHALL COMPLY WITH THE FOLLOWING)

A. NFPA 70 - National Electrical Code, 2008

B. NFPA 72 - National Fire Alarm Code, 2007.

C. NFPA-90A – Standard for the Installation of Air Conditioning and Ventilating Systems.

D. NFPA 101 - Code for Safety to Life from Fire to Buildings and Structures, 2010 Edition – Florida Specific Edition.

E. Florida Building Code – 2010. Shall take precedence where conflicts arise.

1.3 REGULATORY REQUIREMENTS

A. System: UL listed. Provide with UL Label and listed to comply with U.L. 864, 9th edition, effective December 31, 2008.

B. Conform to requirements of NFPA 101 – Florida Specific Edition, and the Local Fire Marshall.

1.4 DESCRIPTION OF SYSTEM

A. The system shall be an addressable, microprocessor based fire alarm control system with transient protection on each circuit and walk-through test capability. The system shall have the capability to control and supervise all the addressable devices and non-addressable appliance and auxiliary control circuits. Each component of the system shall be UL listed for its use. The system shall have a Dynamic LCD display and be located in a constantly attended location while the building is occupied. LCD Display shall be located between 66” and 70” above the finished floor. The system shall be completely new.

B. Beneficial use (substantial completion) shall not be construed as complete acceptance.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience.

B. Installer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience with projects of equivalent scope of work and size and certified by the Florida State Licensing Board as fire alarm installing contractor. The actual installer shall be licensed to install fire alarm systems and shall be certified by the system manufacturer to install the system. Proof of certification and liscensure shall be provided upon request.

1.6 SUBMITTALS

A. Submit six (6) copies shop drawings and product data.

B. Provide complete point to point wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes. Indicate the location of surge protection devices.

C. Submit manufacturer's installation instructions.

D. Submit manufacturer's certificate that the system meets or exceeds specified requirements - certification per NFPA 72, as outlined by the State Fire Marshal’s Rule 69A-48. At no cost to the Owner.

E. Submit copy of Contractor's license before work begins.

F. Submit battery calculations indicating the required battery, including the specified spare capacity.

G. Submit voltage drop calculations.

1.7 PROJECT RECORD DRAWINGS

A. Contractor shall provide five (5) sets of as-built drawings to the Owner upon completion of project.

B. As-builts shall include the location of end-of-line devices, surge protection devices and exact conduit and wire routing. Numbers and types or conductors shall be indicated for each circuit.

C. As-Built drawings shall show all device locations including devices addresses, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each conduit, and circuit layouts for all

floors. Drawings shall comply with the requirements of NFPA 170. All drawings must reflect device address as verified in the presence of the engineer and/or end user.

D. A fire alarm operating matrix shall be placed on the As-Built drawings. This matrix shall show actions of initiating devices (detectors, manual initiators, water flow contacts, etc.) on one axis and output devices (speakers, strobes, bells, door releases, smoke control fans, elevator relays, etc.) on the other. Entries which require descriptions, explanation of processes, sequences, interfaces, etc. can be flagged by symbols keyed to supplementary notes. Also provide a zone-by-zone sequence of operation or a schedule identifying all initiators, outputs, and interfaces.

E. Owner shall receive two (2) CDs containing all AS-BUILT drawings in AutoCAD format (.dwg).

F. Please a hard copy print of the as-built drawings inside the door of the main fire alarm control panels.

1.8 OPERATION AND MAINTENANCE DATA

A. Provide seven (7) copies of operation and maintenance data prior at the completion of construction for all point devices, CPUs, and all other equipment.

B. Include operating instructions, and maintenance and repair procedures.

C. Provide manufacturer representative's letter stating that the system is operational.

D. Maintain system for a minimum of one (1) year, after complete acceptance by the Owner, in accordance with NFPA 72.

E. Provide, at the end of the first year after construction completion, a yearly certification as outlined by the State Fire Marshal's Rule 69A-48.

F. Provide a CD with a copy of the final programming, including any software access codes necessary for the Owner to access the required program.

G. Provide schematic floor plan drawings of the building for display in the command center per NFPA.

H. List of spare parts delivered.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Products shall be delivered to job site in manufacturers original shipping packages.

B. Provide storage and protection of products, as needed.

1.10 SPECIAL REQUIREMENTS

A. The Fire Alarm System herein specified shall be furnished by a manufacturer of Fire Alarm Systems who has been conducting business in the Tampa Bay area for at least five (5) years. A complete stock of parts for the systems furnished shall be in inventory at the facilities of the supplier. The equipment manufacturer shall have service facilities within a fifty (50) mile radius with parts in stock and trained service personnel and shall respond to a service call within twenty-four (24) hours after request during the warranty period (four (4) hours for an emergency request).

B. Installation to be performed only by Manufacturer’s authorized installer.

C. Fire alarm system, including all equipment and devices, shall be supported by the manufacturer for a minimum of ten (10) years from the date of acceptance. All replacement parts necessary to keep the system functioning and operational as designed and installed shall be available from the manufacturer during this period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fire Lite MS-9600.

B. Silent Knight IntelliKnight 5820XL.

C. Edwards EST

NOTE : Approval of manufacturer's equipment does not any way relieve the Contractor from meeting the performance criteria as outlined in the Plans and Specifications.

2.2 FIRE ALARM CONTROL PANEL (FACP)

A. The system shall be an addressable, microprocessor based fire alarm control system with transient protection on each circuit and walk-through test capability. The system shall have the capability to control and supervise all the addressable

devices and non-addressable appliance and auxiliary control circuits. Each component of the system shall be UL listed for its use. The system shall have a Dynamic LCD display in plain english language. Control panel construction shall be modular with solid state, microprocessor based electronics and shall conform to all requirements made necessary by the Fire Marshall. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions. A local audible device shall sound during alarm, trouble or supervisory conditions. This audible device shall sound differently during each condition to distinguish one (1) condition from another without having to view the panel. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly. The panel shall be complete with all required cards for the points necessary for all the devices indicated. Provide the necessary hard wired circuits for all the indicating appliance and auxiliary control devices. Provide the necessary supervised auxiliary control relays for all monitoring and control requirements. Provide a disable switch for system speakers at the Fire Alarm Control Panel. Label switch 'ALARM SILENCE SWITCH'. (If the switch is left in the disable position during normal system operation, a trouble signal shall sound at the control panel.). All equipment shall be utilized for its intended purpose and shall not be field modified. The fire alarm control panel cabinet shall not be used as a splice or junction box of any kind.

1. Provide a semi-recess mounted cabinet with a hinged, lockable front door.

2. Provide a minimum of 8 amps of power supply/battery charging current.

3. Expansion Capability & Spare Capacity: Each initiation, indicating, addressable, Remote Power Supplies/Boosters, etc.. shall each have 30% spare capacity for future expansion. The spare capacity shall be clearly depicted on shop and as-built drawings.

4. The project requires phasing of the construction. The new fire alarm control panel shall be connected to the existing panel on a temporary basis to allow for the full protection of the building. An alarm on either panel shall sound the building alarm and initiate a call via the alarm communicator to the remote monitoring station.

5. Fire alarm annunciator (FAA): The FAA shall annunciate all functions of the fire alarm system. The FAA shall identify in plain English language all alarms, troubles, and supervisory alarms. The FAA shall be capable of silencing the alarms.

6. Provide a USB connection for trouble shooting on a Microsoft Windows based computer. Provide detailed documentation on a CD ROM showing how each component of the fire alarm system has been programmed. The disc, which will be used for troubleshooting, shall be placed in a protective sleeve and secured to the inside of the each main FACP panel door.

B. The following primary controls shall be visible through a front access panel:

1. Eighty character liquid crystal display. Individual red system alarm LED.
2. Individual yellow supervisory service LED. Individual yellow trouble LED.
3. Green "power on" LED.
4. Alarm acknowledge key.
5. Supervisory acknowledge key.
6. Trouble acknowledge key.
7. Alarm silence key.
8. System reset key.
9. Printer Board.

C. The control shall provide the following:

1. Setting of time and date.
2. LED testing. Alarm, trouble, and abnormal condition listing.
3. Enabling and disabling of each monitor point separately.
4. Activation and deactivation of each control point separately.
5. Changing operator access levels.
6. Walk test enable.
7. Running diagnostic functions.
8. Displaying software revision level.
9. Displaying historical logs.
10. Displaying card status.

11. Point listing.

12. Indicating appliance silence switch.

D. For maintenance purposes, the following lists shall be available from the point lists menu.

1. All points listed by address.

2. Monitor point list.

3. Signal/speaker list.

4. Auxiliary control list.

5. Feedback point list.

6. Pseudo point list.

7. LED/switch status list.

8. One touch function to bypass Audibles/Visuals

9. One touch function to restore Audibles/Visuals

10. One touch function to bypass Elevator Recall

11. One touch function to restore Elevator Recall

12. One touch function to bypass (RESET switches) Air Handling Unit Shut Down

13. One touch function to restore Air Handling Unit Shut Down

14. One touch function to bypass any door holders.

15. One touch function to restore door holders.

16. One touch function to bypass annunciation to Security panels.

17. One touch function to restore annunciation to Security panels.

2.3 INITIATION DEVICES AND ACCESSORIES - ADDRESSABLE

A. Manual Pull Station: Semi-flush mounted, supervised, non-coded, normally open single action, addressable type manual pull station. Manual stations shall be single action and shall be constructed of impact resistant lexan with raised white lettering and a smooth high gloss finish. The station shall have a hinged front

with key lock. Stations which utilize screwdrivers, Allen wrenches, or other commonly available tools shall not be accepted. Stations shall be keyed alike with the fire alarm control panel. When the station is operated, the handle shall lock in a protruding manner to facilitate quick visual identification of the activated station.

B. Heat Detector: Easy installation, low profile with wide base to cover mounting plate and box. Detectors shall be white and shall be self-restoring operation. Detectors shall be a combination rate of rise/fixed temperature with thermostats rated at l35 degrees F, except when the plans call for a 194 or 200 degrees F rating (HT). Rate of rise setting shall be selectable at either 15 degrees F per minute or 20 degrees F per minute, factory set at 15 degrees F. The detector shall be the addressable type for use with an addressable system and shall be UL 521 listed for this purpose.

1. Heat detectors installed in hazardous environments shall be the explosion proof type.

C. Smoke Detectors: NFPA 72; photoelectric type with plug-in base, supervised visual indication of detector actuation, suitable for mounting on four inch (4") outlet box.

1. Detectors shall be listed to U.L. Standard 268 and shall be documented compatible with the control equipment to which it is connected. Detectors shall be listed for this purpose by Underwriters Laboratories, Inc. The detectors shall obtain their operating power from the fire alarm panel supervised detection loop. The operating voltage shall be 24 VDC (nominal). Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal to be generated at the control panel. Detectors shall be the addressable type for use on an addressable type system.

2. Each detector shall have a flashing status indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance. The detector may be reset by actuating the control panel reset switch.

3. To minimize nuisance alarms, voltage, EMI and RF transient suppression techniques shall be employed as-well-as a smoke verification circuit and an insect screen. The detector design shall provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). The detector head shall be easily disassembled to facilitate cleaning. Devices that blink

GREEN under normal operation and change to blinking RED in alarm condition shall be acceptable.

4. Smoke Detector Sensitivity Adjustments: Means shall be provided for adjusting the sensitivity of any or all intelligent smoke detectors in the system from the fire alarm control panel, and shall provide for sensitivity reports to be printed by the system printer for annual recording and logging of the calibration maintenance schedule. Sensitivity reports shall meet NFPA 72 calibrated test method requirements. Sensitivity range shall be within the allowed UL window. The detector shall employ automatic environmental compensation.

5. Alarm Verification: Each of the Intelligent/Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The Alarm Verification Function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system, or anytime after system turn-on. The Alarm Verification shall not require any additional hardware to be added to the Fire Alarm Control Panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

D. Duct Mounted Smoke Detectors: Duct mounted smoke detectors shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle. The detectors shall be the same as the smoke detectors described in Section 2.03, C., above. Detectors shall be 4 wire operation, addressable type for use on an addressable type system. The detectors shall be mounted in a duct housing with an integral red LED which shall pulse continuously to indicate power on and glow continuously to indicate alarm or sensor trouble condition. The detectors shall be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive materials shall be used. Detectors shall be provided with the capability of performing automatic fan shutdown either directly from the detector or via the main control panel. Devices that blink GREEN under normal operation and change to blinking RED in alarm condition shall be acceptable. Duct detectors shall be installed in strict compliance with the manufacturer's installation instructions. All tests performed to determine velocity and moisture shall be performed by the specific type instrument stated in the manufacturers' installation instructions. Contractor is advised not to place new duct detectors in the same location as the old duct detectors without first testing and confirming velocity and moisture are consistent with manufacturers' installation instructions. All test performed shall be in the presence of the Owner. The Engineer shall be provided written results for each

location and test performed. Engineer shall provide Approval and Owner shall provide Acceptance. If Contractor chooses to employ the expertise of a Mechanical Contractor, it shall be at Contractors expense.

1. Provide a remote alarm indicator with a test switch for each duct mounted smoke detector.

2. Provide a sampling tube sized for the required duct width and rated and tested for the air velocity present in the duct. Sampling Tubes shall not be field modified, cut, drilled or otherwise unless specifically recommended by the manufacturer.

3. Provide detector listed for use in the environment installed, including high humidity, un-conditioned type spaces.

4. Relays for fan shutdown shall be located within three feet of the air handler controller. Relays shall be located in an accessible location and the box labeled “shut-down relay”.

2.4 INDICATING APPLIANCES AND ACCESSORIES

A. Speakers/Horns: Where indicated on the drawings provide moisture repellent, fire retardant speaker/horn designed for smooth frequency response with minimal distortion. Speaker/Horns shall be listed and approved for use as a fire alarm indicating appliance. Speaker/Horns shall all sound the same and provide evacuation as required by applicable codes and standards. Outdoor speaker/horns shall be weatherproof, installed in a weatherproof outlet box, and listed for use as an outdoor fire alarm indicating appliance.

1. Sound Level: Not to exceed 120 dB. Adjust speaker power levels to achieve audibility acceptance by fire marshal. Where ambient levels exceed 105 dB, strobe lights shall be employed.

2. Speakers/horns located in hallways and cafeterias shall have a sound level of at least 90 dbA.

3. Where any horn, strobe or horn/strobe is exposed to the elements, a protective hood shall be installed over the device. The hood shall be painted to match the horn color.

4. All Speaker/Horn enclosures shall be white.

B. Visual Flashing Lamps (Xenon Strobe): Visual indicating appliances shall be comprised of xenon flashtube and be entirely solid state. These devices shall be UL listed and be capable of either ceiling or wall mounting. The lexan lens shall be pyramidal in shape to allow better visibility. Separate alarm indicating circuits

shall be provided for strobes. The maximum strobe pulse duration shall be 0.2 seconds with a maximum duty cycle of 40 percent. The intensity shall be selected to meet the NFPA requirements and the flash rate shall be at least 1 Hz but not to exceed 3 Hz. In all cases strobe must meet current ADA and NFPA requirements. Provide synchronized strobes where required by NFPA-72. Strobes shall be wall mounted. Ceiling mounted strobes are not acceptable. Strobe enclosures shall be white.

C. Audio/Visual Alarm Indicating Appliance: Audio/Visual units shall provide a common enclosure for the fire alarm audible and visual alarm devices. The housing shall be designed to accommodate either horns, bells, chimes, or speakers. The unit shall be complete with a tamper resistant, pyramidal shaped lexan lens with "Fire" lettering visible from a 180 degree field of view. The front panel or bezel which is constructed of cast metal maybe inverted so that the lens is below the audible device. The lamp assembly shall incorporate a built-in reflector for more efficient light propagation and a special shock-mounting arrangement to resist Bulb failure due to vibration. Lamp shall be provided with a 4 wire connection to insure properly supervised in/out system connection. Unit shall be complete with all mounting hardware including backbox. Audio/Visual unit shall be UL Listed for its intended purpose. The audible appliance and visual flashing lamps shall meet the specification indicated above in Parts A and B. Combination speaker/strobe enclosures shall be white.

2.5 MISCELLANEOUS DEVICES AND ACCESSORIES

A. Relays and Control Modules for auxiliary control: Provide auxiliary control relays or control modules for door release, hood fire suppression panel supervision, end of line supervision and other required control functions indicated on the drawings or otherwise specified. All auxiliary control circuits shall be indicated on the annunciator as a separate zone or shall be addressable so the device can be identified quickly and accurately.

B. Provide wall mounted, magnetic door holder/automatic door release devices. Door holder shall have a minimum 25 lbs. holding force. Provide variable stem length coordinated with the door requirements.

C. Monitor Module (Individual Addressable Module)

1. Addressable Monitor modules shall be provided to connect one supervised circuit of a conventional alarm or trouble initiating device (any N.O. dry contact device), such as tamper switches and water flow switches, etc., to the Fire Alarm Control Panel.

2. The Monitor Module shall mount on box specified by the manufacturer..

3. For difficult to reach areas, the Monitor Module shall be available in a miniature package and shall be no larger than 2-3/4" x 1-1/4" x 1/2".

D. Provide all required supervised control circuits for air handler shutdown. Provide a remote indicator whenever the duct mounted detector is concealed from view. Remote indicator shall be located in an accessible and readily visible location.

E. Provide for supervision of all sprinkler system water flow switches and tamper switches.

F. Provide control circuits for all required valve shutdowns including gas.

G. Isolator Modules: Provide isolator modules to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each building or protected zone of the building. If a wire-to-wire short occurs, the Isolator Module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section of the SLC loop. The Isolator Module and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.

2.6 BATTERY BACK-UP

A. The system shall be battery back-up for 24 hours plus five (5) minutes of alarm capabilities after a 24 hour standby period (per NFPA 72) with all system indicating appliances operating, including strobes, plus 30% spare capacity. Batteries shall be completely sealed, rechargeable type and maintenance free. Submit complete battery calculations indicating the spare capacity. Batteries shall be mounted in a separate enclosure where required by NFPA.

2.7 LIGHTNING PROTECTION

A. Surge protection shall be provided on all circuits that enter and exit the building,

B. Provide lightning protection on the 120 volt power circuit to the control panel main power supply and all power expander panels.

C. All lightning protection shall be manufactured and listed for use with the fire alarm system by EDCO, DiTEk or approved equal. Devices shall be terminal strip mounted and shall be mounted in a terminal cabinet separate from the control panel, as required to meet UL requirements. Cabinet shall be readily accessible and not located above the ceiling,

D. Lightning protection devices shall be UL listed. The clamping voltage shall be coordinated with the system voltage to avoid nuisance clamping. Devices found to clamp to quickly shall be replaced.

2.8 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

A. Provide required monitoring and signaling and connection of the fire alarm control panel to the Owner's off-site remote monitoring. Provide require phone line cabling back into the Owner's telecom clost or board. Connection to the actual phone lines will be by the Owner.

2.9 FIRE ALARM CABLE

A. All fire alarm conductors shall meet the requirements of the local fire marshal and the National Electrical Code and Manufacturers' Installation Instructions. All conductors shall be in conduit.

B. Surge protection shall be provided on all circuits that enter and exit the building, and shall be provided on all 120 volt electrical power circuits serving any fire alarm equipment including the FACP and any power expander panels.

PART 3 - SEQUENCE OF OPERATION

3.1 ENTIRE BUILDING

A. Building shall go into alarm if an initiation device goes into an alarm condition. All device addresses shall clearly indicate on the annunciation display. All alarm, trouble and supervisory conditions shall annunciate locations.

B. All pull stations, heat detectors, smoke detectors, and duct smoke detectors shall, when placed in an alarm mode, sound the building general alarm, flash strobe lights, shutdown AHUs, release door holders, and annunciate the address of the initiating device to the FACP.

1. Activate all programmed indicating appliance circuits until silenced.

2. Actuate all programmed strobe units until the panel is reset.

3. Annunciate the active initiating devices.

C. All pull stations, heat detectors, smoke detectors, and duct smoke detectors shall, when placed in a trouble mode, indicate the address of the device or zone of any device experiencing trouble to the FACP.

D. Duct smoke detectors shall be interlocked to shutdown their respective units on alarm. The shutdown circuit shall be supervised and controlled directly from the FACP.

E. Provide all control functions required by Florida Building Code.

PART 4 - PROGRAMMING

4.1 The system shall be fully programmed and completely operational prior to acceptance. Beneficial use shall not be construed as acceptance. Provide all necessary software access to the owner for re-programming by the owner's future vendor. Provide all required programming and re-programming for all inspections and final acceptance by the owner, engineer, and fire marshal at no additional cost to the owner. Programmable devices shall be as such they are easily programmed and installed as identical replacements for possible future bad devices. if the need for a separate programming device is necessary to accomplish, then the programming device shall be considered as part of the scope of work herein. All device nomenclature shall be submitted to the Owner for acceptance prior to programming the system.

4.2 The Manufacturer shall provide the necessary documentation and training to allow the Owner's personnel to maintain and replace addressable devices." any special programming tools required to complete such tasks shall be part of the scope of work and provided to the owner at no additional cost.

4.3 Program data shall be stored in non-volatile memory with battery back-up. Program data shall not be lost due to temporary outages, surges, dips, etc.

PART 5 - EXECUTION

5.1 INSTALLATION OF FIRE ALARM AND DETECTION SYSTEMS

A. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECAs "Standard of Installation" and NFPA-72.

B. Wiring Systems and Materials

1. Wiring shall be in accordance with requirements of the National Electrical Code and NFPA Regulation 72. The fire alarm system, including components, conduit, boxes and wiring shall be completely installed and wiring and conduit shall be properly tagged and color coded. Make final connections as shown and required by the equipment manufacturer's wiring instructions.

2. All wiring shall be new and installed in conduit.

3. Wiring shall be color coded.

Manual Stations, Smoke & Heat Detectors	Orange/Brown
Horns and Strobes	Yellow/Blue
Smoke Detector Power	Red & Black
Door Holders	White
Air Handler Shut-down Relays	Purple
Control Panel Power	Black/White

Proposed color coding shall be submitted for review prior to order and installation.

C. Wiring Class and Style

1. Signal Line Circuit (SLC): Class B

2. Initiation Device Circuit (IDC): Class B

3. Notification Appliance Circuit (NAC): Class B or Class A

4. All circuits shall be limited to 70% of their total capacity at final installation and acceptance. As-built drawings shall reflect 30% spare capacity.

D. All wire shall be terminated with crimp type open-end spade lugs using tool approved by plug manufacturer. Wire terminating at the control panel or terminal cabinets shall be identified as to circuit and use.

E. Wiring run to terminal cabinets shall terminate on barrier-type terminal strips. Provide new terminal strips where required. Wiring run within the building envelope shall not be run underground.

E. All wiring to be installed in conduit with continuous ground.

F. All junction box covers shall be painted red. All lengths of conduits shall have at least one red stripe.

G. AHU shutdown relays and equipment control relays shall be mounted within three (3) feet of controlled device. AHU shutdown relays shall be wired on a separate circuit.

H. Visual flashing lamps and speakers shall be wired on alternate circuits to provide coverage in the event of the failure of one circuit. Provide the required number of

circuits for the indicated number of alarm indicating devices. System shall be designed and installed to insure that any single indicating appliance or signal circuit annunciates only on one designated floor. Each Floor shall have a minimum of one speaker circuit and one separate strobe light circuit per floor, but provide at least the minimum shown on the drawings.

I. Provide conduit, wire and circuit breakers to connect fire alarm control panels to a dedicated circuit. The fire alarm circuit breaker shall be accessible to authorized personnel only and shall be marked FIRE ALARM CIRCUIT CONTROL. Provide handle lock for circuit breaker handle. Fire Alarm Circuit Breaker shall be RED in color and not painted.

J. Air handler shutdown shall be controlled from the main Fire Alarm Control Panel. A disconnect switch shall be provided as part of the Fire Alarm Control Panel to allow testing of the system without disruption of air conditioning service or to operate air handlers when system cannot be quickly restored to normal. When the disconnect switch is in the disconnect position, a disarrangement trouble signal shall continue to sound at the panel until the switch is restored to normal. Label switch “FAN DISCONNECT”.

K. Initiation device circuit (IDC) or Signaling Line Circuit (SLC) shall not serve more than three floors.

5.2 QUALITY ASSURANCE

A. NEC Compliance comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories.

B. UL Compliance and Labeling - Provide fire alarm and detection system components which are UL listed and labeled.

C. Misc. compliance - The fire alarm system is to be installed in accordance with the equipment manufacturer's written instructions and comply with all applicable portions of the NECAs "Standard Installation" and all local codes and ordinances.

5.3 FIELD QUALITY CONTROL

A. Inspect relays and signals for malfunctioning, and where necessary adjust units for proper operation to fulfill project requirements. Any fine adjustment shall be performed by specially trained personnel in direct employ of manufacturer of the fire alarm detection system eguipment. The Manufacturer's representative shall perform a quality inspection off the final installation and, in the presence of the Contractor, Architect/Engineer, and Owner's Representatives, shall perform a

complete functional test of the system. A system certification verifying the proper system operation shall be required prior to acceptance by the Owner.

5.4 SYSTEM GUARANTEE

A. All components, parts, and assemblies supplied by the Manufacturer shall be guaranteed against defects in materials and workmanship for a period of twelve (12) months commencing the date of substantial completion. Warranty service shall be provided by a qualified factory trained representative of the equipment manufacturer. Service response time shall be a maximum of four (4) hours before arrival to site.

B. Testing: The Contractor shall perform all electrical and mechanical tests required by the equipment manufacturer's form and National Fire Protection Association - 72. All test and report costs shall be in the contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate, one (1) copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.

2. Indication that all equipment is properly installed and functions and conforms with these specifications.

3. Test result of individual initiating devices and indicating appliances.

4. Serial numbers, locations by zone and model number for each installed detector.

5. Response time on thermostats and flame detectors (if used).

6. Technician's name, certificate number and date.

7. System will not be accepted until this certification is received.

C. Documentation: After completion of the tests and adjustments listed above, the Contractor shall submit the following information to the Owner.

1. A copy of the test report described in this specification and a Certificate of Compliance prepared as per National Fire Protection Association Standard 72, and State Fire Marshal's Rule 69A-48 to be complete at final test.

2. Affixed to FACP a standard service tag, as described in rule 69A-48 for fire alarm contractors by the Office of the State Fire Marshal.

3. All tests, including final tests and inspections shall be coordinated and held in presence of the Owners' representatives and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost to the Owner.

    a. Before final acceptance of work; the Contractor shall deliver seven (7) copies of a composite "Operating and Shop Maintenance Manual." Each manual shall contain, but not be limited to:

    b. A statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.

    c. Individual factory issued manuals containing all technical information on each piece of equipment installed. In the event that such manuals are not obtainable from the factory, it shall be the responsibility of the Contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.

    d. One (1) copy of all approved shop drawings, instruction sheets, operating instructions, and spare parts bulletins.

    e. Provide a written description of standard control panel functions and user instructions at each FACP. These instructions shall be written in standard laymen's English so that an unfamiliar operator can accomplish basic functions such as reset.

    f. Provide written certification that the installation meets industry standards, including NFPA 72, NFPA 70 and current ADA standards.

D. Warranty: All parts, equipment, systems, and labor (workmanship) shall be warranted by the Contractor for a period of five (5) years following the date of substantial completion. The warranty shall include parts, labor, prompt field service, pick-up, and delivery.

5.6 TRAINING

A. Provide training for four (4) people on the operation, maintenance, and repair of the system at the Contractor’s expense. Training shall be certified by the manufacturer and be at different times for each person. Provide written documentation on the closeout documents with the names of those who were trained, along with the dates and location of training. Provide sufficient training

for the Owner's designated staff to become factory certified for the maintenance of this system.

B. Provide general operating instructions and demonstration for Owner's staff.

5.7 FIRE MARSHAL (OR BUILDING OFFICIAL) INSPECTIONS

A. The contractor, including the fire alarm sub-contractor and associated superintendent, shall be present on site to walk the project with the fire marshal for any inspections called for or otherwise required by the fire marshal or any other jurisdiction.

END OF SECTION 16721