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 15-C-00044

Louisiana Pump Station Rehabilitation

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

AUGUST 2018

Revised 2016-08-29

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

****

BID NOTICE MEMO

****

Sealed bids will be received by the City of Tampa no later than 1:30 p.m. on September 4, 2018:

****

CONTRACT NO.: 15-C-00044; Louisiana Pump Station Rehabilitation

BID DATE: September 4, 2018 ESTIMATE: $7,300,000 SCOPE: The project comprises furnishing all labor, materials, and equipment to remove existing pumps, motors and concrete pedestals from pump No.1, No. 2 and No. 3., 24" discharge valves, piping, pump controls, vacuum priming system, compressed air system, potable water system, existing electrical equipment and demolish existing wall and structures; install three (3) 250 HP pumps and motors, discharge and suction valves, piping, 750 KW stand by generator, CIPP lining, structural coating, floor coating, concrete pedestal supports, air compressors, vacuum priming system, new crane, crane trolley and girder, automatic bar screen with compactor, install three (3) 480V variable frequency drives, pump controls, annunciator panel, motor control center, new generator, electrical switchgear, conduits, wiring, and other electrical and new HVAC/ventilation system. The work also includes furnishing all labor, materials, and equipment to install a new 24" flow meter and meter vault outside the station and temporary bypass pumping, demolish existing walls, sidewalk, parking lot, roofs and structures, install new electrical room building addition, new flat roofs and clay tile roofs, windows, doors, aluminum fence, new landscaping with all associated work required for a complete project in accordance with the Contract Documents.

PRE-BID CONFERENCE: Tuesday, August 21, 2018, 10:30 a.m., 606 W. Louisiana Ave., Tampa, FL 33603
Attendance is not mandatory, but recommended.

****

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/contract-administration/programs/construction-project-bidding. Email Questions to: contractadministration@tampagov.net .

TABLE OF CONTENTS

NOTICE TO BIDDERS
CITY OF TAMPA, FLORIDA
Contract 15-C-00044; Louisiana Pump Station Rehabilitation

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., September 04, 2018, 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, remove existing pumps, motors and concrete pedestals from pump No.1, No. 2 and No. 3., 24" discharge valves, piping, pump controls, vacuum priming system, compressed air system, potable water system, existing electrical equipment and demolish existing wall and structures; install three (3) 250 HP pumps and motors, discharge and suction valves, piping, 750 KW stand by generator, CIPP lining, structural coating, floor coating, concrete pedestal supports, air compressors, vacuum priming system, new crane, crane trolley and girder, automatic bar screen with compactor, install three (3) 480V variable frequency drives, pump controls, annunciator panel, motor control center, new generator, electrical switchgear, conduits, wiring, and other electrical and new HVAC/ventilation system. The work also includes furnishing all labor, materials, and equipment to install a new 24" flow meter and meter vault outside the station and temporary bypass pumping, demolish existing walls, sidewalk, parking lot, roofs and structures, install new electrical room building addition, new flat roofs and clay tile roofs, windows, doors, aluminum fence, new landscaping with all associated work required for a complete project in accordance with the Contract Documents.

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

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

To be eligible to submit a proposal, a Bidder must hold the required and/or appropriate current license, certificate, or registration (e.g. DBPR license/certificate of authorization, etc.) in good standing at the time of receipt of Bids. **Per Section 489.131, Florida Statutes, Proposals submitted for the construction, improvement, remodeling, or repair of public projects must be accompanied by evidence that the Bidder holds the required and/or appropriate current certificate or registration, unless the work to be performed is exempt under Section 489.103, Florida Statutes**.

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.

Pursuant to Section 2-282, City of Tampa Code, during the solicitation period, including any protest and/or appeal, NO CONTACT with City officers or employees is permitted from any bidder or proposer, other than as specifically stated in this solicitation and as follows:
Director of the Contract Administration Department (CAD)
Contracts Management Supervisor, Jim Greiner
Contract Officer, Jody Gray
City legal department

Any Requests For Information must be submitted by email to 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.

Pursuant to Section 287.087, Florida Statutes, under certain circumstances preference may be given to businesses with a drug-free workplace program that meets the requirements of said Section.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.01 GENERAL:

The proposed work is the Louisiana Pump Station Rehabilitation 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.

To be eligible to submit a proposal, a Bidder must hold the required and/or appropriate current license, certificate, or registration (e.g. DBPR license/certificate of authorization, etc.) in good standing at the time of receipt of Bids. **Per Section 489.131, Florida Statutes, Proposals submitted for the construction, improvement, remodeling, or repair of public projects must be accompanied by evidence that the Bidder holds the required and/or appropriate current certificate or registration, unless the work to be performed is exempt under Section 489.103, Florida Statutes.**

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 INSTRUCTIONS TO BIDDERS

SECTION 2 – GENERAL INSTRUCTIONS. Section I-2.07 SIGNATURE AND QUALIFICATIONS OF BIDDERS 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.
>
> 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 County where its principal place of business is. Failure to submit what is required is grounds to reject the bid of that bidder.

SECTION 2 – GENERAL INSTRUCTIONS. Section I-2.14 NONDISCRIMINATION IN EMPLOYMENT is changed to add the following to the end of the existing text:

The following provisions are hereby incorporated into any contract executed by or on behalf of the City. Contractor shall comply with the following Statement of Assurance: During the performance of the Contract, the Contractor assures the City, that the Contractor is in compliance with Title VII of the 1964 Civil Rights Act, as amended, the Florida Civil Rights Act of 1992, and the City of Tampa Code of Ordinances, Chapter 12, in that Firm/Contractor does not on the grounds of race, color, national origin, religion, sex, sexual orientation, gender identity or expression, age, disability, familial status, or marital status, discriminate in any form or manner against said Firm's/Contractor's employees or applicants for employment. Contractor understands and agrees that the Contract is conditioned upon the veracity of this Statement of Assurance, and that violation of this condition shall be considered a material breach of the Award/Contract. Furthermore, Contractor herein assures the City that said Contractor will comply with Title VI of the Civil Rights Act of 1964 when federal grant(s) is/are

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

involved. This Statement of Assurance shall be interpreted to include Vietnam-Era Veterans and Disabled Veterans within its protective range of applicability. Firm/Contractor further acknowledges and agrees to provide the City with all information and documentation that may be requested by the City from time to time regarding the solicitation, selection, treatment and payment of subcontractors, suppliers and vendors in connection with this Award/Contract. Firm/Contractor further acknowledges that it must comply with City of Tampa Code of Ordinances, Chapter 26.5, as enacted by Ordinance No. 2008-89.

I-1.05 TIME FOR COMPLETION:

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

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

I-1.06 LIQUIDATED DAMAGES:

The amount of liquidated damages, referred to in Article 4.06 of the Agreement, for completion of this project shall be $500 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.

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 the attached and incorporated Special Instructions pages beginning with page INS-1 entitled CITY OF TAMPA INSURANCE REQUIREMENTS, which among other things requires the Contractor to provide a Certificate of Insurance to the City prior to commencing work. The City may from time to time use a third party vendor to manage its insurance certificates and related documentation which vendor may periodically initiate contact, requests for information, etc. on the City's behalf.

I-1.10 EQUAL BUSINESS OPPORTUNITY PROGRAM (EBO) REQUIREMENTS / PROJECT SUBCONTRACTING GOAL(S)

BIDDERS MUST SUBMIT COMPLETED AND SIGNED CITY OF TAMPA FORMS MBD-10 AND MBD-20 WITH THEIR BIDS. BIDS SUBMITTED WITHOUT THESE COMPLETED FORMS (INCLUDING SIGNATURES) WILL BE DEEMED NON-RESPONSIVE. INSTRUCTIONS ON COMPLETING THE FORMS ARE INCLUDED AFTER EACH FORM IN THIS BID PACKAGE.

THE CHECKED BOX INDICATES SECTION THAT APPLIES TO THIS BID.

☒ **SUBCONTRACTING GOAL – (WMBE and SLBE)**

In accordance with the City of Tampa's EBO Program, Chapter 26.5, City of Tampa Code, the subcontracting goal(s) has/have been established for subcontracting with City-certified underutilized WMBEs (Women and Minority Business Enterprises) and/or SLBEs (Small Local Business Enterprises) on this project (hereinafter "Goal"). *The Goal is based, in part, upon the availability of City-certified firms to perform the anticipated scope of work* ***(Bid is subject to the subcontracting project goal(s) section for which a corresponding numerical percent is indicated).*** **Project Industry Category: Construction**

Project Goal(s):

30% U-WMBE (Underutilized Woman and Minority Business Enterprise) (EBO Program)
per MBD Form-70 the U-WMBE subcontract Classification for Construction is African American (BBE)

_____**% SLBE (Small Local Business Enterprise) (EBO Program)** *only City-certified SLBEs*

_____**% U-WMBE/SLBE Combined (EBO Program)**
per MBD Form-70 the U-WMBE subcontract Classification for Construction is African American (BBE) together with City-certified SLBEs

_____**% WMBE/SLBE ASPIRATIONAL (EBO Program)** An all-inclusive SLBE/WMBE goal; any City certified firm counts towards goal attainment.

BIDDERS MUST SOLICIT ALL COMPANIES ON THE ATTACHED AVAILABILITY CONTACT LIST at least **five (5) City business days or more prior to bid opening as a first step** to demonstrate Good Faith Efforts to achieve the Goal. Substantive documentation that demonstrates Good Faith Efforts to achieve the Goal **must be submitted with the bid**, including emails, faxes, phone calls, letters, and other communication with City-certified firms. Bidders may explore other potential opportunities for subcontracting by consulting the current directory of all certified firms posted by the City of Tampa at https://tampa.diversitysoftware.com as the Availability Contact List may not be inclusive of all firms that could count toward Goal attainment. However, ONLY SUBCONTRACTING with those specific WMBEs designated as "underutilized" by Classification in the appropriate industry category (and, if made applicable by being specifically included in the above Goal, SLBEs) will count toward meeting the Goal. Making Good Faith Efforts through these and other means (not pro-forma) is the responsibility of the Bidder. See the attached Good Faith Effort Compliance Plan (GFECP) (MBD Form-50) for specific requirements.

GOOD FAITH EFFORT COMPLIANCE PLAN (GFECP) REQUIRED (MBD FORM-50). When a Goal has been established, the Bidder **must submit** with its bid a Good Faith Effort Compliance Plan (GFECP) using the attached MBD Form-50 together with supporting documentation as specified therein. **Submittals that do not contain MBD Form-50 when a Goal has been established will be deemed non-responsive**. Additional explanation and documentation is required whenever a City-certified subcontractor's quote is not utilized. Any additional information regarding GFECP (post-bid) shall be only upon the City's request for clarification of information submitted with bid and not to "cure" omissions or deficiencies of the bid.

NOTE: When U-WMBEs are included in a Goal, only those City-certified subcontractors whose WMBE Classification is designated "underutilized" will count toward Goal attainment. Refer to **MBD Form-70** to identify underutilized WMBEs by subcontract Classification for the applicable project industry category. A prime bidder who is a City-certified WMBE and/or SLBE is not exempt from the **GFECP MBD Form-50** requirements.

☐ **SUBCONTRACTING GOAL – (DBE) FDOT DISADVANTAGED BUSINESS ENTERPRISE PROGRAM**

The City of Tampa is required to use the Florida Department of Transportation (FDOT) Disadvantaged Business Enterprise (DBE) program on contracts with Federal Highway Administration (FHWA) funds. Effective October 1, 2017 through to September 30, 2020, the overall FDOT DBE aspirational goal is **10.65%** and is *race neutral*, meaning that FDOT believes the aspirational DBE goal may be achieved entirely through ordinary, competitive procurement methods. Despite the absence of a contract specific DBE goal on this project, the City encourages bidders to seek out and use DBEs and other minority, small businesses. For assistance in identifying certified DBEs, FDOT offers the use of its supportive services program accessed via FDOT's Equal Opportunity Office at http://www.fdot.gov/equalopportunity/serviceproviders.shtm. FDOT DBE rules and regulations apply to this solicitation, including the requirement to report bidder opportunity information in the FDOT Equal Opportunity Compliance (EOC) web-based application within three (3) business days of submission of the bid for ALL subcontractors who quoted bidder for this specific project. The five (5) char/digit LAP Agreement Contract Number for this project is G_____. The web address to the EOC system is: https://fdotwp1.dot.state.fl.us/EqualOpportunityCompliance/Account.aspx/LogIn?ReturnUrl=%2fEqualOpportunityCompliance

NOTE: Regardless of FDOT DBE program applicability, for data collection purposes bidder still **must submit** City Forms MBD-10 and MBD-20 completed and signed with its bid or the bid will be deemed non-responsive.

DIVERSITY MANAGEMENT INITIATIVE (DMI) DATA REPORTING FORMS REQUIRED FOR ALL CONTRACTS

Bidder **must submit**, with its bid, completed and signed Forms MBD-10 and MBD-20 to be considered a responsive bid. Specifically, the 'Schedule of All Solicited Sub-(Contractors/Consultants/Suppliers) (Form MBD-10)' listing all subcontractors (including non-certified) solicited and 'Schedule of All -To Be Utilized Sub-(Contractors/Consultants/Suppliers) (Form MBD-20)' listing all subcontractors (including non-certified) to be utilized. Supplemental forms, such as 'Form MBD-40 Official Letter Of Intent' (LOI), can be submitted with the bid or once declared lowest-responsive bidder. After an award, 'DMI Sub-(Contractors/Consultants/Suppliers) Payment Form (Form MBD-30)' is to be submitted with payment requests to report payments to subcontractors and using the on-line automated MBD compliance software system available at https://tampa.diversitysoftware.com

For additional information about the WMBE and SLBE programs contact the Minority and Small Business Development Office at 813-274-5522. (3-18)

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 KeyRating Guide Property/Casualty.

I-1.12 PUBLIC CONSTRUCTION BOND:

The Bidder who is awarded the Contract will be required to furnish a Public Construction Bond upon the form provided herein, equal to 100 percent of the Contract price, such Bond to be issued and executed by (a) surety company(ies) acceptable to the City and licensed to underwrite contracts in the State of Florida. After execution of the Agreement and before commencing work, the Contractor must provide the City a certified copy of the officially recorded Bond.

I-1.13 AGREEMENT

SECTION 2 – POWERS OF THE CITY'S REPRESENTATIVES, new Article 2.05:
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 Article 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 Contractor 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.

SECTION 5 – SUBCONTRACTS AND ASSIGNMENTS, Article 5.01, Page A-7, last paragraph:
Change "…twenty-five (25) percent…" to "…fifty-one (51) percent…"

SECTION 8 – CONTRACTOR'S EMPLOYEES, Article 8.03, Page A-9, delete Article 8.03 in its entirety and Replace with the following new article:

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 and must not maintain, provide or permit facilities that are segregated.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

SECTION 10 – PAYMENTS, Article 10.05, Page A-10, 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…"

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.02, Page A-12, 1st Paragraph, 2nd Sentence:
Delete the 2nd Sentence in its entirety and replace it with the following new 2nd Sentence:

Without limiting application of Article 11.07, below, 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, defend, and hold harmless the City Indemnified Parties (as defined below) from any and all Claims (as defined below) 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 damages which may be incurred by reason of such infringement at any time during the prosecution or after completion of the work.

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.03, Page A-12:
Delete Article 11.03 in its entirety and replace with the following new article:

ARTICLE 11.03 INTENTIONALLY OMITTED.

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.07, Page A-12:
Delete Article 11.07 in its entirety and replace with the following new article:

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.

Contractor releases and agrees to defend, indemnify and hold harmless the City, its officers, elected and appointed officials, employees, and/or agents (collectively, "City Indemnified Parties") from and against any and all losses, liabilities, damages, penalties, settlements, judgments, charges, or costs (including without limitation attorneys' fees, professional fees, or other expenses) of every kind and character arising out of any and all claims, liens, is entitled to indemnification hereunder. This obligation shall in no way be limited in any nature whatsoever by any limitation on the amount or type of Contractor's insurance coverage.

The parties agree that to the extent the written terms of this indemnification are deemed by a court of competent jurisdiction to be in conflict with any provisions of Florida law, in particular Sections 725.06 and 725.08, Florida Statutes, the written terms of this indemnification shall be deemed by any court of competent jurisdiction to be modified in such a manner as to be in fully and complete compliance with all such laws and to contain such limiting conditions or limitations of liability, or to not contain any unenforceable or prohibited term or terms, such that this indemnification shall be enforceable in accordance with and to the maximum extent permitted by Florida law.

The obligation of Contractor under this Article is absolute and unconditional; it is not conditioned in any way on any attempt by a City Indemnified Party to collect from an insurer any amount under a liability insurance policy, and is not subject to any set-off, defense, deduction, or counterclaim that the Contactor might have against the City Indemnified Party. The duty to defend hereunder is independent and separate from the duty to indemnify, and the duty to defend exists regardless of any ultimate liability of Contractor, the City, and any City Indemnified Party. The duty to defend arises immediately upon presentation of a Claim by any party and written notice of such Claim being provided to Contractor. Contractor's defense and indemnity obligations hereunder will survive the expiration or earlier termination of this Contract.

Contractor agrees and recognizes that the City Indemnified Parties shall not be held liable or responsible for any Claims which may result from any actions or omissions of Contractor in which the City Indemnified Parties participated either through providing data or advice and/or review or concurrence of Contractor's actions. In

reviewing, approving or rejecting any submissions by Contractor or other acts of Contractor, the City in no way assumes or shares any responsibility or liability of Contractor or any tier of subcontractor/subconsultant/supplier, under this Contract.

In the event the law is construed to require a specific consideration for such indemnification, the parties agree that the sum of Ten Dollars and 00/100 ($10.00), receipt of which is hereby acknowledged, is the specific consideration for such indemnification and the providing of such indemnification is deemed to be part of the specifications with respect to the services provided by Contractor.

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.12, Page A-13:
Change Article 11.12 to add the following new language after existing text:

The City of Tampa is a public agency subject to Chapter 119, Florida Statutes. In accordance with Florida Statutes, 119.0701, Contractor agrees to comply with Florida's Public Records Law, including the following:

1. Contractor shall keep and maintain public records required by the City to perform the services under this Agreement;

2. Upon request by the City, provide the City with copies of the requested records, having redacted records in total on in part that are exempt from disclosure by law or allow the records to be inspected or copied within a reasonable time (with provision of a copy of such records to the City) 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 records, in part or in total, that are exempt or that are confidential and exempt from disclosure requirements are not disclosed except as authorized by law for the duration of the Agreement term and following completion (or earlier termination) of the Agreement if Contractor does not transfer the records to the City;

4. Upon completion (or earlier termination) of the Agreement, Contractor shall within 30 days after such event either transfer to the City, at no cost, all public records in possession of the Contractor or keep and maintain the public records in compliance with Chapter 119, Florida Statutes. If Contractor transfers all public records to the City upon completion (or earlier termination) of the Agreement, Contractor shall destroy any duplicate records that are exempt or confidential and exempt from public records disclosure requirements. If Contractor keeps and maintains public records upon completion (or earlier termination) of the Agreement, Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City in a format that is compatible with the information technology systems of the agency.

The failure of Contractor to comply with Chapter 119, Florida Statutes, and/or the provisions set forth in this Article shall be grounds for immediate unilateral termination of the Agreement by the City; the City shall also have the option to withhold compensation due Contractor until records are received as provided herein.

IF CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT 813-274-8598, JIM.GREINER@TAMPAGOV.NET, AND CONTRACT ADMINISTRATION DEPARTMENT, TAMPA MUNICIPAL OFFICE BUILDING, 4TH FLOOR, 306 E. JACKSON ST. TAMPA, FLORIDA 33602.

I-1.14 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 Contractor to perform work pursuant to the contract.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.15 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, which may be downloaded from the City's web site, at http://www.tampagov.net/contract-administration/programs/construction-project-bidding.

Bidder as part of the solicitation process (and as Contractor if Bidder is successful) may hold, come into possession of, and/or generate certain building plans, blueprints, schematic drawings, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, facility, or other structure owned or operated by the City or an agency (singularly or collectively "Exempt Plans"), which pursuant to Section 119.071(3), Florida Statutes, are exempt from Section 119.07(1), Florida Statutes and Section 24(a), Art. I of the Florida State Constitution. Contractor certifies it has read and is familiar the exemptions and obligations of Section 119.071(3), Florida Statutes; further that Contractor is and shall remain in compliance with same, including without limitation maintaining the exempt status of such Exempt Plans, for so long as any Exempt Plans are held by or otherwise in its possession.

I-1.16 PAYMENT DISPUTE RESOLUTION

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

I-1.17 SCRUTINIZED COMPANIES CERTIFICATION

Section 287.135, Florida Statutes, prohibits agencies or local governmental entities from contracting for goods or services of any amount with companies that are on the Scrutinized Companies that Boycott Israel List or are engaged in a boycott of Israel, and of $1 million or more with companies that are on either the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or are engaged in business operations in Cuba or Syria. Specifically, Section 287.135(2), Florida Statutes, states: "A company is ineligible to, and may not, bid on, submit a proposal for, or enter into or renew a contract with an agency or local governmental entity for goods or services of: (a) Any amount if, at the time of bidding on, submitting a proposal for, or entering into or renewing such contract, the company is on the Scrutinized Companies that Boycott Israel List, created pursuant to s. 215.4725, or is engaged in a boycott of Israel; or (b) One million dollars or more if, at the time of bidding on, submitting a proposal for, or entering into or renewing such contract, the company: 1. Is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to s. 215.473; or 2. Is engaged in business operations in Cuba or Syria."

Upon submitting its bid or proposal, a bidder/proposer: (i) certifies the company is not in violation of Section 287.135, Florida Statutes, and shall not be in violation at the time the company enters into or renews any resulting contract; and (ii) agrees any such resulting contract shall be deemed to contain a provision that allows the City, at its option, to terminate such contract for cause if the company is found to have submitted a false certification, been placed on one or any of the foregoing Lists, been engaged in a boycott of Israel, or been engaged in business operations in Cuba or Syria.

I-1.18 FLORIDA'S PUBLIC RECORDS LAW; DATA COLLECTION

Pursuant to Section 119.071(5)(a)2a, Florida Statutes, social security numbers shall only be collected from Bidders and/or Contractor by the City should such number be needed for identification, verification, and/or tax reporting purposes. To the extent Bidder and/or Contractor collects an individual's social security number in the course of acting on behalf of the City pursuant to the terms and conditions of its Proposal or, if awarded, the Agreement, Bidder and/or Contractor shall follow the requirements of Florida's Public Records Law.

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

Prior to commencing any work or services or taking occupancy under that certain written agreement or award (for purposes of this document, Agreement) between the City of Tampa, Florida (City) and Firm/Awardee/Contractor/Consultant/Lessee/non-City party, etc. (for purposes of this document, Firm) to which this document is attached and incorporated as an Exhibit or otherwise, and continuing during the term of said Agreement (or longer if the Agreement and/or this document so requires), Firm shall provide, pay for, and maintain insurance against claims for injuries to persons (including death) or damages to property which may arise from or in connection with the performance of the Agreement (including without limitation occupancy and/or use of certain property/premises) by Firm, its agents, representatives, employees, suppliers, subtenants, or subcontractors (which term includes sub-consultants, as applicable) of any tier subject to the terms and conditions of this document. Firm's maintenance of insurance coverage as required herein is a material element of the Agreement and the failure to maintain or renew coverage or provide evidence of same (defined to include without limitation Firm's affirmative duty to provide from time to time upon City's request certificates of insurance, complete and certified copies of Firm's insurance policies, forms, and endorsements, information on the amount of claims payments or reserves chargeable to the aggregate amount of coverage(s) whether during the term of the Agreement or after as may be requested by the City in response to an issue or potential claim arising out of or related to the Agreement to which Firm's insurance obligations hereunder may apply or possibly help mitigate) may be treated as a material breach of the Agreement. Should at any time Firm not maintain the insurance coverages required, City at its sole option (but without any obligation or waiver of its rights) may (i) terminate the Agreement or (ii) purchase such coverages as City deems necessary to protect itself (charging Firm for same) and at City's option suspending Firm's performance until such coverage is in place. If Firm does not reimburse City for such costs within 10 days after demand, in addition to any other rights, City shall also have the right to offset such costs from amounts due Firm under any agreement with the City. All provisions intended to survive or to be performed subsequent to the expiration or termination of the Agreement shall survive, including without limitation Firm's obligation to maintain or renew coverage, provide evidence of coverage and certified copies of policies, etc. upon City's request and/or in response to a potential claim, litigation, etc.

The City reserves the right from time to time to modify or waive any or all of these insurance requirements (or to reject policies) based on the specific nature of goods/services to be provided, nature of the risk, prior experience, insurer, coverage, financial condition, failure to operate legally, or other special circumstances. If Firm maintains broader coverage and/or higher limits than the minimums shown herein, the City requires and shall be entitled to such broader coverage and/or higher limits maintained by Firm. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City. No representation is made that the minimum insurance requirements are sufficient to cover Firm's interests, liabilities, or obligations. Required insurance shall not limit Firm's liability.

Firm acknowledges and agrees Firm and not the City is the party in the best position to determine applicability (e.g. "IF APPLICABLE"), confirm, and/or verify its insurance coverage. Acceptance by the City, or by any of its employees, representatives, agents, etc. of certificates or other documentation of insurance or policies pursuant to the terms of this document and the Agreement evidencing insurance coverages and limits does not constitute approval or agreement that the insurance requirements have been met or that coverages or policies are in compliance. Furthermore, receipt, acceptance, and/or approval of certificates or other documentation of insurance or policies or copies of policies by the City, or by any of its employees, representatives, agents, etc., which indicate less coverage than required does not constitute a waiver of Firm's obligation to fulfill these insurance requirements.

MINIMUM SCOPE AND LIMIT OF INSURANCE [1]

A. Commercial General Liability (CGL) Insurance on the most current Insurance Services Office (ISO) Form CG 00 01 or its equivalent on an "occurrence" basis (Modified Occurrence or Claims Made forms are not acceptable without prior written consent of the City). Coverage must be provided to cover liability contemplated by the Agreement including without limitation premises and operations, independent contractors, contractual liability, products and completed operations, property damage, bodily, personal and advertising injury, contractual liability, explosion, collapse, underground coverages, personal injury liability, death, employees-as-insureds. Products and completed operations liability coverage maintained for at least 3 years after completion of work. Limits shall not be less than $1M per occurrence and $2M general aggregate for Agreements valued at $2M or less; if valued over $2M, a general aggregate limit that equals or exceeds the Agreement's value. If a general aggregate limit applies; it shall apply separately to the project/location (ISO CG 2S 03 or 2S 04 or equivalent). **(ALWAYS APPLICABLE)**

B. Automobile Liability (AL) Insurance in accordance with Florida law, as to the ownership, maintenance, and use of all owned, non-owned, leased, or hired vehicles. AL insurance shall not be less than: (a) $500,000 combined single limit each occurrence bodily injury and property damage for Agreements valued at $100,000 or less or (b) $1M combined single limit each occurrence bodily injury and property damage for Agreements valued over $100,000. If transportation of hazardous material involved, the MCS-90 endorsement (or equivalent). **(ALWAYS APPLICABLE)**

C. Worker's Compensation (WC) & Employer's Liability Insurance for all employees engaged under the Agreement, Worker's Compensation as required by Florida law. Employer's Liability with minimum limits of (a) $500,000 bodily injury by accident and each accident, bodily injury by disease policy limit, and bodily injury by disease each employee for Agreements valued at $100,000 and under or (b) $1M bodily injury by accident and each accident, bodily injury by disease policy limit, and bodily injury by disease each for all other Agreements. **(ALWAYS APPLICABLE)**

D. Excess (Umbrella) Liability Insurance for Agreements valued at $2M or more, at least $4M per occurrence in excess of underlying limits and no more restrictive than underlying coverage for all work performed by Firm. May also compensate for a deficiency in CGL, AL, or WC. **(ALWAYS APPLICABLE)**

E. Builder's Risk Insurance for property loss exposure associated with construction/renovation/additions to buildings or structures, including materials or fixtures to be incorporated. Must be "All Risk" form with limits of no less than the project's completed value, have no coinsurance penalties, eliminate the "occupancy clause", cover Finn (together with its contractors, subcontractors of every tier, and suppliers), and name City as a Loss Payee. **(IF APPLICABLE)**

F. Installation Floater coverage for property (usually highly valued equipment or materials such as compressors, generators, etc.) during its installation. Coverage must be "All Risk" including installation and transit for no less than 100% of the installed replacement cost value. **(IF APPLICABLE)**

G. Architects & Engineers Liability/ Professional Liability (E&O)/ Contractors Professional Liability (CPrL)/ Medical Malpractice Insurance where Agreement involves Florida-regulated professional services (e.g. architect, engineer, design-builder, CM, accountant, appraiser, investment banker medical professional) at any tier, whether employed or independent, vicarious design liability exposure (e.g. construction means & methods, design supervision), value engineering, constructability assessments/reviews, BIM process, and/or performance specifications. Limits of at least $1M per occurrence and $2M aggregate; deletion of design/ build liability exclusions, as applicable, and maintained for at least 3 years after completion of work/services and City's acceptance of same. **(IF APPLICABLE)**

H. Railroad Protective Liability CRPL) Insurance for construction within 50ft of operated railroad track(s) or where affects any railroad bridge, trestle, tunnel, track(s) roadbed, or over/under pass. Subject to involved rail road's approval prior to commencement of work. **(IF APPLICABLE).**

I. Pollution and/or Asbestos Legal Liability Insurance where Agreement involves asbestos and/or environmental hazards/contamination risks (defined broadly, e.g. lead, mold, bacteria, fuel storage, underground work, cleanup (owned or non-owned sites), pollutant generation/transportation, marine/natural resource damage, contamination claim, restitution, business interruption, mold, fungus, lead-based paint, 3rd party claims/removal, etc.), with limits of at least $1M per occurrence and $2M aggregate, maintained for at least 3 years after Agreement completion. **(IF APPLICABLE)**

J. Cyber Liability Insurance where Agreement involves portals allowing access to obtain, use, or store data; managed dedicated servers; cloud hosting services; software/hardware; programming; and/or other IT services

[1] "M" indicates million(s), for example $1M is $1,000,000

Document updated and approved by Legal and Risk Management as of 08/16/2016

and products are involved. Limits of not less than $2M per occurrence and $2M aggregate. Coverage sufficiently broad to respond to duties and obligations undertaken by Firm, and shall include, but not be limited to, claims involving infringement of intellectual property/copyright, trademark, trade dress, invasion of privacy violations, damage to or destruction of electronic information, information theft, release of confidential and/or private information, alteration of electronic information, extortion, virus transmission, and network security. Coverage, as applicable and with sufficient limits to respond, for breach response costs, regulatory fines and penalties, credit monitoring expenses. **(IF APPLICABLE)**

K. Drone/UAV Liability Insurance where Agreements involves unmanned aerial vehicles/drones. Coverage to include products and completed operations, property damage, bodily injury with limits no less than $1M per occurrence, and $2M aggregate; may be provided by CGL endorsement subject to City's prior written approval. **(IF APPLICABLE)**

L. Longshore & Harbor Workers' Compensation Act/Jones Act for work being conducted near, above, or on "navigable waters" for not less than the above Employer's Liability Insurance limit. **(IF APPLICABLE)**

M. Garagekeeper/Hangerkeeper/Marina Operator Legal Liability Insurance and/or Hull/P&IInsurance where parking lot, valet, dealership, garage services, towing, etc. and/or operation of a hangar, marina, or air plane/ship repairer, providing safe berth, air/watercraft storage/docking (on land/ in water), fueling, tours, charters, ferries, dredges, tugs, mooring, towing, boat/aircraft equipment/repair/alteration/maintenance, etc.; cover- age against liability for damage to vehicles air/watercraft, their machinery in Firm's care, custody, or control both private & commercial. Limits at least equal to greater of $1M, value of max number of vehicles that may be in Firm's custody, or of most costly object in Firm's custody. (IF **APPLICABLE)**

N. Property Insurance and Interruption of Business ClOB) Insurance where premises, building, structure, or improved real property is leased, licensed, or otherwise occupied by Firm. Property Insurance against all risks of loss to any occupant/tenant improvements at full replacement cost with no coinsurance penalty, including fire, water, leak damage, and flood, as applicable, vandalism and malicious mischief endorsements. lOB by which minimum monthly rent will be paid to City for up to 1 year if premises are destroyed, rendered inaccessible or untenantable, including disruption of utilities, water, or telecommunications. **(IF APPLICABLE)**

0. Liquor Liability/Host Liquor Liability where Firm directly or indirectly provides alcoholic beverages, limits of at least $1M per occurrence and $1M aggregate. **(IF APPLICABLE)**

P. Educators Legal Liability Insurance where day care, after school program, recreational activities, etc. limits per G above. **(IF APPLICABLE)**

ADDITIONAL REQUIREMENTS

ACCEPTABILTIY OF INSURERS- Insurance is to be placed with insurers admitted in the State of Florida and who have a current A.M. Best rating of no less than **A-:VII** or, if not rated by A.M. Best, as otherwise approved by the City in advance and in writing.

ADDITONAL INSURED - **City, its elected officials, departments, officers, officials, employees, and volunteers together with, as applicable, any associated lender of the City shall be covered as additional insureds on all liability coverage** (e.g. CGL, AL, and Excess (Umbrella) Liability) as to liability arising out of work or operations performed by or on behalf of Firm including materials, parts, or equipment furnished in connection with such work or operations and automobiles owned, leased, hired, or borrowed by or on behalf of Firm. Coverage can be provided in the form of an endorsement to Firm's insurance (at least as broad as ISO Form CG 20 10 11 85 or **both** CG 10 20, CG 20 26, CG 20 33, or CG 20 38 **and** CG 20 37 if later revisions used).

CANCELLATION/NON-RENEWAL – Each insurance policy shall provide that at least 30 days written notice must be given to City of any cancellation, intent to non-renew, or material reduction in coverage (except aggregate liability limits) and at least 10 days' notice for non-payment of premium. Firm shall also have an independent duty to notify City in like manner, within 5 business days of Firm's receipt from its insurer of any notices of same. **If** any policy's aggregate limit is reduced, Firm shall directly take steps to have it reinstated. Notice and proof of renewal/continued coverage/certifications, etc. shall be sent to the City's notice (or Award contact) address as stated in the Agreement with a copy to the following:

☑ Contract Administration Department, 306 E Jackson St, Tampa, FL 33602 ☐ Purchasing Department, 306 E Jackson Street, Tampa, FL 33602

☐ Other:_____

CERTIFICATE OF INSURANCE (COI) – to be provided to City by insurance carrier prior to Firm beginning any work/services or taking occupancy and, if the insurance expires prior to completion of the work or services or Agreement term (as may be extended), a renewal COI at least 30 days before expiration to the above address(es). COIs shall specifically identify the Agreement and its subject (project, lease, etc.), shall be sufficiently comprehensive to insure City (named as additional insured) and Firm and to certify that coverage extends to subcontractors' acts or omissions, and as to permit the City to determine the required coverages are in place without the responsibility of examining individual policies. **Certificate Holder must be The City of Tampa, Florida.**

CLAIMS MADE – **If** any liability insurance is issued on a claims made form, Firm agrees to maintain such coverage uninterrupted for at least 3 years following completion and acceptance of the work either through purchase of an extended reporting provision or purchase of successive renewals. The Retroactive Date must be shown and be a date not later than the earlier of the Agreement date or the date performance/occupancy began thereunder.

DEDUCTIBLES/ SELF-INSURED RETENTIONS (SIR) – must be disclosed to City and, if over $500,000, approved by the City in advance and in writing, including at City's option being guaranteed, reduced, or eliminated (additionally if a SIR provides a financial guarantee guaranteeing payment of losses and related investigations, claim administration, and defense expenses). Firm shall be fully responsible for any deductible or SIR (without limiting the foregoing a policy with a SIR shall provide or be endorsed to provide that the SIR may be satisfied by either the City or named insured). In the event of loss which would have been covered but for a deductible or SIR, City may withhold from any payment due Firm, under any agreement with the City, an amount equal to same to cover such loss should full recovery not be obtained under the policy.

PERFORMANCE- All insurance policies shall be fully performable in Hillsborough County, Florida (the County), and construed in accordance with Florida law. Further, all insurance policies must expressly state that the insurance company will accept service of process in the County and that the exclusive venue for any action concerning any matter under those policies shall be in the appropriate state court of the County.

PRIMARY POLICIES - Firm's insurance coverage shall be primary insurance coverage at least as broad as ISO CG 20 01 04 13 as to the City, its elected officials, departments, officers, employees, and volunteers. Any insurance or self-insurance maintained by the City, its elected officials, departments, officers, employees, and volunteers shall be excess of the Firm's insurance and shall not contribute with it.

SUBCONTRACTORS/INDEPENDENT ASSOCIATES/CONSULTANTS/SUBTENANTS/SUBLICENSEE - **Firm shall require and verify that all such entities maintain insurance meeting all requirements stated herein with the City as an additional insured** by endorsement (ISO FORM CG 20 38, or broader) or otherwise include such entities within Firm's insurance policies. Upon City's request, Firm shall furnish complete and certified copies of copies of such entities' insurance policies, forms, and endorsements.

SUBCONTRACTOR DEFAULT INSURANCE CONTROLLED INSURANCE PROGRAM, WRAP-UP. Use requires express prior written consent of City Risk Manager.

UNAVAILABILTIY- To the fullest extent permitted by law, if Firm is out of business or otherwise unavailable at the time a claim is presented to City, Firm hereby assigns to the City all of its right, title and interest (but not any liabilities or obligations) under any applicable policies of insurance.

WAIVER OF SUBROGATION – With regard to any policy of insurance that would pay third party losses, Firm hereby grants City a waiver of any right to subrogation which any insurer of Firm may acquire against the City by virtue of the payment of any loss under such insurance. Firm agrees to obtain any endorsement that may be necessary to affect such waiver, but this provision shall apply to such policies regardless.

WAIVER/RELEASE AGREEMENT – Where Firm has a defined group of persons who might be exposed to harm (e.g. participants in an athletic event/program, volunteers) any waiver or release agreement used by Firm whereby such persons (and their parent/guardian as applicable) discharge Firm from claims and liabilities, shall include the City, its elected officials, departments, officers, officials, employees, and volunteers to the same extent as Firm.

Document updated and approved by Legal and Risk Management as of 08/16/2016

Louisiana Pump Station Rehabilitation
Project 15-C-00044
U-WMBE Availability Contact List
(The Underutilized WMBE Industry Category for Construction Subcontracts is BBE)

#'s	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
	Manzi Metals, Inc	352-799-8211	352-799-8244	bmanzi@manzimetals.com	15293 FLIGHT PATH DR	BROOKSVILL	FL	34604	Supply Vaves & Actuators	593245008	BBE	African American
	Manzi Metals, Inc	352-799-8211	352-799-8244	bmanzi@manzimetals.com	15293 FLIGHT PATH DR	BROOKSVILL	FL	34604	New Flow Meter	593245008	BBE	African American
	ECO 2000 INC	352-793-5060	352-793-9074	WATERWORKS@ECO2000INC.CO	1611 W C-48	BUSHNELL	FL	33513	Bypass Pump	593648996	BBE	African American
	McKenzie Contracting LLC	813-454-4429	813-454-4429	kathy@mckenziecontractingllc.co	7712 E. Broadway Ave.	Tampa	FL	33619	Bypass Pump	463561860	BBE	African American
	All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATERS AVENUE	TAMPA	FL	33604	Electrical Contractor	043689273	BBE	African American
	Brown & Brown Electric, I	954-938-8986	954-938-9272	Hermine.Brown@brownandbrow	1150 SW 30th Avenue	Pompano Be	FL	33069	Electrical Contractor	592283934	BBE	African American
	Fennell Electric, Inc.	407-466-9408	866-514-3716	fennellelectric@yahoo.com	604 Glenfield Ct	Apopka	FL	32712	Electrical Contractor	810557754	BBE	African American
	J & J Multiservices LLC	813-662-0888	813-654-7184	mjones@jnjmultiservices.net	3433 Lithia Pinecrest Rd	Valrico	FL	33596	Electrical Contractor	593744152	BBE	African American
	MDH Enterprises, Inc.	386-789-2672	866-681-5026	matize@my-es.com	281 East C Street	Orange City	FL	32763	Electrical Contractor	650849332	BBE	African American
	Manzi Metals, Inc	352-799-8211	352-799-8244	bmanzi@manzimetals.com	15293 FLIGHT PATH DR	BROOKSVILL	FL	34604	Hot Tap	593245008	BBE	African American
	Fletcher Painting, Inc.	407-290-1188	407-290-9309	fletcherjunior@cs.com	4355 Fairmont Street Suite 8	Orlando	FL	32808	Painting Contractor	593587717	BBE	African American
	Obi Global, LLC	813-400-8562		obigloballlc@gmail.com	11507 Dr. MLK Blvd	Mango	FL	33550	Painting Contractor	471881723	BBE	African American
	Pro-Fit Development, Inc.	813-514-8783	813-231-8866	Info@Pro-FitDevelopment.com	4007 N Taliaferro Ave.	Tampa	FL	33603	Roofing Contractor	432013650	BBE	African American
	Reeves Building and Plum	813-238-6197	813-238-6197	ReevesBuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Roofing Contractor	593011515	BBE	African American
	Denson Construction Inc.	863-709-1001	863-709-1071	pete@denson-construction.com	4270 HOLDEN ROAD	LAKELAND	FL	33811	Concrete	593571944	BBE	African American
	Excel 4 LLC	407-480-8976		excel4llc@yahoo.com	318 N. John Young Parkway Su	Kissimmee	FL	34741	Concrete	454149326	BBE	African American
	Exclusive Contractors, Inc.	863-559-1039	000-000-0000	roadcontractor2@YAHOO.com	277 S. 10th Ave	Bartow	FL	33830	Concrete	592345574	BBE	African American

African American/Black Business Enterprises (BBE) shall count toward the subcontract goal. Refer to MBD Form 70 - Procurement Guidelines

Louisiana Pump Station Rehabilitation
Project 15-C-00044
U-WMBE Availability Contact List
(The Underutilized WMBE Industry Category for Construction Subcontracts is BBE)

#'s	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
	Just Koolin Air Conditionin	813-444-2594	813-325-2145	Justkoolinac.adm@gmail.com	4210 E 22nd Ave	Tampa	FL	33605	Air Conditioning Contrac	455494658	BBE	African American
	Reggies Affordable Heatin	813-453-5752	941-737-7781	reggie@reggiesac.com	5614 E 29th Ave	Tampa	FL	33619	Air Conditioning Contrac	205282459	BBE	African American
	AAJ Lawn Care Services, In	813-220-8533	888-277-1860	aajlawncare@gmail.com	3716 E. Idlewild Avenue	Tampa	FL	33610	Landscaping Services	260254393	BBE	African American
	BAY LIGHT, LLC	813-972-4057	813-971-0882	baylightllc25@gmail.com	10105 N. 11TH ST.	Tampa	FL	33612	Landscaping Services	455079825	BBE	African American
	BUN Construction Co., Inc	813-931-8270	813-931-9185	bunconstruction@tampabay.rr.c	4135 E. Hillsborough Avenue	Tampa	FL	33610	Landscaping Services	593362663	BBE	African American
	Cutups Lawn Service	813-361-8871	813-238-2397	cutupslawnservice@yahoo.com	3217 East Powhatan Ave.	Tampa	FL	33610	Landscaping Services	611241291	BBE	African American
	Dean's Enviornment	863-595-8255	904-791-9060	deank8859@gmail.com	2644 Whispering Trails Dr	Winter Have	FL	33884	Landscaping Services	830461047	BBE	African American
	Promise Care LLC	813-988-8633	813-988-1555	promisecarellc@outlook.com	10711 n 53rd st	Tampa	FL	33617	Landscaping Services	464723775	BBE	African American
	T.C.C Enterprise Inc	813-606-9148	813-237-0396	tcc_inc@live.com	3902 E POWHATAN AVE	TAMPA	FL	33610	Landscaping Services	463223645	BBE	African American
	Yahweh Lawn Care & Land	727-303-5609		Yahwehlawn@gmail.com	2621 Emerson ave S.	St. Petersbu	FL	33712	Landscaping Services	472424364	BBE	African American
	Fresh Start Development,	813-758-5345	813-333-5949	freshstartdevelop@yahoo.com	601 S Falkenburg Rd	Tampa	FL	33619	Fencing	203857845	BBE	African American
	Denson Construction Inc.	863-709-1001	863-709-1071	pete@denson-construction.com	4270 HOLDEN ROAD	LAKELAND	FL	33811	Rehabilitation Pipe	593571944	BBE	African American
	Excel 4 LLC	407-480-8976		excel4llc@yahoo.com	318 N. John Young Parkway Su	Kissimmee	FL	34741	Rehabilitation Pipe	454149326	BBE	African American
	Exclusive Contractors, Inc.	863-559-1039	000-000-0000	roadcontractor2@YAHOO.com	277 S. 10th Ave	Bartow	FL	33830	Rehabilitation Pipe	592345574	BBE	African American
	Denson Construction Inc.	863-709-1001	863-709-1071	pete@denson-construction.com	4270 HOLDEN ROAD	LAKELAND	FL	33811	Rehabilitation Concrete	593571944	BBE	African American
	Excel 4 LLC	407-480-8976		excel4llc@yahoo.com	318 N. John Young Parkway Su	Kissimmee	FL	34741	Masonry	454149326	BBE	African American
	Exclusive Contractors, Inc.	863-559-1039	000-000-0000	roadcontractor2@YAHOO.com	277 S. 10th Ave	Bartow	FL	33830	Concrete (Sidewalks, Dri	592345574	BBE	African American

African American/Black Business Enterprises (BBE) shall count toward the subcontract goal. Refer to MBD Form 70 - Procurement Guidelines

Louisiana Pump Station Rehabilitation
Project 15-C-00044
U-WMBE Availability Contact List
(The Underutilized WMBE Industry Category for Construction Subcontracts is BBE)

#'s	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
	Fletcher Painting, Inc.	407-290-1188	407-290-9309	fletcherjunior@cs.com	4355 Fairmont Street Suite 8	Orlando	FL	32808	Floor Coating	593587717	BBE	African American
	Obi Global, LLC	813-400-8562		obigloballlc@gmail.com	11507 Dr. MLK Blvd	Mango	FL	33550	Floor Coating	471881723	BBE	African American
	Excel 4 LLC	407-480-8976		excel4llc@yahoo.com	318 N. John Young Parkway Su	Kissimmee	FL	34741	Demolition (Site)	454149326	BBE	African American
	Exclusive Contractors, Inc.	863-559-1039	000-000-0000	roadcontractor2@YAHOO.com	277 S. 10th Ave	Bartow	FL	33830	Demolition (Site)	592345574	BBE	African American
	E Johnson Hauling and Co	813-417-9116		johnsonhauling78@gmail.com	709 E.Lake Ave.	Tampa	FL	33603	Trucking and Hauling Se	813301557	BBE	African American
	PAR Development Partner	813-374-2856		Yancy@pardevelop.com	2109 E. Palm Ave., Suite 312	Tampa	FL	33605	Trucking and Hauling Se	205657414	BBE	African American
	Provision Trucking Compa	813-898-3632	813-898-3632	provisiontrucking@yahoo.com	20405 Berrywood Lane	Tampa	FL	33647	Trucking and Hauling Se	900922228	BBE	African American
	Renew Construction Servi	813-990-7700	813-315-6279	jrd.renew@gmail.com	5508 N 50th St N	Tampa	FL	33610	Trucking and Hauling Se	471907700	BBE	African American
	Sabrina's Trucking, LLC	813-629-7210	813-986-1124	jtrucker151@aol.com	P.O. Box 992	Mango	FL	33550	Trucking and Hauling Se	204083765	BBE	African American
	Wiggins Hauling & Transfe	813-562-3798	813-562-3798	Dooley813@aol.com	7016 Conifer Dr.	Tampa	FL	33637	Trucking and Hauling Se	205011331	BBE	African American
	Howard & Associates, Arc	813-872-8881		harry.howard@haa-architects.co	3300 Henderson Blvd. Ste 206	Tampa	FL	33609	Architectural Services	593099636	BBE	African American
	Jerel McCants Architectur	813-812-9120		jerel@jmccants.com	1726 East 7th Avenue	Tampa	FL	33605	Architectural Services	271558886	BBE	African American
	Allen Masonry & General	813-597-3289	813-436-0999	allenmasonrygc@gmail.com	2049 Waikiki Way	Tampa	FL	33619	Masonry	593752366	BBE	African American
	E/S Concrete Service, Inc.	727-821-5029	727-821-5029	enorisslysr@yahoo.com	726 E. Harbor Drive	St. Petersbu	FL	33705	Masonry	593119582	BBE	African American
	Fresh Start Development,	813-758-5345	813-333-5949	freshstartdevelop@yahoo.com	601 S Falkenburg Rd	Tampa	FL	33619	Masonry	203857845	BBE	African American
	Mason Global LLC	813-323-3648	813-323-3648	alan@masongloballlc.com	6133 Lanshire Dr	Tampa	FL	33634	Masonry	471844251	BBE	African American
	Provisions Construction &	407-985-2442	407-985-2440	marrington@provisionscdi.com	3401 Lake Breeze Drive Bldg 6	Orlando	FL	32808	Masonry	462802435	BBE	African American

African American/Black Business Enterprises (BBE) shall count toward the subcontract goal. Refer to MBD Form 70 - Procurement Guidelines

Louisiana Pump Station Rehabilitation
Project 15-C-00044
U-WMBE Availability Contact List
(The Underutilized WMBE Industry Category for Construction Subcontracts is BBE)

#'s	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
	Denson Construction Inc.	863-709-1001	863-709-1071	pete@denson-construction.com	4270 HOLDEN ROAD	LAKELAND	FL	33811	Curbing	593571944	BBE	African American
	Excel 4 LLC	407-480-8976		excel4llc@yahoo.com	318 N. John Young Parkway Su	Kissimmee	FL	34741	Curbing	454149326	BBE	African American
	Exclusive Contractors, Inc.	863-559-1039	000-000-0000	roadcontractor2@YAHOO.com	277 S. 10th Ave	Bartow	FL	33830	Curbing	592345574	BBE	African American
	Reeves Building and Plum	813-238-6197	813-238-6197	ReevesBuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Plumbing Contractor	593011515	BBE	African American
	The Generals Plumbing Co	804-539-1330		thegeneral41@gmail.com	5342 River Rock Road	Lakeland	FL	33809	Plumbing Contractor	465042951	BBE	African American
	Fletcher Painting, Inc.	407-290-1188	407-290-9309	fletcherjunior@cs.com	4355 Fairmont Street Suite 8	Orlando	FL	32808	Exterior Finishing	593587717	BBE	African American
	Obi Global, LLC	813-400-8562		obigloballlc@gmail.com	11507 Dr. MLK Blvd	Mango	FL	33550	Exterior Finishing	471881723	BBE	African American

African American/Black Business Enterprises (BBE) shall count toward the subcontract goal. Refer to MBD Form 70 - Procurement Guidelines

Instructions Regarding Use of the SLBE Goal Contact List

Bidders must solicit a subcontracting bid from ALL of the firms listed on the SLBEs list provided within the Specifications, and provide documentation of emails, faxes, phone calls, letters, or other communication with the firms as 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 contact list. The Goal and Requirements of the City's Equal Business Opportunity Program are stated in the Bid/Contract Document, Specifications.

PROPOSAL

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

Legal Name of Bidder: _____

Bidder's Fictitious Name, *if applicable*: _____

Bidder is a/an: ☐ Individual ☐ Partnership* ☐ Joint Venture* ☐ LLC ☐ Corp. ☐ Other:

Bidder is organized under the laws of: ☐ State of Florida ☐ Other:

Bidder Mailing Address: _____

Bidder's Federal Employee Identification No. (FEI/EIN): _____

Bidder's License No.:_____ Bidder's FDOS (SUNBIZ) Doc. No.: _____
(See Ch. 489. FS; use entity's, individual's only if applicable)

Bidder Contact Name**: _____ Email:_____ Phone: (_____) _____

Bidder's own initial application for employment has criminal history screening practices similar in nature to the practices contained in Chapter 12, Article VI, City of Tampa Code *(Responses, whether "Yes" or "No", are for informational purposes only and will not be used as a basis of award or denial, nor as a basis for any protest)*: ☐Yes ☐No

The below named person, appearing before the undersigned authority and after being first duly sworn, for him/herself and on behalf of the entity submitting this Proposal does hereby affirm and declare as follows:

(1) He/She is of lawful age and is authorized to act on behalf of Bidder (the individual, partnership, corporation, entity, etc. submitting this Proposal) and that all statements made in this document are true and correct to the best of my knowledge.

(2) If Bidder is operating under a fictitious name, Bidder has currently complied with any and all laws and procedures governing the operation of businesses under fictitious names in the State of Florida

(3) No person or entity other than Bidder has any interest in this Proposal or in the Contract proposed to be entered into.

(4) This Proposal is made without any understanding, agreement, or connection with any person or entity making Proposal for the same purposes, and is in all respects fair and without collusion or fraud.

(5) 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.

(6) 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.

(7) Bidder has carefully examined and fully understands the Solicitation and has full knowledge of the scope, nature, and quality of the work to be performed; furthermore, 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.

(8) Bidder (including its principals) ☐ has | ☐ has NOT been debarred or suspended from contracting with a public entity.

(9) Bidder ☐ has | ☐ has NOT implemented a drug-free workplace program that meets the requirements of Section 287.087, Florida Statutes.

(10) Bidder has carefully examined and fully understands all the component parts of the Contract Documents and agrees Bidder will execute the Contract, provide the required Public Construction Bond, and will fully perform the work in strict accordance with the terms of the Contract and Contract Documents therein referred to for the following prices, to wit:

* If a Partnership or Joint Venture, attach Partnership or Joint Venture Agreement.

** Someone the City may contact with questions/correspondence regarding this Solicitation and/or permits.

Contract Item No.	Estimated Quantity	Description and Price in Words	Computed Total Price for Item in Figures
BASE BID	LS	The work includes the furnishing of all labor, equipment, and material to remove existing pumps, motors and concrete pedestals from pump No.1, No. 2 and No. 3., 24" discharge valves, piping, pump controls, vacuum priming system, compressed air system, potable water system, existing electrical equipment and demolish existing wall and structures; install three (3) 250 HP pumps and motors, discharge and suction valves, piping, 750 KW stand by generator, CIPP lining, structural coating, floor coating, concrete pedestal supports, air compressors, vacuum priming system, new crane, crane trolley and girder, automatic bar screen with compactor, install three (3) 480V variable frequency drives, pump controls, annunciator panel, motor control center, new generator, electrical switchgear, conduits, wiring, and other electrical and new HVAC/ventilation system. The work also includes furnishing all labor, materials, and equipment to install a new 24" flow meter and meter vault outside the station and temporary bypass pumping, demolish existing walls, sidewalk, parking lot, roofs and structures, install new electrical room building addition, new flat roofs and clay tile roofs, windows, doors, aluminum fence, new landscaping, any allowances that may be listed in Section 01020, and with all associated work required for a complete project in accordance with the Contract Documents. _____ _____ dollars and _____ cents (BASE BID) LS	$_____

Computed Total Price in Words: _____

_____ dollars and _____ cents.

Computed Total Price in Figures: $_____

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 ____ #6 ____ #7 ____ #8 ____.

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

Bidder acknowledges that it is aware of Florida's Trench Safety Act (Sections 553.60-553.64, Florida Statutes), and agrees that Bidder together with any involved subcontractors will comply with all applicable trench safety standards. Bidder further acknowledges that included in the various items of this Proposal and the total bid price (as applicable) are costs for complying with the Trench Safety Act. Bidder further identifies the costs and methods summarized below:

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

Total Cost: $ _____

Accompanying this Proposal is a certified check, cashier's check or Tampa Bid Bond (form included herein must be used) for at least five percent (5%) of the total amount of the Proposal which check shall become the property of the City, or which bond shall become forthwith due and payable to the City, if this Proposal shall be accepted by the City and the Bidder shall fail to enter into a legally binding contract with and to furnish the required Public Construction Bond to the City within twenty (20) days after the date of its receipt of written Notice of Award by the City so to do.

FAILURE TO COMPLETE THE ABOVE MAY RESULT IN THE PROPOSAL BEING DECLARED NON-RESPONSIVE.

[SEAL]

Name of Bidder: _____

Authorized Signature: _____

Signer's Printed Name: _____

Signer's Title: _____

STATE OF _____

COUNTY OF _____

For an entity: The forgoing instrument was sworn (or affirmed) before me this ____ day of _____, 20____ by _____ as _____ of _____, a/n □ Partnership □ Joint Venture □ LLC □ Corp □ Other:_____, on behalf of such entity. Such individual is □ personally known to me or □ produced a/n _____ state driver's license as identification.

For an individual: The forgoing instrument was sworn (or affirmed) before me this ____ day of _____, 20____ by _____, who is □ personally known to me or □ produced a/n _____ state driver's license as identification.

[NOTARY SEAL]

_____

Notary Public, State of _____

Notary Printed Name: _____

Commission No.: _____

My Commission Expires: _____

Good Faith Effort Compliance Plan Guidelines

for Women/Minority Business Enterprise\Small Local Business Enterprise Participation
City of Tampa - Equal Business Opportunity Program
(MBD Form 50 – detailed instructions on page 2 of 2)

Contract Name_____ Bid Date _____

Bidder/Proposer_____

Signature _____ Date _____

Name _____ Title _____

The Compliance Plan with attachments is a true account of Good Faith Efforts (GFE) made to achieve the participation goals as specified for Women/Minority Business Enterprises/Small Local Business Enterprises (WMBE/SLBE) on the referenced contract:

□ The WMBE/SLBE participation Goal is Met or Exceeded. See DMI Forms 10 and 20 which accurately report all subcontractors solicited and all subcontractors to-be-utilized.

□ The WMBE/SLBE participation Goal is Not Achieved. The following list is an overview of the baseline GFE action steps already performed. Furthermore, it is understood that these GFE requirements are weighted in the compliance evaluation based on the veracity and demonstrable degree of documentation provided with the bid/proposal:

(Check applicable boxes below. Must enclose supporting documents accordingly with remarks)

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

(2) Provided interested WMBE/SLBEs with adequate, specific scope information about the plans, specifications, and requirements of the contract, including addenda, in a timely manner to assist them in responding to the requested-scope identified by bidder/proposer for the solicitation. □ See enclosed actual solicitations used. □ Qualifying Remarks:

(3) Negotiated in good faith with interested WMBE/SLBEs that have submitted bids (e.g. adjusted quantities or scale). Documentation of negotiation must include the names, addresses, and telephone numbers of WMBE/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 WMBE/SLBEs to perform the work. Additional costs involved in soliciting and using subcontractors is not a sufficient reason for a bidder/proposer's failure to meet goals or achieve participation, as long as such costs are reasonable. Bidders are not required to accept excessive quotes in order to meet the goal.
□ DMI Utilized Forms for sub-(contractor/consultant) reflect genuine negotiations □ This project is an RFQ/RFP in nature and negotiations are limited to clarifications of scope/specifications and qualifications. □ See enclosed documentation. □ Qualifying Remarks:

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

(5) Made scope(s) of work available to WMBE/SLBE subcontractors and suppliers; and, segmented portions of the work or material consistent with the available WMBE/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. □ Qualifying Remarks:

(6) Made good faith efforts, despite the ability or desire of Bidder/Proposer to perform the work of a contract with its own forces/organization. A Bidder/Proposer who desires to self-perform the work of a contract must demonstrate good faith efforts if the goal has not been met. □ Sub-Contractors were not prohibited from submitting bids/proposals and were solicited on work typically self-performed by the prime. □ Qualifying Remarks:

(7) Segmented portions of the work to be performed by WMBE/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 (quantities/scale) to facilitate WMBE/SLBE participation, even when the Bidder/Proposer 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/proposals and were solicited on work typically self-performed by the prime. □ See enclosed comments. □ Qualifying Remarks:

(8) Made efforts to assist interested WMBE/SLBEs in obtaining bonding, lines of credit, or insurance as required by the city or contractor.
□ See enclosed documentation on initiatives undertaken and methods to accomplish. □ Qualifying Remarks:

(9) Made efforts to assist interested WMBE/SLBEs in obtaining necessary equipment, supplies, materials, or related assistance or services, including participation in an acceptable mentor-protégé program. □ See enclosed documentation of initiatives and/or agreements. □ Qualifying Remarks:

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

Note: Provide any unsolicited information that will support the Bid/RFP Compliance Evaluation. □ Named Documents Are:

Participation Plan: Guidance for Complying with Good Faith Efforts Outreach

1. All firms on the WMBE/SLBE Goal Setting List must be solicited and documentation provided for email, fax, letters, phone calls, and other methods of outreach/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 MBD Office and/or researching the on-line Diversity Management Business System Directory for Tampa certified WMBE/SLBE firms.

2. Solicitation of WMBE/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 sent a minimum of a week (i.e. 5 business days or more) before the bid/proposal date. Actual copies of the bidder's solicitation containing their scope specific instructions should be provided.

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

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

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

6. Contractor Shall not preclude WMBE/SLBEs from bidding on any part of work, even if the Contractor may desire to self-perform the work.

7. Contractor Shall avoid relying solely on subcontracting out work-scope where WMBE/SLBE availability is not sufficient to attain the pre-determined subcontract goal set for the Bid or when targeted sub-consultant participation is stated within the RFP/RFQ.

8. In its solicitations, the Bidder should offer assistance to WMBE/SLBEs in obtaining bonding, insurance, et cetera, 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 WMBE/SLBEs, if needed.

10. Contractor should use the services offered by such agencies as the City of Tampa Minority and Small Business Development Office, Hillsborough County Entrepreneur Collaborative Center, Hillsborough County Economic Development Department's MBE/SBE Program and the NAACP Empowerment Center to name a few for the recruitment and placement of WMBEs/SLBEs.

Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive

Page 1 of 4 – DMI Solicited/Utilized Schedules
City of Tampa – Schedule of All Solicited Sub-(Contractors/Consultants/Suppliers)
(FORM MBD-10)

Contract No.:_____ Contract Name:_____
Company Name:_____ Address:_____
Federal ID:_____ Phone:_____ Fax:_____ Email:_____

Check applicable box(es). Detailed Instructions for completing this form are on page 2 of 4.
[ ] No Firms were contacted or solicited for this contract.
[ ] No Firms were contacted because:_____
[ ] See attached list of additional Firms solicited and all supplemental information (List must comply to this form)
Note: Form MBD-10 must list ALL subcontractors solicited including Non-minority/small businesses

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

S = SLBE W=WMBE O = Neither Federal ID	Company Name Address Phone, Fax, Email	Type of Ownership (F=Female M=Male) BF BM = African Am. HF HM = Hispanic 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 Response Received Y/N

It is hereby certified that the information provided is an accurate and true account of contacts and solicitations for sub–contracting opportunities on this contract.

Signed:_____ Name/Title:_____ Date:_____

Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive
Forms must be included with Bid / Proposal

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 to achieve participation.

- **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 and/or doing business as (dba) if applicable.
- **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 or solicited for this contract.** Checking the box indicates that a pre-determined Subcontract Goal or Participation Plan Requirement 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 (MBD Form-30) must be submitted with every pay application and invoice. 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 or solicited.
- **See attached documents.** Check box, if after you have completed the DMI Form in its entirety, you need more space to list additional firms and/or if you have supplemental information/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 either Women/Minority Business Enterprise; **"O" = Non-certified others**.
- **Federal ID.** FIN. A number assigned to a business for tax reporting purposes. This information is critical in proper identification and payment of the contractor/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 materials provided by the subcontractor. NIGP codes aka "National Institute of Governmental Purchasing" are listed at top section of document.
- **Contact Method L=letter, F=fax, E=Email, P=Phone.** Indicate with letter the method(s) 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. Must keep records: log, ledger, documentation, etc. that can validate/verify.

If additional information is required or you have questions, please contact the Equal Business Opportunity Program - Minority and Small Business Development Office at (813) 274-5522.

Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive

Page 3 of 4 – DMI Solicited/Utilized Schedules
City of Tampa – Schedule of All To-Be-Utilized Sub-(Contractors/Consultants/Suppliers)
(FORM MBD-20)

Contract No.:_____ Contract Name:_____
Company Name:_____ Address:_____
Federal ID:_____ Phone:_____ Fax:_____ Email:_____

Check applicable box(es). Detailed Instructions for completing this form are on page 4 of 4.
[ ] See attached list of additional Firms Utilized and all supplemental information (List must comply to this form)
Note: Form MBD-20 must list ALL subcontractors To-Be-Utilized including Non-minority/small businesses
[ ] No Subcontracting/consulting (of any kind) will be performed on this contract.
[ ] No Firms are listed to be utilized because:_____

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

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

S = SLBE W=WMBE O =Neither Federal ID	Company Name Address Phone, Fax, Email	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 (LOI) if available	Percent of Scope or Contract %

Total ALL 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.

Signed:_____ Name/Title:_____ Date:_____

Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive
Forms must be included with Bid / Proposal

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 (regardless of ownership or size) projected to be utilized must be included on this form. Note: Ability or desire to self-perform all work shall not exempt the prime from Good Faith Efforts to achieve participation.

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 and/or doing business as (dba) if applicable.
- **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/consulting (of any kind) will be performed on this contract.** Checking box indicates your business will not use subcontractors when no Subcontract Goal or Participation Plan Requirement was 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 (MBD Form-30) must be submitted with every pay application and invoice. Note: certified SLBE or WMBE firms bidding as Primes are not exempt from outreach and solicitation of subcontractors, including completion and submitting Form-10 and Form-20.
- **No Firms listed To-Be-Utilized.** Check box; provide brief explanation why no firms were retained when a goal or participation plan requirement was set on the contract. Note: mandatory compliance with Good Faith Effort outreach (GFECP) requirements applies (MBD Form-50) and supporting documentation must accompany the bid.
- **See attached documents.** Check box, if after completing the DMI Form in its entirety, you need more space to list additional firms and/or if you have supplemental information/documentation relating to the scope/value/percent utilization of subcontractors. Reproduce copies of MBD-20 and attach. All data not submitted on duplicate forms must be in the same format and content as specified in these instructions.

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; **"O" = Non-certified others**.
- **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. Abbreviated list of NIGP is available at http:/www.tampagov.net/mbd "Information Resources".
- **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. For CCNA only (i.e. Consultant A/E Services) you must indicate subcontracts as percent of total scope/contract.
- **Total Subcontract/Supplier Utilization.** – Provide total dollar amount of all subcontractors/suppliers projected to be used for the contract. (Dollar amounts may be optional in CCNA depending on solicitation format).
- **Total SLBE Utilization.** Provide total dollar amount for all projected SLBE subcontractors/Suppliers used for this contract. (Dollar amounts may be optional in CCNA proposals depending on the solicitation format).
- **Total WMBE Utilization.** Provide total dollar amount for all projected WMBE subcontractors/Suppliers used for this contract. (Dollar amounts may be optional in CCNA proposals depending on the solicitation format).
- **Percent SLBE Utilization.** Total amount allocated to SLBEs divided by the total bid/proposal amount.
- **Percent WMBE Utilization.** Total amount allocated to WMBEs divided by the total bid/proposal amount.

If additional information is required or you have questions, please contact the Equal Business Opportunity Program - Minority and Small Business Development Office at (813) 274-5522.

TAMPA BID BOND
Contract 15-C-00044; Louisiana Pump Station Rehabilitation

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 15-C-00044, Louisiana Pump Station Rehabilitation.

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 _____, 20___.

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 15-C-00044 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, between the City of Tampa, Florida, hereinafter called the City, and _____ hereinafter called the Contractor, as of the _____ day of _____, 20___ when the City Council of the City of Tampa, Florida adopted a Resolution authorizing, among other things, the Mayor's execution of this Agreement.

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 15-C-00044; Louisiana Pump Station Rehabilitation, shall include, but not be limited to, remove existing pumps, motors and concrete pedestals from pump No.1, No. 2 and No. 3., 24" discharge valves, piping, pump controls, vacuum priming system, compressed air system, potable water system, existing electrical equipment and demolish existing wall and structures; install three (3) 250 HP pumps and motors, discharge and suction valves, piping, 750 KW stand by generator, CIPP lining, structural coating, floor coating, concrete pedestal supports, air compressors, vacuum priming system, new crane, crane trolley and girder, automatic bar screen with compactor, install three (3) 480V variable frequency drives, pump controls, annunciator panel, motor control center, new generator, electrical switchgear, conduits, wiring, and other electrical and new HVAC/ventilation system. The work also includes furnishing all labor, materials, and equipment to install a new 24" flow meter and meter vault outside the station and temporary bypass pumping, demolish existing walls, sidewalk, parking lot, roofs and structures, install new electrical room building addition, new flat roofs and clay tile roofs, windows, doors, aluminum fence, new landscaping with all associated work required for a complete project in accordance with the Contract Documents.

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

TAMPA AGREEMENT

SECTION 1
GENERAL

ARTICLE 1.01 THE CONTRACT

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

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

ARTICLE 1.02 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 2
POWERS OF THE CITY'S REPRESENTATIVES

ARTICLE 2.01 THE ENGINEER

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

(a)To monitor the performance of the work.

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

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

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

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

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

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

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

ARTICLE 2.02 DIRECTOR

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

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

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

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

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

ARTICLE 2.03 NO ESTOPPEL

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

ARTICLE 2.04 NO WAIVER OF RIGHTS

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

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

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

SECTION 3
PERFORMANCE OF WORK

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 3.05 PRESERVATION OF PROPERTY

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

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

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

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

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

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

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

SECTION 4
TIME PROVISIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 5
SUBCONTRACTS AND ASSIGNMENTS

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

Before making any subcontract, the Contractor must submit a

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

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

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

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

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

SECTION 6
SECURITY AND GUARANTY

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

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

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

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

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

SECTION 7
CHANGES

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

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

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

ARTICLE 7.02 EXTRA WORK

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

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

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

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

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

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

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

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

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

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

ARTICLE 7.03 DISPUTED WORK

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

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

ARTICLE 7.04 OMITTED WORK

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

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

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

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

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

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

SECTION 8
CONTRACTOR'S EMPLOYEES

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

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

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

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

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

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

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

SECTION 9
CONTRACTOR'S DEFAULT

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

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

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

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

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

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

SECTION 10
PAYMENTS

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

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

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

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

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

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

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

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

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

FOR CONTRACT AMOUNTS OVER $250,000

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

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

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

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

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

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

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

ARTICLE 10.06 FINAL PAYMENT

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

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

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

ARTICLE 10.07 ACCEPTANCE OF FINAL PAYMENT

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

SECTION 11
MISCELLANEOUS PROVISIONS

ARTICLE 11.01 CONTRACTOR'S WARRANTIES

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

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

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

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

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

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

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

ARTICLE 11.02 PATENTED DEVICES, MATERIAL AND PROCESSES

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

ARTICLE 11.03 SUITS AT LAW

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

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

ARTICLE 11.04 CLAIMS FOR DAMAGES

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

ARTICLE 11.05 NO CLAIMS AGAINST INDIVIDUALS

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

ARTICLE 11.06 LIABILITY UNAFFECTED

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

ARTICLE 11.07 INDEMNIFICATION PROVISIONS

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

ARTICLE 11.08 UNLAWFUL PROVISIONS DEEMED STRICKEN

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

ARTICLE 11.09 LEGAL PROVISIONS DEEMED INCLUDED

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

ARTICLE 11.10 DEATH OR INCOMPETENCY OF CONTRACTOR

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

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

ARTICLE 11.11 NUMBER AND GENDER OF WORDS

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

ARTICLE 11.12 ACCESS TO RECORDS

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

SECTION 12
LABOR STANDARDS

ARTICLE 12.01 LABOR STANDARDS

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

ARTICLE 12.02 NOTICE TO LABOR UNIONS

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

ARTICLE 12.03 SAFETY AND HEALTH REGULATIONS

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

ARTICLE 12.04 EEO AFFIRMATIVE ACTION REQUIREMENTS

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

ARTICLE 12.05 PREVAILING RATES OF WAGES

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

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

* * * * * * *

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

CITY OF TAMPA, FLORIDA

_____
Bob Buckhorn, Mayor
(SEAL)

ATTEST:

_____
City Clerk

Approved as to Form:
The execution of this document was authorized
by Resolution No. _____

_____
Rachel S. Peterkin, Assistant City Attorney

Contractor

By:_____
(SEAL)

Title:

ATTEST:

_____
Witness

STATE OF)
) SS:
COUNTY OF)

For a Corporation:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ___ of _____, 20___ 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 _____, 20___ 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 _____, 20___ 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

_____
(Name of Surety)

_____
(Surety Address)

By _____
(As Attorney in Fact)*

_____
Telephone Number of Surety

Approved as to legal sufficiency:

By _____
Assistant City Attorney

Countersignature:

_____
(Name of Local Agency)

_____
(Address of Resident Agent)

By _____

Title _____

_____
Telephone Number of Local Agency

*(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.

* * * * * * *

SPECIFIC PROVISIONS

SP-1 Scope

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

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

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

SP-2 Permits

The City will obtain the Florida Department of Environmental Protection (FDEP) Permit for Constructing a Domestic Wastewater Collection/Transmission System, currently administered by Hillsborough County Environmental Protection Commission (EPC).

The Contractor shall obtain all permits required to comply with SP-4 Maintenance of Traffic, contained herein. The Contractor may also be required to Permit for disposal of debris and sludge removed during the wet well cleaning operations.

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

City/County building permit fees will be paid by the City. Right-of-way and maintenance of traffic permit fees shall be paid by the Contractor.

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

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

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

SP-3 Wastewater Facilities

Wastewater facilities protection and replacement work not specifically shown or described 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 in accordance with these specifications and in accordance with the City of Tampa Wastewater Standards, as though it were specifically delineated or described. The cost of this work shall be included in the cost of the pay item to which it is incidental, and no additional payment will be made therefor. This work may include, but is not limited to the removal and restoration of manhole frame, covers and/or top slabs and repair of manhole chimneys and gravity sanitary sewers for installation of bypass pumping equipment.

SP-4 Maintenance of Traffic

The Contractor shall arrange his work so that there will be as little disruption of traffic as possible.

At least seventy-two hours before starting any work in City streets, the Contractor shall obtain a City of Tampa Street Closure Permit for any traffic lane or street closure within the City. The permit will establish the requirements for closures related to the number of lanes and time of day lanes or streets may be closed. If the Contractor proposes a complete street closure, a detailed traffic maintenance plan shall be submitted to the City of Tampa Traffic Engineering Division together with the application for the Street Closure Permit. The traffic maintenance plan shall include proposed detour routes and locations and descriptions of direction signs for the construction area and detour routes. Two approved copies of all Street Closure Permits shall be submitted to the Engineer before starting any work in City streets. No changes to approved Street Closure Permits will be permitted without prior approval by the City.

The Contractor shall furnish and maintain all necessary signs, barricades, lights and flagmen necessary to control traffic and provide for safety to the public, all in compliance with the Florida Department of Transportation "Manual on Traffic Controls and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations," with subsequent revisions and additions, and to the satisfaction of the Engineer.

The cost of maintaining traffic and of any additional earth excavation, selected fill, temporary wearing surface, temporary bridges, barricades, warning lights, flagmen, and like work required therefor shall be included in the total Lump Sum Price, as applicable, and no additional payment with be made therefor.

SP-5 Working Drawings

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

SP-6 Environmental Protection

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

SP-7 Use of Explosives

Explosives shall not be used on the work.

SP-8 Construction Start

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

SP-9 Coordination and Cooperation

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

SP-10 Construction Easements

In the event that, in the opinion of the Contractor, obtaining a temporary easement for storage of materials is necessary or desirable, it shall be the sole responsibility of the Contractor to obtain such easements from the Owner of the property. If such easements are obtained by the Contractor, they shall contain provisions to hold the City harmless from any operations of the Contractor within the easement limits. The Contractor shall not conduct construction operations on private property outside the limits of any easement obtained by the City or of any City-owned property or right-of-ways unless a copy of the temporary construction easement agreement is filed with the Engineer.

SP-11 Releasing Facilities for Use

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

SP-12 Material and Equipment Approval

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

The Contractor shall coordinate the procurement process with construction sequence and construction operations to minimize the duration of bypass pumping.

SP-13 Working Hours

Normal working hours for this project will be from 7:00am to 4:00pm, Monday thru Friday. If certain phases of the project require work outside of the normal hours, a minimum of 7-days notice must be provided to allow scheduling of City inspectors.

SP-14 Contractor Emergency Response Time

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

During the initial setup and operation of the bypass pumping, the Contractor shall have personnel on site 24 hours a day as described in the subsection headed “Bypass Pumping”.

SP-15 Contractor's Field Office

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

SP-16 Salvage

All existing pipe, appurtenances and equipment removed by the Contractor and which are not designated to be salvaged shall become the property of the Contractor and shall be removed from the site of the work to the Contractor's own place of disposal. The City reserves the right to salvage additional items than listed below at no additional cost to the City.

Items which are shown on the Plans, specified or directed to be salvaged shall be removed by the Contractor, delivered, and unloaded at the City of Tampa’s Howard F. Curren AWTP, located at 2708 Maritime Blvd or a location within the Department’s service area, as directed by the Engineer. The cost of removing, disposing, delivering, and unloading as salvage items of pipe and appurtenances shall be included in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

The Contractor shall carefully remove or dissemble the following items which are intended to be salvaged for this project:

- Since Louisiana PS is a hub site for our DCR system, the Moscad PLC and radio equipment will need to remain in operation during all phases of the project
- VFDs for pumps #1, #2, and #3 Pump
- Automatic Transfer Switch
- Old motor starters

SP-17 Sequence of Operations

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

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

SP-18 Dewatering

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SP-20 Existing Wastewater Flows

In order to prepare the pumping station during rehabilitation work as shown and specified, the Contractor shall provide bypass pumping for as long as the pumping station is out of service during construction. The following flow data was obtained from the City of Tampa Wastewater Department and is believed to be reasonably accurate, but not guaranteed to be absolutely so, and is presented only as an approximation:

Low Dry Weather Flow –	4,200 GPM; 6 MGD
Average Dry Weather Flow –	7,000 GPM; 10 MGD
Peak Dry Weather Flow –	10,500 GPM; 15 MGD
Peak Wet Weather Flow –	24,300 GPM; 35 MGD

SP-21 Bypass Pumping

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

- Site plan showing location and arrangement of pumps and piping, including pipe sizes, fittings, valves, and connections
- Pump operation strategy and projected flow rates
- Pump curves for each size pump
- Details and sequencing of all pipe plug installations
- Temporary electrical service, pump controls, motor starters/ VFDs etc.

Bypass pumping system shall be capable of providing a minimum peak flow rate of 35 MGD (24,300 GPM). The estimated pipeline pressure at the phase 1 bypass point of connection, as shown on the plans, under the peak flow rate is 20 PSI at an Elevation of 12 feet.

Pump suction pipes shall be installed in the manholes, junction chambers and siphon outlet structures for the various size pipes shown on the plans. Inflatable plugs shall be placed to block the flow during construction. Suction pipes shall be arranged to avoid suction vortices in the structures. External mechanism, such as anti-vortex plates shall be provided if necessary.

The bypass pumping system layout shall be arranged such that continuous access to the pumping station is available to facilitate the successful completion of work included in this project. The bypass arrangement and plug installations may need to be modified throughout the project to rehabilitate the pipes and structures in this project.

Partial backup of wastewater in the 48-inch influent interceptor sewer is acceptable. The maximum elevation to which the wastewater shall be allowed to rise is Elevation -4.00 feet, which is equivalent to approximately 12 inches above the crown of the influent 48-inch interceptor. Backup of wastewater beyond this elevation can result in upstream overflows. The Contractor shall assume responsibility for fines and cleanup cost of upstream overflows due to insufficient or defective bypass pumping operation or untimely responses to high water alarms.

The bypass shall be watertight. Individual suction pipes for each bypass pump shall be required, and shall access the junction chambers, manholes or siphon outlet chambers through the manhole openings or the siphon outlet chamber's removable concrete slabs. Manhole frames and tops and the siphon outlet chamber's concrete removable concrete slabs can be removed in coordination with the City. Special consideration shall be given to not damaging the T-Lock lining or protective coating of the manhole chimneys. All structure modifications or any damage to the existing structure's protective lining or coating shall be restored to pre-construction condition as approved by the City. Removal of structure tops and manhole chimney is permitted. Manifold suction arrangements will not be considered acceptable. As a minimum, the bypass discharge pipe shall have an air release valve at the highest point.

The bypass pumping system shall as a minimum consist of the pumps, the pump drives, suction and discharge piping, level sensing equipment, and pump controls to automatically start, stop and control speed of pumps, as necessary, to bypass at a rate equal to the incoming flow. Controls and/or pump drive systems will be required for both electric and diesel pumps so that the pump speed is automatically adjusted to match the incoming flow. The pumps shall be designed to handle the flow rates shown in the subsection heading "Existing Wastewater Flows". Each pump shall be equipped with a check valve on the discharge to prevent backflow through the pumps.

Temporary covers shall be installed to seal the annular spaces between the suction pipes and the openings in the manholes or structures to prevent the gas from escaping during bypass pumping operations.

Bypass pumping system shall be continuously monitored (24-hrs/day) by the bypass contractor/supplier for the first 48 hours of operation. Once the 48 hour performance test is successful, the system can be placed into unmanned service. During unmanned operation the Contractor shall be available on a 24-hour/7-day/week basis to respond within 1 hour to problems and to make any necessary adjustments and/or repairs needed to maintain continuous operation of the bypass system. The Contractor shall be solely responsible for maintaining the bypass system during the bypass operation. Personnel responding to auto-dialer notifications must be extremely knowledgeable with the bypass system and capable of troubleshooting any problems in a timely manner.

Bypass system will have a monitoring/alarm system equipped with an auto-dialer that automatically contacts the contractor if one of the primary pumps fail or high water level occurs. The auto-dialer shall be powered at all times using a battery back-up system or equivalent. The battery system shall be connected to a charger attached to the temporary electric utility service.

Contractor shall provide a perimeter fence around the bypass equipment, with a padlock so that unauthorized persons cannot operate the equipment. Multiple fences or locked panel may be required, dependent on the individual set up of the bypass pumping layout.

Contractor shall design and size the bypass system and shall guarantee that the system meets the peak flow requirements. Prior to performing any work that will prevent the pumping station from being placed back into service, the minimum flow rates of the bypass system must be confirmed and a performance test of the system must be completed to ensure that the system will provide uninterrupted service under all conditions.

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

The bypass pumping shall continue in service until the pump station rehabilitation is complete and the wastewater pumps are back in service. The bypass pumping system shall not be removed until the contractor demonstrates that the rehabilitated pumping station has successfully completed the testing phase of this project.

Pumping equipment shall be of a type suitable for pumping raw unscreened wastewater over an indefinite period without clogging or requiring shutdown for routine maintenance. Bypass pumping shall be continuous during the entire length of time each portion of the work is being accomplished. The pumps shall be electrical driven pumps on VFDs. The Contractor shall be responsible for obtaining and removing a temporary power drop and meter from TECO and all associated cost with the installation. The contractor shall also be responsible for costs required to supply and maintain power needed to continuously operate the bypass system

Option for diesel powered pumps with automatic speed controllers may be considered, provided that the Contractor has onsite fuel tanks that are monitored daily. Large capacity pumps for managing peak flows can be diesel driven.

The bypass pumping system shall include back-up pumps. The back-up pumps shall be completely installed and shall automatically be placed into operation in the event one of the primary pumps fail. Back-up pumps shall be no smaller than the largest primary pumps they are replacing. The number of back-up pumps shall conform to the following chart.

Primary Bypass Pumps	Required Back-up Pumps
1-2	1
3-4	2
5-6	3
7-8	4
9-10	5

For example, if the primary system has (1) 8" pump and (1) 10" pump then the required back-up pump provided shall be (1) 10" pump. Second example, if primary bypass system has (2) 8" pumps and (1) 10" pump, then the required back-up pumps provided shall be (1) 8" pump and (1) 10" pumps. Last example, if primary bypass system has (2) 8" pumps and (3) 10" pump, then the required back-up pumps provided shall be (3) 10" pumps.

Sufficient back-up generators shall be used so that all primary pumps and all back-up pumps remain available for operation in the event of a power loss. Diesel pumps with variable speed controllers may be used as back-up pumps for electrical driven pumps on VFD(s) as long as a back-up generator is provided to supply power to the electrical pumps. The generator shall be of sufficient size so that all required electrical pumps remain available during a power outage.

The costs of bypass pumping shall be included in the total Lump Sum Price. There is no separate contract item for bypass pumping and no extra payment shall be made.

SP-22 Pump Station Wet Well

During bypass operations, the Contractor shall dewater and subsequently clean the wet well prior to initiating any modifications noted in the contract drawings.

The Contractor shall remove all debris and sludge located in the wet well and shall dispose of it in an acceptable manner. The debris and sludge removed shall be sole in accordance with SP-53 included herein. Since this pumping station wet well was cleaned in October 2017, there is expected to be less than 10 CY of debris within the wet well that needs to be removed.

SP-23 Project Sign

The Contractor shall furnish two project signs as shown on the detail included herein, and install them in the construction area as directed by the Engineer at least five (5) days prior to commencing work at the site.

The cost of fabrication, erection, maintenance, removal, and proper disposal of the project sign at the completion of the project, including all labor and materials shall be deemed included in the prices bid for the various Contract Items of this Contract, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

No extra payment will be made for obliterating of certain names and offices and replacement thereof with others because of administrative changes during the course of the Contract.

SP-24 Construction Operations

In City streets, excavated materials shall, where practicable, be deposited upon streets, sidewalks, driveways, or other paved surfaces within the street right-of-way, except that interruptions to the use of driveways shall be kept to a minimum. The Contractor shall clean up areas from which soil has been removed at the end of each day by sweeping, washing, or other approved methods. When the work is halted by rain, the Contractor shall clean up the working areas before leaving the site.

Trenches shall be protected at the close of each day's operations by lighted barricades, fences, and other methods to the satisfaction of the Engineer. Fences shall meet ASHA standards and be structurally stable as approved by the Engineer. No excavations shall be left open over a weekend.

In general, pipes shall be laid in open cut trenches, except when another method, such as jacking, augering or tunneling is shown on the Plans, specified or ordered.

In City**,** State and County highways, excavated materials shall not be stored or cast upon the pavement, unless an advance approval of the governing agency is first obtained by the Contractor.

SP-25 Project Cleanup

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

SP-26 Work in Streets and Highways

All work within streets and highways shall be subject to the regulations and requirements of the appropriate agencies. Within the City of Tampa, streets and highways are under the jurisdiction of the City of Tampa, Department of Public Works or State of Florida, Department of Transportation. Outside the City of Tampa, streets and highways are under the jurisdiction of the County of Hillsborough or the State Department of Transportation.

Methods and materials of construction used in restoration within such streets and highways, including pavement, sidewalk, curb, curb and gutter removal and replacement, replacement of storm sewerage facilities, excavation and backfilling, and the storage of plant, materials and equipment shall conform to the requirements herein. A detail is shown on the plans for the restoration of City Streets.

SP-27 Surface Restoration

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

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

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

SP-28 Work Adjacent to Utilities

Existing utilities including house services adjacent to or crossing the line of the work shall be protected as shown on the Plans, specified herein, and in accordance with the requirements of the General Provisions.

SP-29 Utility Protection Considerations

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

The Contractor shall furnish, install, and remove sheeting and shoring and other protective measures as may be necessary to satisfactorily accomplish the construction of this project. The cost of such sheeting and shoring and other protective measures shall be included in the unit prices as bid for the storm or sanitary sewer pipe items, and no separate payment shall be made therefor.

SP-30 Water and Electric Services

The City will provide potable water service during construction through the established potable water meter and double backflow preventer. The Contractor shall use water through existing connection or fixtures. Any additional water connection required for the project, other than those establish fixtures, shall be constructed and connected downstream of the backflow preventer. Construction and removal of such connections and/or use of a separate construction water service from nearby hydrant due to the disruption of the water meter during construction shall be the responsibility of the Contractor, and such cost shall be included in the Lump Sum Price and no separate payment will be made therefor.

The City will provide electrical services in the station during construction through the established electrical meters and connections, except for times when service from the Tampa Electric Company is being relocated or modified. Any electrical service required during such period shall be responsibility of the Contractor and such cost shall be included in the Lump Sum Price and no separate payment will be made therefor. Any temporary electrical service required for the bypass pumps shall be responsibility of the Contractor and such cost shall be included in the Lump Sum Price and no separate payment will be made therefor

Shop drawings for temporary electrical services required during bypass pumping operations shall be included in the bypass pumping submittal, and shall be submitted prior to commencing any major demolition work.

SP-31 Protection of Trees and Shrubs

All trees and shrubs, except where otherwise shown or ordered, shall be adequately protected by boxes, fences, or otherwise carefully supported, as necessary, by the Contractor. Protective barricades shall be placed around all protected trees and grand trees and shall remain in place until all potentially damaging construction activities are completed (see barricade detail on the Plans). The Parks Department must inspect the site after tree protection devices have been installed and prior to construction. A 48-hour notice must be given to Parks Department to schedule the inspection. No excavated or backfill material shall be placed in a manner which, in the opinion of the Engineer, may result in damage to trees or shrubs. Prior to mobilization, all exposed roots shall be covered with a two (2)-inch layer of mulch. The Contractor shall replace all trees or shrubs which are destroyed or damaged to such extent, in the opinion of the Engineer, to be considered destroyed. Replacement of destroyed trees or shrubs shall be made with new stock conforming to the requirements of the City's Tree Ordinance at the expense of the Contractor, and no separate payment will be made therefor.

Beneath trees within the limits of the excavation, and where possible, pipelines shall be built in short tunnels, except as otherwise shown or specified. When the tree is outside the limits of the excavation but, where the distance from the centerline of the new pipeline to the trunk of any tree is such that, in the opinion of the Engineer, the excavation would result in serious damage to the tree, the pipeline shall be constructed in short tunnel, as ordered in writing by the Engineer. The Contractor shall be responsible for all damage to trees and shrubs as a result of his operations, whether the pipeline is placed on trench, tunnel, or other excavation.

The Contractor shall provide the services of a certified arborist when it is necessary to trim or cut a branch from a tree or prune roots.

The cost of protection of trees and shrubs, replacement or repair of trees or shrubs destroyed by the Contractor, short tunnels, cutting or trimming of tree branches and pruning roots shall be included in the various classified unit price Contract Items for pipelines, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

SP-32 Existing Storm Sewer Facilities

In the course of the work, it will be necessary to install temporary pipe and pumps over, under or closely adjacent to existing stormwater swales, grate inlets, culverts and other storm sewerage facilities. The Contractor shall protect all existing storm sewerage facilities which are shown on the Plans or located in the field during the course of the work.

Facilities which are damaged due to the work method of the Contractor shall be replaced by the Contractor to such limits as directed by the Engineer. Materials used for such replacements shall be similar to those used in the existing facility and shall conform to City Standards for the construction of storm sewers for work done in the City of Tampa.

The cost of protecting, replacing, relocating and maintaining storm sewerage facilities shall be included in the various classified unit price Contract Items for pipelines, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor, unless otherwise specified in other Contract Items.

The maintenance and guarantee provisions of the Agreement shall also apply to all replacements of damaged or relocated storm sewerage facilities accomplished by the Contractor.

SP-33 Fences

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

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

The cost of temporary fences and permanent fence restoration shall be included the in the total Lump Sum Price and no separate payment will be made therefor.

SP-34 Data to be Submitted on Pipe

Prior to his entering into any subcontract for the manufacture or purchase of any pipe, the Contractor shall submit to the Engineer, in an amount equal to four (4) sets to be retained by the City plus the number of sets desired by the Contractor, the following information:

1. A general description of and specifications for the pipe and pipe joints proposed.

2. Notarized certificates of manufacture for DIP and Steel Pipe stating conformance to applicable standards and specifications.

3. Any additional information that the Engineer may deem necessary in order to evaluate the qualifications of the manufacturer and to determine the suitability of the proposed pipe to meet the requirements of the Contract Documents.

4. Contractor shall coordinate with the pump manufacturer to propose special design fittings that will suit the existing field dimension with the proposed equipment dimensions. This information shall be captured and included in the shop drawing submittal for the special fittings.

The Contractor shall not enter into any subcontract for the furnishing of pipe until he has received the Engineer's approval, in writing, of the proposed manufacturer and pipe.

All pipe of specified classes and materials shall be of one kind and shall be produced by a single manufacturer.

SP-35 Concrete Requirements

Concrete work for sanitary sewer facilities shall comply with specification section 03300 "Cast In Place Concrete" and as shown on the Plans.

SP-36 Compaction of Suitable Clay Fill Material

The Contractor shall have equipment available to properly compact any suitable clay fill material at no additional cost to the project.

SP-37 Temporary Pavement Restoration

Temporary work shall be maintained in a suitable and safe condition for traffic until the permanent pavement is laid, or until final acceptance of the work.

SP-38 Work Directive Change

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

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

SP-39 Services of Manufacturers' Representatives

The services of manufacturers' representatives shall be provided on the site as required for the supervision of installation, the adjustment and placing in satisfactory trouble-free operation of pipelines, valves, tapping sleeves, pumps, electrical gear and other equipment and for instructing City personnel in the operation and maintenance of such equipment.

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

The cost of all services of manufacturers' representatives shall be included in the total Lump Sum Price, and no separate payment will be made therefor.

SP-40 Piping and Equipment Identification

All piping and equipment shall be identified as follows:

1. All painted piping and equipment shall be color coded. Such coding on pipelines shall be painted, spiral wrapped with plastic tape or encased on colored polyethylene encasement. See workmanship and materials sections for specific pipe materials.

2. All furnished equipment shall have an identification nameplate. The nameplates shall be of Type 316 stainless steel, No. 6 finish, not less than No. 16 gauge with indented stamped lettering. Namplates shall be attached to equipment bases in accessible locations and shall not be painted. Namplates shall be fastened, in a permanent manner, arranged not to damage equipment, with not less than four stainless steel fasteners. All nameplates shall conform to the following standard:

   Name of Equipment
   12-Digit Number (furnished by the Engineer)

3. Each above ground valve shall be identified with a round brass disc, approximately 3 inches in diameter and not less than No. 14 gauge. Disc shall be fastened to the valves and stamped with an identification number to be furnished by the Engineer. Valves that are replacing existing valves shall be numbered in accordance to the disc on the existing valve.

4. Piping shall be identified with a designation and direction of flow arrow, after painting. The designation shall be furnished by the Engineer. The designations shall consist of up to 20 letters. The designations and flow arrows shall be painted on using a suitable stencil. Designations and flow arrows shall be arranged to be clearly visible from normal viewing areas.

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

SP-41 Storage of Materials

The Contractor may use the pump station site for storage of material and equipment. The Contractor may not use that portion of the right-of-way located between the existing/proposed curb lines or existing/proposed edges of pavement to store pipe, structures, materials, surplus excavated fill, or equipment other than that used for excavating or dewatering. The Contractor may use that portion of the right-of-way behind the existing or proposed curb line or off the edge of pavement for storage provided that this use does not obstruct pedestrian or vehicular traffic and conforms to the City's Tree Ordinance. If the area behind the curb line/off the edge of pavement is insufficient in size to accommodate the Contractor's storage needs, the Contractor is required to secure the use of a parcel of land for use as a storage site for the duration of this project. Mechanical and electrical equipment stored at this site, such as pumps, motors or VFDs shall be given adequate protection from the elements as to not compromise its integrity or function.

Upon completion of the project, all storage areas will be restored to a condition which meets or exceeds the pre-construction condition of the storage area. Payment for use and restoration of storage areas will be included in the appropriate lump sum price and no separate payment will be made therefor.

SP-42 Temporary Work Stoppages

The Contractor shall temporarily discontinue all construction activities, except for bypass pumping, and emergency responses from, and including, Thanksgiving Day through the following Sunday, and December 24 through January 2.

SP-43 Project Photographs

The Contractor will not be required to furnish photographs of the project; however, the Engineer may or may not take photographs of the area immediately prior to and after completion of the construction for record and information. To assure that there will not be any conflict with this photography, the Contractor shall not perform clearing operations or action which will disturb any street or area within the project until the Engineer has been advised thereof and has had adequate opportunity to perform the desired photography.

SP-44 Project Videotaping

The Contractor shall submit to the Engineer for approval prior to commencing work a continuous color videotape recording complete coverage of pre-construction conditions of all surface features within the construction's zone of influence, simultaneously produced audio commentary and electronic display of time and date. The videotape recording shall be sufficient to fulfill the technical and forensic requirements of the project and professionally produced by a firm regularly engaged in the business of construction video documentation, shall provide continuous unedited coverage, establishing locations and viewer orientation with clear, bright, steady and sharp video images with accurate colors free of distortion or other imperfections. The videotaping shall be completed both outside and inside of the pumping station.

SP-45 Valves

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

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

Cast iron valve boxes shall be firmly supported and maintained centered and plumb over the operating nut of the valve by the Contractor with box cover flush with the surface of the finished pavement or at such other levels as may be directed. Valve boxes shall have 6-inch thick wire mesh reinforced concrete pads poured around the top section of the valve box when in pavement or when directed by the Engineer. The pad shall be 24 inches square and shall be centered on the valve box. All valve covers shall be painted as prescribed by the American Public Works Association (APWA) uniform color code for utility systems.

The valve and valve box shall be installed so City personnel can insert a valve key through the valve box and completely open and close the valve. Operating nut shall not be more than 24” below grade. Add valve stem extension as necessary. This test will be accomplished before final acceptance of the valve and box.

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

Payment for valves shall be included in the price of the work to which the valves are incidental unless a separate pay item is included in these contract documents.

SP-46 Tree Removal and Replacement

The Contractor shall remove and replace trees as identified on the plans and as directed by the Engineer. All tree removal and replacement activities shall be in compliance with the City of Tampa Municipal Code, Chapter 13, Landscaping, Tree Removal and Site Clearing, as amended, latest edition.

The Contractor shall contact the City's Parks Department and the City's Construction Services Center to coordinate removal and replacement details and inspections. Substandard workmanship will be rejected. The Contractor shall pack, transport, and handle the replacement trees with care to ensure protection against injury. Upon arrival, the Contractor shall protect all trees from drying out by properly protecting the trees with soil, wet peat moss, or in a manner acceptable to the Engineer. No tree shall be bound with rope or wire in a manner that could cause damage.

Trees that are transported or planted improperly shall receive a special review established on a case-by-case basis.

The Contractor shall be responsible for maintaining the trees in a vigorous, healthy condition for a period of 90 days after replacement of all trees has been approved by the Engineer. Tree maintenance shall include, but not necessarily be limited to, watering, fertilizing, pruning, staking, guying, and all measures necessary to successfully maintain the trees to the satisfaction of the Engineer.

SP-47 As-Built Plans

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

The Contractor shall provide the City of Tampa with one (1) hardcopy and (1) electronic high resolution color PDF copy set of "As-Built" plans along with the supporting survey data. The survey shall be in accordance with the City of Tampa Department of Public Works specifications and note keeping standards for surveys and signed by a Land Surveyor registered in the State of Florida. Plan sheets shall have all deviations from original design annotated in red pencil to clearly show as-built conditions. Relocation of existing facilities and utilities must be clearly noted and their location identified by station, offset and elevation, when performed by the Contractor.

All relocation of structures and pipelines must be clearly shown on Plans with as-built stations and offsets verified. All as-built inverts for the entire project must be clearly noted on plan sheets. No separate payment shall be made for this work.

All as-built plans shall be submitted within seven (7) calendar days of the final inspection. The final payment will not be issued until the as-built plans have been submitted to, and accepted by the City. Upon request the City will provide AutoCAD drawings.

SP-48 Safety

1. Responsibility: Employees shall immediately report any unsafe work practice or unsafe condition to their supervisor(s). The Contractor is solely responsible for the safety of their workers, and shall comply with all applicable requirements [i.e.: 29 CFR 1910 -Occupational Safety and Health Standards, 29 CFR 1926 - Safety and Health Regulations for Construction, etc.] and industry safety standards while at the work site. The fact that City personnel may bring un-safe conditions to the attention of any member of the Contractors work force does not relieve the Contractor of this responsibility.

   All Contractor employees and sub-contractors shall be given a copy of SP-56.

   The Contractor shall have a designated Safety Officer within his organization. At the Pre-Construction meeting, the Contractor shall provide the name and contact information of the Safety Officer to the Engineer.

   At the Pre-Construction meeting, the Contractor will be given pertinent safety related information, necessary forms and instructions (i.e.: AWTP[1] Lockout/Tagout Procedures, AWTP Hot Work Permits, etc) that pertain to any work that might be utilized during the contract. The Contractor shall be responsible to disseminate that information to their employees and sub-contractors. Special care shall be taken by the Contractor to ensure that any new employee or sub-contractor to the work site shall be briefed on these safety instructions.
   If warranted by the project and directed by the Engineer, the Contractor shall develop and implement a comprehensive health and safety plan for their employees that will cover all aspects of onsite construction operations and activities associated with the contract. This plan must comply with all applicable health and safety regulations and any project specific requirements that the contract has specified.

2. Incident Reporting: All accidents that result in personal injury, illness or property damage shall be immediately reported and investigated, regardless of the extent of injury, illness or property damage. Employees must report accidents within one hour (or as soon as practical) from the time of occurrence to their immediate supervisor who in turn will report it to the City's inspector. The City inspector may record the incident in their daily report and report it to the Risk Management Division (274-5708).

3. Air-Borne Debris: All personnel in close proximity to drilling, sawing, sanding, scraping, spraying, power-washing or other work being done, either in enclosed spaces or in the open, that creates dust or air-borne debris shall wear eye protection
   [29 CFR 1910.133] and a respirator [29 CFR 1910.134].

4. Hot Work: All welding, soldering, brazing, acetylene cutting or any other work at the AWTP or any pump station; that produces high temperatures shall require a AWTP "Hot Work Permit" and may require one or more fire watches. The number and location of fire watches (if any) shall be a condition of the Hot Work Permit. A current, portable, fully charged fire extinguisher shall be located with each person performing hot work and each fire watch. The Hot Work Permit shall be signed off by the appropriate personnel and maintained in the project file.

5. Confined Spaces: OSHA defines a confined space as having limited or restricted means for entry or exit, and is not designed for continuous employee occupancy. Confined spaces include, but are not limited to: vaults, tanks, manholes,
wet-wells, pipelines, utility tunnels, etc.

   The Contractor shall take measures [29 CFR 1910.146 (c)(5)] to ensure that atmospheric conditions in confined spaces are not hazardous to occupants. This can be accomplished by forcing a sufficient amount of clean air through the confined space and testing the atmosphere by using a portable certified, calibrated, atmosphere monitor that meets OSHA requirements [29 CFR 1910.146(c)(5)(ii)(C)]. The atmosphere monitor should record oxygen content, flammable gases and vapors and toxic air contaminants, such as the Industrial Scientific TMX-412.
6. Lockout / Tagout Policy: The AWTP Lockout / Tagout program is designed to set standards to help safeguard all employees from hazardous electrical or mechanical energy while they are performing service or maintenance on machines and equipment at the AWTP or any pump station. This program will also identify the practices and procedures to shut down and Lockout or Tagout machines and equipment. The Contractor shall be given a copy of the AWTP "LOCKOUT / TAGOUT POLICY AND PROCEDURES" instruction and shall make all of his employees and sub-contractors aware of this program.

   No padlock (lockout) shall be removed except by the individual that installed it or if not available, by a City of Tampa AWTP team leader.

   No tag (tagout) shall be removed except by the individual that installed it or if not available, by a City of Tampa AWTP team leader, except in an Emergency and the tag states "Do Not Use Unless in an Emergency". In that event, the Contractor shall notify the City of Tampa AWTP team leader, who will prepare the necessary follow up report.

7. Trench Safety: Any excavation deeper than four (4) feet shall adhere to the requirements contained in 29 CFR 1926.650 thru 652 and the Florida Trench Safety Act [Florida Statutes, ss 553.60 - 553.64].

8. Open Flames: No fires shall be allowed. No open flames necessary for any construction activity shall ever be left un-attended. A current, portable, fully charged fire extinguisher shall be located with each activity requiring an open flame.

9. Sparks: Any activity lasting more than 10 continuous minutes, that creates sparks, such as grinding or chipping shall have a dedicated fire watch in attendance. A current, portable, fully charged fire extinguisher shall be located with each activity creating sparks, regardless if a fire watch is required or not.

10. First Aid: The Contractor shall furnish appropriate First Aid Kits [29 CFR 1910.151] and shall be responsible to ensure his employees are properly trained to render first aid. If injurious corrosive materials are to be utilized, eye wash and body wash facilities must be provided in the immediate area.

11. Related Costs: All costs associated with these or any safety measures shall be included in the total lump sum contract price or the various contract item unit prices, as applicable, and no separate payment shall be made thereof.

SP-49 Vibration Requirements for Rotating Equipment

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

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

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

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

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

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

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

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

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

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

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

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

   a. All mounting bolts shall be tight before proceeding.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SP-50 Training

Provide the services of knowledgeable, technically competent, factory-trained specialists to instruct Pumping Station personnel in the operation and maintenance of the equipment and system components listed herein. The City will furnish training classroom space.

1. Coordinate services with the City, with a minimum of 30 days prior notice.

2. Provide a combination of classroom and "hands-on" instruction designed to completely familiarize operating and maintenance personnel with the systems theory, standard operating procedures, safety features and emergency procedures, and general maintenance of all components.

3. Conduct all training at the Pump Station during regular hours on weekdays.

Provide training for the following equipment:

Equipment	**Minimum Hours of Training**

Wastewater Pumps	4
Pump Controls	4
Adjustable Frequency Drives	4
480 Volt Switchgear	4
Motor Control Centers	4
General Controls and Instrumentation	4

Credentials: Submit for approval, credentials of equipment manufacturer representatives who are to be course instructors at least 14 days prior to a proposed training session.

Scheduling: Submit training outline and other information for approval at least 14 days prior to the proposed date for the training sessions. Verify scheduling with the City at least 14 days prior to the training sessions.

Number of Copies: For each training class, provide instructional material for at least ten attendees plus five extra copies, plus duplicate copies of all audio-visual aids utilized during each training course.

Training Topic Detail: Describe "hands-on" demonstrations planned for the training. Reference training aids to be utilized in the training (i.e. video tapes, slides, transparencies) and attach where applicable.

Training Outline:

1. Equipment Operation
   a. Describe equipment's operating (process) function.

   b. Describe equipment's fundamental operating principles and dynamics.

   c. Identify equipment's mechanical, electrical and electronic components and features.

   d. Identify all support equipment associated with the operation of the subject equipment.

2. Detailed Component Description

   a. Identify and describe in detail each component's function.

   b. Where applicable, group related components into subsystems.

   c. Identify, and describe in detail, equipment safety features and control interlocks.

3. Equipment Preventive Maintenance

   a. Describe preventive maintenance inspection procedures required to perform and inspect the equipment in operation, and spot potential trouble symptoms (anticipate breakdowns).

   b. Outline recommended routine lubrication and adjustments (preventive maintenance).

4. Equipment Troubleshooting

    a. Define recommended systematic troubleshooting procedures.

    b. Provide component specific troubleshooting checklists.

    c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.

5. Equipment Corrective Maintenance

    a. Describe recommended equipment preparation requirements.

    b. Identify and describe the use of special tools required for maintenance of the equipment.

    c. Describe component removal/installation and disassembly/ assembly procedures.

    d. Perform at least two "hands-on" demonstrations of common corrective maintenance repairs.

    e. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.

    f. Define recommended torqueing, mounting, calibration, and alignment procedures and settings, as appropriate.

SP-51 Programmed Controls Equipment

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

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

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

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

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

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

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

SP-52 Operation and Maintenance Manual, Submittals / Request for Information / Shop Drawings, and Asset Tracking Form

Operation and Maintenance Manuals

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

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

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

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

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

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

5. One valve schedule, giving the valve number, location, fluid and fluid destination for each valve installed and prepared as specified in No. 3 above. All valves in the same piping system shall be grouped together in the schedule. A sample of the valve numbering system to be used will be furnished by the Engineer. Valve numbers may include three or four numerals and a letter.

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

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

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

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

Submittals / Request for Information / Shop Drawings

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

Asset Tracking Form

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

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

SP-53 Disposal of Debris

The Contractor will be permitted to transport and dispose debris at the Howard F. Curren AWT Plant at 2700 Maritime Boulevard between the hours of 6:00 a.m. to 6:00 p.m., as directed by the Engineer. Within 30 days after the completion of the work, the Contractor shall coordinate with Plant personnel for hauling the stored debris from the Treatment Plant to an approved disposal site.

In addition, the Contractor will have the following responsibilities:

1. Be solely responsible to handle, transport, test, permit, and dispose of debris in accordance with all applicable regulatory requirements.
2. For transportation between project site and the Treatment Plant.
3. To apply for, pay fees, and obtain all required environmental or transportation permits prior to handling debris. Permitting agencies include, but are not limited to, EPA, DER, DOT, Hillsborough County, City of Tampa, and Expressway Authority.
4. To perform all necessary tests as required by permit and all applicable regulatory requirements.
5. The Contractor is responsible to pay all applicable disposal fees.

SP-54 Interruption of Service

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

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

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

SP-55 Electrical Requirements

Electrical Work

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

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

Electrician Qualifications

The Electrician performing the electrical work shall be licensed / certified in the State of Florida. The Electrician shall be thoroughly experienced with, and regularly engaged in, the demolition, installation, and trouble-shooting of industrial power systems with nominal system voltages of 240 through 13,200 volts. The Electrician shall provide the City with evidence demonstrating at least three (3) years of successful industrial power system installations. The Electrician shall supply the City with references of industrial clients that will attest to the Electrician’s work experience.

In addition, the electrical contractor or sub-contractor shall provide a minimum 3 references for industrial projects of similar complexity, content and scope of this project including, but not limited to, the following:

1) Installation of Variable Frequency Drives (VFD) and Motor Control Centers (MCC) for multiple pumps with 250 horsepower (HP) motors or larger
2) Installation of 750 kW standby generator or larger
3) Installation of Electrical and Instrumentation components for a 25 MGD wastewater pumping station or larger.

SP-56 Requests for Changes in Electrical Service

For all work that requires a change in electrical services, the Contractor shall notify the City a minimum of two weeks in advance of the required service request. Service requests shall include, but is not limited to; power disconnections, power reconnections, handhole installations, scheduled outages, and inspections. The City shall make arrangements directly with Tampa Electric Company (TECO) regarding service requests for power disconnections, power reconnections, and handhole installations. For service requests to perform scheduled outages or inspections, the Contractor shall contact TECO directly. It is the responsibility of the Contractor to coordinate their work with availability and schedule for TECO to perform the required service. After the Contractor contacts TECO and is given a work request number by TECO, the Contractor shall notify the City and provide the City with the TECO Work Request Number. After the TECO Work Request Number is received by the City, the City shall notify TECO to proceed with the Contractor's requested service.

If the work requires a complete power disconnection, power reconnection requests by the Contractor shall not be approved by the City until the work has passed inspections by both the City of Tampa's Construction Services Department and Tampa Electric Company. In addition, the removal of any bypass pumping or back-up power systems that were needed to maintain wastewater flows shall not be allowed until power has been restored and the pumping station has passed all operational tests and inspections.

SP-60 Contingency

The Contractor shall include a two hundred thousand Dollar ($200,000.00) contingency sum, to be included as part of the total bid amount for this contract. The contingency is for the purpose of compensating the Contractor for any incidental work that may arise as construction operations proceed and was not addressed as part of the original work portrayed in the Plans and Specifications.

The two hundred thousand Dollar ($200,000.00) contingency sum is an upset limit. Any amount of the contingency shall be paid only after negotiation.

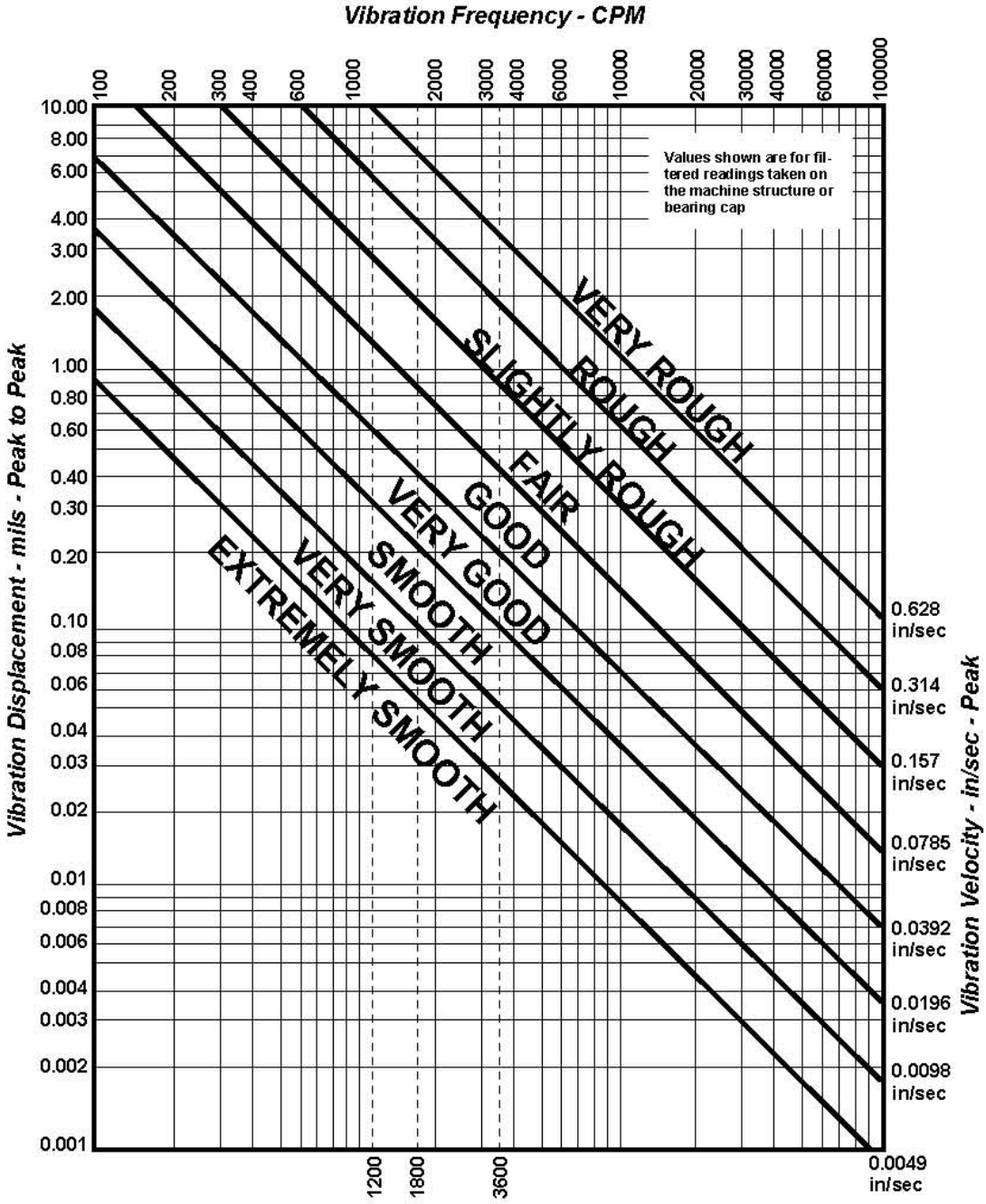
SP-999 Equipment Standardization

The City has standardized on various equipment specified for this project. A list of this equipment is as follows.

- Fairbanks Morse Pumps
- Dezurik Plug Valves
- ABB Flow Meters
- Yaskaswa Variable Frequency Drives
- Maple HMI Annunciators

Copies of these standardizations are provided below at the end of the specific provisions section.

GENERAL MACHINERY VIBRATION SEVERITY CHART



condition management solutions

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

David L. Tippin Water Treatment Facility
Caustic Soda Piping Improvements

Project provides for improvements at the David L. Tippin Water Treatment Facility to improve the reliability and safety of the Sodium Hydroxide System of the water distribution system within the facility.

$TBD investment
Scheduled for completion in TBD 2014

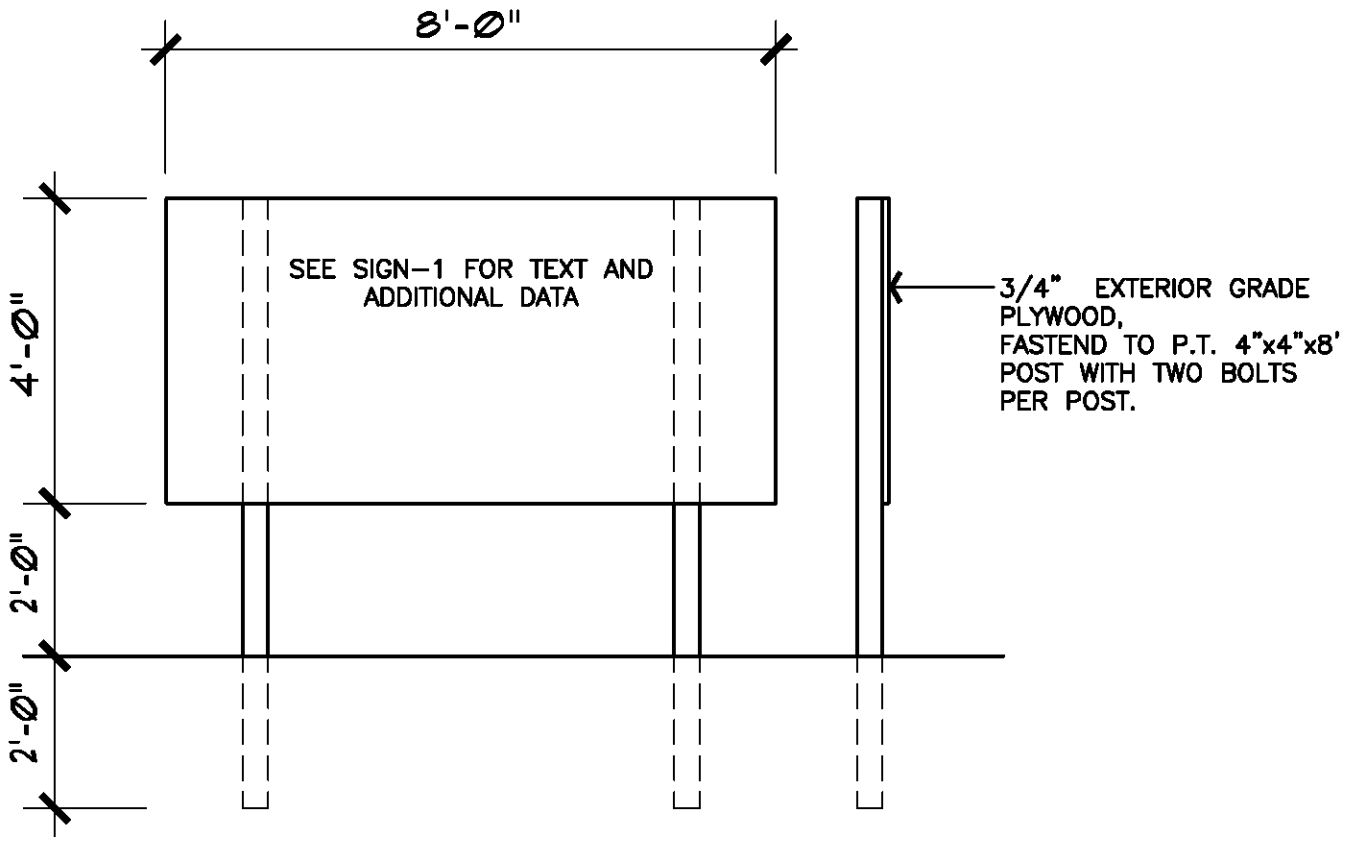
TBD

Colors

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

Font

Franklin Gothic



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

SECTION W-12F - FIBERGLASS REINFORCED POLYESTER MANHOLES

W-12F.01 General

Fiberglass reinforced polyester (FRP) manholes shall be one piece monolithic designed units. Manholes shall be manufactured from commercial grade polyester resins reinforced with glass fibers. FRP manholes shall be manufactured in strict accordance with ASTM D-3753 latest edition. Manholes shall be as manufactured by Fluid Containment, Inc., Conroe, Texas or as manufactured by L.F. Manufacturing, Inc., Giddings, Texas, or approved equal.

FRP manholes for sewers 24-inches in diameter or less shall have a minimum diameter of 4'-0". Manhole installation, pipe connections, and other requirements shall comply with the applicable sections of the specifications and the details shown on the plans.

W-12F.02 Materials

The resins shall be commercial grade unsaturated polyester resin. Resins for each manhole shall be from a single manufacturer; mixing of resins from different manufacturer's shall not be permitted. Quality assurance records must be maintained.

The reinforcing materials shall be commercial grade "E" type glass. The glass shall be in the form of a mat, continuous roving, chopped roving, or roving fabric. The reinforcing shall have a coupling agent that provides a suitable bond between the glass reinforcing and the resin.

If reinforcing material is used on the interior surface of the manholes, it shall be a commercial grade chemical resistant glass or an organic surfacing mat having a coupling agent that will provide a suitable bond with the resin.

Fillers and additives shall be inert to the environment and the manhole construction. Additives may be added as required by the manufacturing process to meet the requirements of the specifications. The reinforced-plastic material resulting from the use of additives and fillers must meet the requirements of this specification.

The laminate shall consist of multiple layers of glass and resin. The interior surface of the manhole shall be resin rich and shall have no exposed fibers.

W-12F-03 Manufacture

Manhole cylinders, manways, and connectors shall be produced from glass fiber-reinforced polyester resin with the construction determined by the particular process of the manufacturer and configuration. The process may include molding, compression molding, pultrusion, or other means.

The manhole shall be a one piece unit consisting of a bottom, barrel section, and a cone section with a fiberglass neck that extends into the frame and cover. The manhole shall provide an area so that the City standard cast iron frame and cover can be supported without damage to the manhole. The cone section, if produced separately, shall be joined to the barrel section at the

factory with a resin-glass reinforced joint which results in a one piece unit. If the cone section is joined with a butt joint, the seam shall be fiberglassed on the inside and outside of the manhole. If the cone section is joined using a bell and spigot design, the seam shall be fiberglassed on the outside of the manhole. Seams shall made using the same glass-resin jointing procedure. Field joints shall only be permitted if they are performed by the manufacturer. The manhole bottom shall be integrally joined to the barrel section and shall be a minimum of 1/2-inch thick. For securing the manhole to a concrete bottom slab, the manhole bottom shall have a anchoring collar around the outside circumference of the manhole that extends a minimum of 3-inches beyond the face of the barrel.

W-12F.04 Standards and Requirements

The interior surface of the manhole shall be a resin rich layer 0.010" to 0.020" thick. The inner surface layer that will be exposed to the corrosive environment shall be followed with a minimum of 2-passes of chopped roving with a minimum length of 0.5" to a maximum length of 2.0". The chopped roving shall be applied uniformly to provide an equivalent weight of 3 oz./ft^2. Each pass of chopped roving shall be well-rolled prior to the application of additional passes. The combined thickness of the inner surface and the interior layer shall not be less than 0.10".

The interior surface shall be free of crazing, delamination, blisters larger than 0.5" in diameter or wrinkles 0.125" or greater in depth. Surface pits shall be permitted if they are less than 0.75" in diameter and less than 0.0625" deep. Voids that cannot be broken with finger pressure and that are entirely below the resin surface shall be permitted if they are less than 0.5" in diameter and less than 0.0625" thick.

The exterior surface shall be relatively smooth with no sharp projections. Hand worked finishes are acceptable if sufficient resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 0.5" in diameter, delamination, or exposed fibers. The laminate shall have a factory installed UV protection.

Manhole repairs when required shall meet all requirements of this specification and the details shown on the plans.

The complete manhole shall have a minimum dynamic load rating of 16,000 lbf when tested in accordance with ASTM 3753, section 8.4 (note 1). When tested for this rating the complete manhole shall not leak, crack, or suffer other damage when load tested to 40,000 lbf. In addition, when loaded to 24,000 lb the manhole shall not deflect vertically downward more than 0.25" at the point where the load is applied.

The tolerance for the inside diameter of the manhole shall be +/- 1% of the required diameter.

Each manhole shall be subjected to an air or water pressure test to determine soundness. The manhole shall be subjected to 3-5 psi pressure test and the entire manhole inspected for leaks. Any leakage through the laminate is cause for failure of the test. Refer to ASTM 3753, section 8.6 for further details of the test.

Chemical resistance testing shall be in accordance with ASTM 3753, section 8.7. In

accordance with the test, the flexural strength, flexural modulus, barcol hardness shall be plotted versus time on log-log coordinates. The line defined by these points shall be extrapolated to 100,000 hours. The results of the test must show that the test sample has retained 50% of the sample's initial properties. The test sample used shall be actual pieces of the manhole or samples manufactured consistent with the manhole construction.

When tested in accordance with ASTM 3753, Section 8.5 (note 1), the manhole cylinder shall have the minimum pipe stiffness values shown in the table below:

Manhole Length (ft)	PSI
3-6.5	0.75
7-12.5	1.26
13-20.5	2.01
21-25.5	3.02
26-35	5.24

The manholes shall have the following physical properties:

Flexural Strength (Cone):	Hoop: 15,400 psi Axial: 17,200 psi
Flexural Strength (Cylinder):	Hoop: 22,500 psi Axial: 14,300 psi
Compressive Strength:	18,900 psi

W-12F.05 Inspection and Testing

All tests shall be performed as specified in the latest edition of ASTM 3753, section 8, test method D-790 (note 5) and test method D-695. The manhole manufacturer shall complete all required ASTM 3753 testing and maintain records of the testing.

The manhole manufacturer shall maintain controls on glass and resin content for all manufacturing processes and for each portion of manhole fabrication. Records of these control checks shall be maintained. Proper glass content may be verified by glass usage checks or by glass and resin application rate checks. These checks shall be done in accordance with the material composition test specified in ASTM 8.8.1.

The quality of all materials, the manufacturing process, and the finished units shall be subject to the inspection and approval of the Engineer. Inspections may be made at the place of manufacturer or at the site of delivery. Manhole sections that fail to meet the requirements of this specification or that have been damaged after delivery shall be rejected.

When requested in writing by the Engineer, each manhole delivered to the site shall be provided with a certification verifying that the manhole has been sampled, tested, and inspected in accordance with the provisions of this specification and meets all requirements. Each certification shall be signed by authorized agent of the supplier or manufacturer and must be submitted to the

Engineer prior to shipment of the manhole. When requested in writing by the Engineer, a copy of the manufacturer's test report and a copy of the test results must also be submitted with the manhole certification.

W-12F.06 Shipping and Handling

The FRP manhole must be handled to ensure that the manhole is not damaged or impacted. Manholes may be lifted either by two slings attached to a spreader bar or by inserting a 4"X4" timber into the top of the manhole with a cable or sling attached to the center. Use of chains or cables which may come into contact with the manhole surface shall not be allowed.

W-12F.07 Marking and Identification

Each manhole shall be labeled with the following information:

1. Manufacturer's name or trademark
2. Manufacturer's serial number
3. Length of manhole
4. Location of manufacturer's factory
5. ASTM designation

* * *

SECTION 32
PLUG VALVES, PUMP-CHECK PLUG VALVES, KNIFE GATE VALVES, PVC BALL VALVES AND ACTUATORS

W-32.01 General

This section includes the plug valve, pump-check (plug) valves, knife gate valves, pvc ball valves and actuators to be provided and installed. Knife gate valves shall be provided with flanges drilled and tapped to ASME B16.5/150. Pump-check valves shall be provided with flanges.

Plug valves for buried applications shall be provided with mechanical joints. Plug valves for above-ground applications shall be provided with flanged connections.

All force main valves shall be plug valves meeting the requirements of the sub-section "Eccentric Plug Valves."

All references to "stainless steel" or "SS" shall mean 316 stainless steel.

All valves of the same type shall be from a single manufacturer. Parts of valves of the same type and size shall be interchangeable.

The Contractor shall prepare and submit for approval a complete detail drawing of all valves in accordance with the requirements of the General Provisions. At minimum the submittal shall show all proposed material types to be used as well as proposed interior and exterior coating manufacturer, coating type and proposed minimum dry film thickness.

All valves shall be carefully erected in their respective positions, free from all distortion and strain, and shall be packed and left in satisfactory operating condition. All valves shall be operated as shown or specified.

Operators include electric motor operators with manually operated handwheels and pneumatic cylinder operators, as shown and specified.

Valve operators shall be provided complete with all appurtenances necessary for the equipment to perform its intended function. Such appurtenances include, but are not limited to, anchor bolts and other mounting hardware, limit switches, pressure switches, gauges, control switches and control valves, electrical supply connections, air supply piping, control valves and regulating controls, solenoid valves, extension stems, local and remote indicators, torque switches, operating nuts, purge water service with all associated piping valves and controls, push-button controls, indicating lights, floor boxes, direct burial valve boxes, and other such items.

Worm gear type operators shall include a worm gear and matching drive worm. Bearings shall be provided for each rotating member.

Traveling nut type operators shall include a threaded steel screw and a bronze nut. A slotted lever or link lever system shall be provided to transfer the applied torque to the disc shaft. All rotating shafts, screws, and links shall have separate bearings. Thrust bearings shall be provided.

W-32.02 Flanges

Flanges shall be cast solid and faced accurately at right angles to the axis of the casting. Flanges shall be faced and drilled and shop coated with a rust preventive compound before shipment.

Dimensions and drillings of flanges shall meet the requirements of ANSI B16.1 for working pressures of 125 pounds per square inch. Special drillings shall be provided where required.

W-32.03 Eccentric Plug Valves

Plug valves shall be of the eccentric valve design and shall meet or exceed the requirements of AWWA C517 and shall be designed for 175 PSI 3'-12" and 150 PSI 14"-36". Every valve shall be given a hydrostatic and seat test, with test results being certified when required by the specifications. Manufacturer's Name shall be cast in body and Valve shall be serialized for future parts identification. Port area shall be 100% of standard pipe area. The Plug shall be Rectangular with associated Rectangular Port and shall provide dead tight shutoff when seated in the closed position. Body material shall be Cast Iron ASTM A126 Class B, Seats shall be 1/8" thick 95% Nickel and 1/2" wide for proper plug seating. Plug shall be Ductile Iron ASTM A536 and Chloroprene Faced. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. Bearings shall be sintered, oil impregnated permanently lubricated type 316 stainless steel, include upper and lower grit excluders to prevent grit and foreign solids from entering the bearings. Grit Excluders in the form of PTFE washers at the upper and lower journals shall be provided to prevent the entry of grit and foreign solids into the bearing areas. Shaft seals shall be multiple V-ring type and shall be externally adjustable via an air gap and re-packable under pressure without removing the actuator or bonnet from the valve. All Flanged and MJ plug valves shall have an air gap between shaft packing and bottom of actuator for visual inspection, adjustment or complete replacement of packing without disturbing any portion of the valve or actuator except the packing gland follower. This valve shaft packing design must have been used successfully within the county for the past 10 years. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable. Valves shall have interior and exterior epoxy.

Plug valves shall be nut operated (1/4 turn) 4" to 8" and gear operated 10" and larger. Both nut and gear operated valves shall have a 2-inch square nut for operation. On pump stations where the valve is 7 feet or more above the floor level, a chain and wheel shall be provided for operation.

All direct burial valves shall be provided with adjustable type cast-iron valve boxes and extension stems to grade. Valve box covers shall have an identification 3" bronze nameplate identification tag mounted on the interior that indicates the manufacturer, serial number, size, type of valve; and the direction and number of turns to open.

Plug valves shall be Dezurik PEF (100% Port) eccentric plug valve. This equipment is standardized for this project and no "or equal" will be considered.

W-32.04 Pump-Check Eccentric Plug Valve

Pump-check valves, unless otherwise specified, shall meet the requirements of the sub-section for "Eccentric Plug Valves".

Pump-check valves shall be a DeZurik PEF Eccentric Plug Valve and shall be equipped with a Rotork Fluid Systems pneumatic double acting actuator series SGP/D scotch yoke mechanism that is properly sized and that is operated by instrument air at 80 psig. Pump-check valve and Actuator shall be

suitable for temporary submergence. Actuator shall be rated for temporary submergence of 15 feet of head for a period of 48 hours.

Each pneumatic cylinder-operated actuator shall include an engineered hydraulic two-speed actuator packaged control system. Provide 4 way pilot solenoid valve in pneumatic circuit for normal open/close control and a 2 way emergency close solenoid valve in the hydraulic circuit to close the valve rapidly on power failure or pump trip. Provide limit switches for valve open and closed remote status indication. Design the air/hydraulic control circuits to open the valve at normal speed when the 4 way and 2 way valves are energized simultaneously. Close the valve at normal speed when the 4 way pilot valve is de-energized (but the 2 way valve is still energized). Close the valve at rapid-close speed when both solenoids are de-energized. Accessories and connections to the pump station in air system shall be shown, specified, and required.

The operation of the automatic pump check valves shall be as follows:

Open Cycle:

1. Pump motor starts, use a delay timer to trigger valve opening at a preset speed.
2. Valve reaches 100 percent capacity at predetermined time.
3. Initial setting for opening cycle is two minutes.

Close Cycle:

1. When a pump stop signal is initiated for any particular control sequence shown, begin the closing cycle at a preset speed, while pump motor continues to run.
2. As the valve moves towards the closed position, the limit switch contacts open at a preset point, de-energizing the motor starter coil. The motor starter contacts open at a preset point, de-energizing the motor starter coil. The motor starter contacts open and the pump motor stops.
3. The valve continues to close as the pump slows down, the valve closing completely just as forward flow from the pump stops. Initial setting for closing cycle shall be 40 seconds.
4. The system is ready for another open cycle.

Manual Functions:

1. A manual override button shall be furnished to allow manual, local operation of the check valve.
2. For manual operation, a manual-automatic selector valve shall be provided. In the manual position, manual operation of the valve is accomplished by a wrench on the manual nut.

Rapid Closing Operation:

1. Upon power failure to the pump motor (or pump trip due to emergency or alarm shutdown), the check valve shall close immediately.

The actuators and control system shall be designed and built for valve operation at the pressure of the pipeline in which the valve is located when operated by a compressed air supply of 80 psig. The actuators shall provide timing control in each direction of movement.

Control Cabinet:

Rotork control system shall allow a 2 to 3 minutes stroke time via a specially designed hydraulic speed control / manual override system. This system shall also allow 15 seconds fail stroke upon loss of ESD and control signal voltage. Speed shall be adjustable.

Normal Operation:

An ASCO 120 VAC solenoid directional control valve shall be used to stroke the actuator open and close pneumatically, at the same time the two flow control valves allow the actuator to stroke at a 2 to 3 minute time. The lever on the hydraulic manual override must be in the mid position.

Emergency Operation:

The 120 VAC signal to the ASCO solenoid directional control valve and the 120 VAC signal to the MODULAR CONTROL valve drops out. This allows the actuator to stroke close at time of 15 seconds. The ESD stroke time is adjustable with flow control valve.

Manual Operation:

Before going to manual operation the supply pressure must not be present at the ASCO solenoid directional control valve. The actuator can be manually stroked via the hydraulic manual override

Mounting:

The actuator will be installed in the horizontal position with the Manual Hydraulic Override mounted 90 degree to the top of the actuator.

Start-Up:

Prior to start up, contractor shall inform service techs of all requirements of the certificate of proper installation. All forms and documentation required for the certificate of proper installation shall be given to service tech prior to start up with a minimum of 1 day per one actuator. Start-up shall be performed by direct factory tech that resides in Florida.

The Actuator shall be the Rotork GP series with Hydraulic Override Model GP-130C-385A/D1-HP1 as Manufactured by Rotork Controls, Rochester, N.Y.

W-32.05 Knife Gate Valves

Knife gate valves shall be furnished and installed at the pump suction for Pumps No. 1, 2 and 3 as shown. The knife gate valve for these locations, including the proper sealing face shall be suited for operation on a horizontal alignment.

All knife gate valves shall be a Model KGC-BD Bi-Directional Cast 316ss Knife Gate Valves as manufactured by DeZURIK or pre-approved approved equal.

Gate edge shall be machined, finished, and rounded. The gate faces shall be finish ground.

Exclusive Premium Packing System shall fit a rounded machined packing chamber. The Exclusive Premium Packing System shall consist of multiple layers of packing with anti-extrusion guides. The packing gland shall match the valve body. The fasteners shall be stainless steel.

Body shall be a one piece casting of type 316 stainless steel. Valve inside port diameter shall be equal to ANSI B36.10 STD pipe inside diameter. Raised faces shall be full width per ASME B16.20 standards for spiral-wound gaskets.

Resilient Seat shall be capable of bubble-tight bi-directional shutoff to the full pressure rating of the valve, and provide provides shutoff on dead end service. Valves shall be of a perimeter seat design and the seat shall provide guiding for the gate. Resilient seat shall be a one-piece rubber molded seat with seat pucks at the top and an encapsulated full metal reinforcement insert in 316 stainless steel for rigidity. Seat pucks shall be locked into a machined pocket in the bottom of the packing chamber and not interfere with the integrity of the packing chamber. The perimeter seat shall be locked into the valve body in a dovetail groove. Resilient seat material shall be Chloroprene.

Face-to-face dimension shall meet MSS SP-81 for knife gate valves.

Cold Working Pressure valve rating shall meet or exceed MSS SP-81. Valves shall be 150 psi for 2-28” and 100 psi (690 kPa) available for 30” and 36” (750mm and 900mm).

Flange drilling shall be in accordance with (ASME B16.5 class 150, 2-24”) (ASME 16.47 Series A class 150, 26-48”)

Knife gate valves shall be provided with a Rotork IQ Series electrical actuator with Remote Hand Station in accordance with subsection W-32.06 & W-32.07.

All valves shall have a 2-Year Manufacturer’s Warranty.

W-32.06 Knife Gate Submersible Electric Motor Actuator

Electric motor actuators for knife gate valves shall be the close-coupled electric motor-driven screw type. Electric motor actuators shall operate the valves from full closed to full open in 120 seconds. Additional limit switches, indicating lights, position transmitters and remote position indicators, remote operating controls and other accessories and controls shall be provided as shown, specified, or required.

1. GENERAL:

The actuators shall be suitable for use on a nominal 480 volt three-phase 60 Hertz power supply and are to incorporate motor, integral reversing starter, local control facilities, terminals for remote control and indication connections, and a backlit LCD display with digital position indication and alarm icons housed within a self-contained sealed enclosure.

In order to maintain the integrity of the enclosure, setting of the torque levels, position limits and configuration of the indication contacts etc. shall be carried out without the removal of any actuator covers and without mains power providing the option of Infra-red or Bluetooth® wireless interface. Sufficient commissioning tools shall be provided with the actuators and must meet the enclosure protection and certification levels of the actuators. Commissioning tools shall not form an integral part of the actuator and must be removable for secure storage / authorized release. In addition, provision shall be made for the protection of configured actuator settings by a means independent of access to the

commissioning tool. Provision shall be made to disable Bluetooth® communications or only allow a Bluetooth® connection initiated by an Infra-Red command for maximum security.

The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel irrespective of the connection sequence of the power supply.

The actuator shall include an on-board data logger to store operational data such as valve torque profiles, actuator events, and statistics that can be viewed locally on the LCD screen or downloaded via infrared port. A PDA shall be furnished by the actuator manufacturer and include actuator diagnostic software to download, review, analyze, and reconfigure the actuator. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence of the three-phase power supply connected to the actuator.

2. ACTUATOR SIZING:

The actuator shall be sized to guarantee valve closure at the specified differential pressure and temperature. The safety margin of motor power available for seating and unseating the valve shall be sufficient to ensure torque switch trip at maximum valve torque with the supply voltage 10% below nominal. For linear operating valves, the operating speed shall be such as to give valve closing and opening at approximately 10-12 inches per minute unless otherwise stated in the data sheet. For 90° valve types the operating time will be specified.

3. ENVIRONMENTAL:

Actuators shall be suitable for indoor and outdoor use. The actuator shall be capable of functioning in an ambient temperature ranging from -33°C (22°F) to 70°C (140°F), up to 100% relative humidity.

Actuators for hazardous area applications shall meet the area classification, gas group and surface temperature requirements specified.

4. ENCLOSURE:

Actuators shall be o-ring sealed, watertight to IP66/IP68 rated for a minimum of 15 feet of head for 72hrs, NEMA 4,4x and 6. The motor and all other internal electrical elements of the actuator shall be protected from ingress of moisture and dust when the terminal cover is removed on site for cabling, the terminal compartment having the same ingress protection rating as the actuator with the terminal cover removed.

Enclosure must allow for temporary site storage without the need for electrical supply connection.

All external fasteners shall be plated stainless steel. The use of un-plated stainless steel or steel fasteners is not permitted.

5. MOTOR:

The motor shall an integral part of the actuator, designed specifically for valve actuator applications. It shall be a low inertia high torque design, class F insulated with a class B temperature rise giving a time rating of 15 minutes at 40°C (104°F) at an average load of at least 33% of maximum valve torque. Temperature shall be limited by 2 thermostats embedded in the motor end windings and integrated into its control.

Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gearcase.

6. MOTOR PROTECTION:

Protection shall be provided for the motor as follows:

- Stall - the motor shall be de-energized within 8 seconds in the event of a stall when attempting to unseat a jammed valve.
- Over temperature - thermostat will cause tripping of the motor. Auto-reset on cooling
- Single phasing - lost phase protection.
- Direction – phase rotation correction.

7. GEARING:

The actuator gearing shall be totally enclosed in an oil-filled gearcase suitable for operation at any angle. Grease lubrication is not permissible. All drive gearing and components must be of metal construction and incorporate a lost-motion hammer blow feature. For rising spindle valves the output shaft shall be hollow to accept a rising stem, and incorporate thrust bearings of the ball or roller type at the base of the actuator. The design should be such as to permit the opening of the gearcase for inspection or disassembled without releasing the stem thrust or taking the valve out of service. For 90° operating type of valves drive gearing shall be self-locking to prevent the valve back-driving the actuator.

8. HAND OPERATION:

A handwheel shall be provided for emergency operation, engaged when the motor is declutched by a lever or similar means, the drive being restored to electrical operation automatically by starting the motor. The handwheel or selection lever shall not move on restoration of motor drive. Provision shall be made for the hand/auto selection lever to be locked in both hand and auto positions. It should be possible to select hand operation while the actuator is running or start the actuator motor while the hand/auto selection lever is locked in hand without damage to the drive train.

Clockwise operation of the handwheel shall give closing movement of the valve unless otherwise stated in the data sheet. For linear valve types the actuator handwheel drive must be mechanically independent of the motor drive and should be such as to permit valve operation in a reasonable time with a manual force not exceeding 400N through stroke and 800N for seating/unseating of the valve.

9. DRIVE INTERFACE:

The actuator shall be furnished with a drive bushing easily detachable for machining to suit the valve stem or gearbox input shaft. The drive bush shall be positioned in a detachable base of the actuator. Thrust bearings shall be sealed for life and the base shall be capable of withstanding five times the rated thrust of the actuator.

10. LOCAL CONTROLS:

The actuator shall incorporate local controls for Open, Close and Stop and a Local/Stop/Remote mode selector switch lockable in any one of the following three positions: local control only, stop (no

electrical operation), remote control plus local stop only. It shall be possible to select maintained or non-maintained local control.

The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

The local controls and display shall be rotatable through increments of 90 degrees to suit valve and actuator orientation.

11. TORQUE AND LIMITS:

Torque and turns limitation to be adjustable as follows:

- Position setting range – multi-turn: 2.5 to 8,000 turns, with resolution to 7.5 deg. of actuator output.
- Position setting range – direct drive part turn actuators: 90° +/-10°, with resolution to 0.1 deg. of actuator output.
- Torque setting: 40% to 100% rated torque.

Position measurement – Absolute position measurement should be incorporated within the actuator. The technology must be capable of reliably measuring position even in the case of a single fault. The design must be simple with the minimum amount of moving parts (no more than 5). Technologies such as LEDs or potentiometers for position measurement are considered unreliable and therefore not preferred.

Measurement of torque shall be from direct measurement of force at the output of the actuator. Methods of determining torque-using data derived from the motor such as motor speed, current, flux etc are not acceptable

A means for automatic “torque switch bypass” to inhibit torque off during valve unseating and “latching” to prevent torque switch hammer under maintained or repeated control signals shall be provided.

The electrical circuit diagram of the actuator should not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit.

12. REMOTE VALVE POSITION AND STATUS INDICATION:

Four contacts shall be provided which can be selected to indicate any position of the valve; Provision shall be made for the selection of a normally closed or open contact form. Contacts shall maintain and update position indication during handwheel operation when all external power to the actuator is isolated.

The contacts shall be rated for 5mA to 5A, 120V AC, 30V DC.

As an alternative to providing valve position indication any of the four above contacts shall be selectable to signal one of the following:

- Valve opening, closing or moving
- Thermostat tripped, lost phase
- Motor tripped on torque in mid travel, motor stalled

- Remote selected
- Actuator being operated by handwheel
- Actuator fault

Provision shall be made in the design for an additional eight contacts having the same functionality.

A configurable monitor relay shall be provided as standard, which can be used to indicate either Availability or Fault. The relay should be a spring return type with a Normally Open / Normally Closed contact pre-wired to the terminal bung.

The Monitor (availability or fault) relay, being energized from the control transformer will de-energise under any one or more the following conditions:

Available Mode

- Loss of main or customer 24V DC power supply
- Actuator control selected to local or stop
- Motor thermostat tripped
- Actuator internal fault
- Loss of main or customer 24V DC power supply

Provision shall be made in the design for the addition of a contactless transmitter to give a 4-20mA analogue signal corresponding to valve travel and / or torque for remote indication when required. The transmitter will auto range to the set limits

13. LOCAL POSITION INDICATION:

The actuator display shall include a dedicated numeric/symbol digital position indicator displaying valve position from fully open to fully close in 0.1% increments. Valve closed and open positions shall be indicated by symbols showing valve position in relation to the pipework to ensure that valve status is clearly interpreted. With mains power connected, the display shall be backlit to enhance contrast at all ambient light levels and shall be legible from a distance of at least 5m (16ft).

Red, green, and yellow LEDs corresponding to open, closed and intermediate valve positions shall be included on the actuator display when power is switched on. The yellow LED should also be fully programmable for on/off, blinker and fault indication. The digital display shall be maintained and updated during handwheel operation when mains power to the actuator is isolated. In the event of a (main) power (supply) loss or failure, the position contacts must continue to be able to supply remote position feedback and maintain interlock capabilities. If batteries are required to maintain contact functionality the actuator vendor shall provide a supply sufficient for 30 continuous days of un-powered operation with one complete valve cycle every hour

The actuator display shall include a fully configurable dot-matrix display element with a minimum pixel resolution of 168 x 132 to display operational, alarm, configuration and graphical datalogger information. The text display shall be selectable between English and other languages such as: Spanish, German, French, and Italian. Provision shall be made to upload a different language without removal of any covers or using specialized tools not provided as standard with the actuator.

Datalogger graphical displays should as a minimum be able to display log and trend graphs on the local LCD for the following:

- Torque versus Position
- Number of Starts versus Position
- Number of starts per hour
- Dwell Time
- Average temperature

The main display shall be capable of indicating 4 different home-screens of the following configuration:

- Position and status
- Position and torque (analogue)
- Position and torque (digital)
- Position and demand (positioning)

Provision shall be made for the addition of an optional environmental cover to protect the display from high levels of UV radiation or abrasive materials.

The local controls and display shall be rotatable through increments of 90 degrees to suit valve and actuator orientation.

14. INTEGRAL STARTER AND TRANSFORMER:

The reversing starter, control transformer and local controls shall be integral with the valve actuator, suitably housed to prevent breathing and condensation. The starter shall be suitable for 60 starts per hour and of rating appropriate to motor size. The controls supply transformer shall be fed from two of the incoming three phases and incorporate overload protection. It shall have the necessary tapping and be adequately rated to provide power for the following functions:

- Energizing of the contactor coils.
- 24V DC or 110V AC output for remote controls (maximum 5W/VA)
- Supply for all the internal electrical circuits.

15. REMOTE CONTROL FACILITIES:

The necessary control, wiring and terminals shall be provided integral to the actuator enclosure. Open and close external interlocks shall be made available to inhibit local and remote valve opening / closing control. It shall be possible to configure the interlocks to be active in remote control only.

Remote control signals fed from an internal 24V DC (or 110VAC) supply and/or from an external supply between 20V and 60 VDC or 40V and 120VAC, to be suitable for any one or more of the following methods of control:

- Open, Close and Stop control.
- Open and Close maintained or “push to run” (inching) control.
- Overriding Emergency Shut-down to close (or open) valve from a normally closed or open contact.

- Two-wire control, energize to close (or open), de-energize to open (or close).

Additionally provision shall be made for a separate 'drive enable' input to prevent any unwanted electrical operation.

It shall be possible to reverse valve travel without the necessity of stopping the actuator. The motor starter shall be protected from excessive current surges during rapid travel reversal. The internal circuits associated with the remote control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 2kV.

Provision shall be made for operation by distributed control system utilising the following network systems:

- Profibus
- Modbus
- Foundation Fieldbus
- Pakscan (wired and wireless)
- HART

16. MONITORING FACILITIES:

Facilities shall be provided for monitoring actuator operation and availability as follows:

Actuator text display indication of the following status/alarms:

- Closed Limit, open limit, moving open, moving closed, stopped
- Torque trip closing, torque trip opening, stalled
- ESD active, interlock active
- Thermostat trip, phase lost, 24V supply lost, Local control failure
- Configuration error, Position sensor failure, Torque sensor failure
- Battery low, power loss inhibit

Integral datalogger to record and store the following operational data:

- Opening last /average torque against position
- Closing last /average torque against position
- Opening motor starts against position
- Closing motor starts against position
- Total open/closed operations
- Maximum recorded opening and closing torque values
- Event recorder logging operational conditions (valve, control and actuator)

The datalogger shall record relevant time and date information for stored data.

Datalogger data shall be accessed via non-intrusive *Bluetooth*® communication and data displayed on the local LCD. Sufficient standard intrinsically safe tools shall be provided for downloading datalogger and actuator configuration files from the actuators and subsequent uploading to a PC. The actuator manufacturer shall supply PC software to enable datalogger files to be viewed and analyzed.

17. WIRING AND TERMINATION:

Internal wiring shall be tropical grade PVC insulated stranded cable of appropriate size for the control and 3-phase power. Each wire shall be clearly identified at each end. The terminals shall be embedded in a terminal block of high tracking resistance compound.

The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal and shall be provided with a minimum of 3 threaded cable entries with provision for an additional 5 extra conduit entries.

All wiring supplied as part of the actuator to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable.

A durable terminal identification card showing a plan of terminals shall be provided attached to the inside of the terminal box cover indicating:

- Serial number
- External voltage values
- Wiring diagram number
- Terminal layout

The code card shall be suitable for the contractor to inscribe cable core identification alongside terminal numbers.

18. COMMISSIONING KIT:

Each actuator shall be supplied with a start-up kit comprising installation instruction manual, electrical wiring diagram and cover seals to make good any site losses during the commissioning period. In addition, sufficient actuator commissioning tools shall be supplied to enable actuator set up and adjustment during valve/actuator testing and site installation commissioning.

19. PERFORMANCE AND TEST CERTIFICATE:

Each actuator must be performance tested and individual test certificates shall be supplied free of charge. The test equipment should simulate a typical valve load, and the following parameters should be recorded.

- Current at maximum torque setting
- Torque at max. torque setting
- Flash test voltage
- Actuator output speed or operating time.

In addition, the test certificate should record details of specification such as gear ratios for both manual and automatic and second stage gearing if provided, drive closing direction, wiring diagram number.

20. ON SITE START UP ASSISTANCE:

Prior to start up, contractor shall inform service techs of all requirements of the certificate of proper installation. All forms and documentation required for the certificate of proper installation shall be given to service tech prior to start up a minimum of 1 day per two actuators. Startup must be performed by direct factory employees or certified local manufacturer's representative.

21. WARRANTY:

Each actuator shall be warranted for a minimum of 24 months of operation up to a maximum of 36 months from shipment.

22. ACCEPTABLE ELECTRIC MOTOR ACTUATOR MANUFACTURER:

An electric knife gate actuator must be provided for each of the knife gates for Pump#1, Pump#2 & Pump #3. Each actuator must also be provided with a Remote Hand Station mounted at the location shown specified or as directed by the Engineer.

Rotork Controls IQ Series (Open/Close), IQ Series (Throttling) and IQM (Full Modulating), or engineer preapproved equal.

W-32.07 Knife Gate Valve Actuator – Remote Hand Station

1. GENERAL

The Remote Hand Station (RHS) shall be suitable for remote connection to an electric actuator up to 100m distance, include local control facilities, a backlit LCD display and terminals for communication highway connection to the host actuator housed within a self-contained, double-sealed enclosure.

In order to maintain the integrity of the enclosure, setting of the actuator torque levels, position limits and configuration of the indication contacts etc. shall be carried out without the removal of any covers via a Bluetooth® wireless interface. Sufficient commissioning tools shall be provided with the actuators and must meet the enclosure protection and certification levels of the actuator and remote hand station. Commissioning tools shall not form an integral part of the actuator and must be removable for secure storage / authorised release. In addition, provision shall be made for the protection of configured actuator settings by a means independent of access to the commissioning tool. Provision shall be made to disable Bluetooth® communications or only allow a Bluetooth® connection initiated by an Infra-Red command for maximum security.

2. ENVIRONMENTAL

Remote hand station shall be suitable for indoor and outdoor use. The unit shall be capable of functioning in an ambient temperature ranging from -50°C (-58°F) to 70°C (158°F), up to 100% relative humidity. Actuators for hazardous area applications shall meet the area classification, gas group and surface temperature requirements specified in data sheet.

3. ENCLOSURE

Enclosures shall be O-ring sealed, watertight to IP66/IP68 7m for 72hrs, NEMA 4, 6. The internal electrical elements of the actuator shall be protected from ingress of moisture and dust when the terminal cover is removed for site for cabling, the terminal compartment having the same ingress protection rating as the actuator with the terminal cover removed.

Enclosures must allow for temporary site storage without the need for electrical supply connection.

All external fasteners shall be plated stainless steel. The use of un-plated stainless steel or steel fasteners is not permitted.

4. LOCAL CONTROLS

The RHS shall incorporate local controls for Open, Close and Stop and a Local/Stop/Remote mode selector switch lockable in any one of the following three positions: local control only, stop (no electrical operation), remote control plus local stop only. It shall be possible to select maintained or non-maintained local control.

The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator. Provision should be made to enable control arbitration between the RHS and the connected actuator.

The local controls and display shall be rotatable through increments of 90 degrees to suit mounting orientation and access.

5. POWER AND COMMUNICATION

Power for the RHS shall be provided from the actuator and shall run in the same cable as the interconnecting communication. Independent power is not acceptable.

Communication between the RHS and actuator should be based on a high-speed CAN bus technology.

6. LOCAL POSITION INDICATION

The RHS display shall include a dedicated numeric/symbol digital position indicator displaying valve position from fully open to fully close in 0.1% increments. Valve closed and open positions shall be indicated by symbols showing valve position in relation to the pipework to ensure that valve status is clearly interpreted. With power connected, the display shall be backlit to enhance contrast at all ambient light levels and shall be legible from a distance of at least 5m (16ft).

Red, green, and yellow LEDs corresponding to open, closed and intermediate valve positions shall be included on the RHS display when power is switched on. The yellow LED should also be fully programmable for on/off, blinker and fault indication.

The RHS display shall include a fully configurable dot-matrix display element with a minimum pixel resolution of 168 x 132 to display operational, alarm, configuration and graphical datalogger information. The text display shall be selectable between English and other languages such as: Spanish, German, French, and Italian. Provision shall be made to upload a different language without removal of any covers or using specialized tools not provided as standard with the actuator.

Datalogger graphical displays should as a minimum be able to display log and trend graphs on the local LCD for the following:

- Torque versus Position
- Number of Starts versus Position
- Number of starts per hour
- Average temperature

The display shall be capable of indicating 4 different home-screens of the following configuration:

- Position and status

- Position and torque (analogue)
- Position and torque (digital)
- Position and demand (positioning)

Provision shall be made for the addition of an optional environmental cover to protect the display from high levels of UV radiation or abrasive materials.

The local controls and display shall be rotatable through increments of 90 degrees to suit valve and actuator orientation.

Optional vandal-proof cover should be available to prevent un-authorised operation and to protect the LCD and window from damage.

7. MONITORING FACILITIES

Facilities shall be provided for monitoring actuator operation and availability directly from the RHS.

Actuator datalogger information shall be accessed via non-intrusive Bluetooth® communication via the RHS and data displayed on the LCD. Sufficient standard intrinsically safe tools shall be provided for downloading datalogger and actuator configuration files from the actuators and subsequent uploading to a PC. The actuator manufacturer shall supply PC software to enable datalogger files to be viewed and analyzed.

8. WIRING AND TERMINATION

A terminal compartment shall be provided to enable interconnecting cables to be terminated without the removal of the main electronics cover.

The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal.

All wiring supplied as part of the RHS to be contained within the main enclosure for physical and environmental protection.

9. IDENTIFICATION

A durable anodized aluminum nameplate shall be affixed to the RHS housing and contain all relevant serial and approval information.

W-32.08 Valve Limit Switches

Valves shall be provided with suitable mechanical cam gear type limit switches for remote operation, indication and other control as shown, specified, and required. Each limit switch shall be compatible with its associated operation and suitable for the service intended. Limit switches shall be furnished with valves by the valve manufacturer.

Mechanical limit switches for the discharge valve actuators shall be 4-pole gang-mounted in required multiples and with necessary mechanical linkage, as shown on the limit switch contact development chart provided with the sewage pump control Contract Drawings. Switch contact ratings shall be 120-volt a-c, 20 amperes at 75 to 100 percent power factor, and 124-volt d-c, 5 amperes minimum. Mechanical limit switches shall be Series SL2, 3, of 4HC for normal use, as manufactured by NAMCO of North Carolina, or equal. Explosion-proof type shall be Series SL2, 3, or 4XC, or equal. All enclosures shall be watertight and oil-tight for normal service and of cast aluminum for explosion-proof type. Operating levers shall be NAMCO Series D-1260, or equal. Switches shall be complete with all racks, gears, cam, linkages, mountings, and accessories as required.

W-32.09 Testing

All valves shall be given hydrostatic shop pressure tests at twice the working pressure specified. The valves shall be tested, first by applying the hydrostatic pressure with the valve open and then with the valve closed. The valves shall be tight and secure under the test pressure.

Valves shall be tested in place by the Contractor, as far as practicable, and any defects in valves or connections shall be corrected to the satisfaction of the Engineer.

W-32.10 Painting and Coating

The exteriors of the knife gate valve and the pump-check plug valves, other than stainless steel, shall receive the coating system as indicated for steel pipe and fittings in the Workmanship and Materials section titled “Painting”.

Plug valves shall receive a factory interior and exterior coating of Tnemec Series 141 (4 mils thick).

Chain wheels shall be coated by galvanizing or electroplating with zinc or cadmium. The chain shall be coated by electroplating with zinc or cadmium. Zinc electroplating shall meet the requirements of Fed. Spec. QQ-Z-325, Type II, Class 2; and cadmium electroplating shall meet the requirements of Fed. Spec. QQ-P-416, Type II, Class 2.

W-32.11 Ball Valves for CPVC Piping

Manually operated ball valves for CPVC piping shall be CPVC ball valves having renewable Teflon ball seats and EPDM seals. Ball valves shall block in both seating directions, leaving full pressure on the opposite end of the valve. The CPVC ball valves shall be rated at not less than 150 psi working pressure at 75 degrees F, self-lubricating, and shall have socket end connectors. The ball valves shall be of true union design to allow for inspection or removal. CPVC ball valves shall be as manufactured by Hayward Industrial Products, Inc., or equal.

W-32.12 Ball Check Valves for CPVC Piping

Ball check valves for CPVC piping shall be constructed of solid CPVC and shall have a CPVC ball. The check valve shall have EPDM O-rings and shall be capable of operating either horizontally or vertically. The check valve shall have a full flow design that provides a free open area that is equivalent to the connecting pipe size. The check valves shall have socket end connectors and shall be of the true union design to allow for inspection and removal of the valve. Ball valves for CPVC piping shall be as manufactured by Hayward Industrial Products, or equal.

* * *

SECTION 35 -MAGNETIC FLOW METER

W-35.01 GENERAL

The magnetic flow meter system, including the flow element (sensor) and remote signal converter (transmitter), shall be of the WaterMaster series of products manufactured by ABB Ltd. A letter of standardization for the meter manufacturer has been included in the Contract documents and no other manufacturer will be considered.

W-35.02 INSTRUMENT

Magnetic flow meter system shall be of the microprocessor-based, high impedance electromagnetic induction type and produce a DC pulsed signal directly proportional to and linear with the liquid flow rate. Complete zero stability shall be an inherent characteristic of the flow meter system. The magnetic flow meter system shall include a metering tube, signal cable (150 feet), and signal converter/transmitter. The metering tube shall be constructed of 316 stainless steel with flanged connections, have at least two diametrically opposed self-cleaning electrodes compatible with the process fluid (sewage sludge), have a nonconductive liner material rated for the process fluid and be suitable for the intended purpose in all other respects. The meter housing shall be rated for IP68/NEMA 6P, continuous submergence, and have an exterior coating consisting of a corrosion resistant finish. The manufacturer shall supply and connect the signal cable to the flow sensor at the factory using best practices to ensure a waterproof assembly. The manufacturer shall prepare the other end of the cable so that it is ready to be terminated at the remote signal converter/transmitter in the field. The metering tube shall be provided with matching 316 stainless steel grounding rings. The flow meter shall have an operable measurement range of 1000:1, and shall have bi-directional measurement capability with forward, reverse and net totalization.

The signal converter/transmitter shall use a DC pulsed technique to drive bi-polar flux-producing coils and convert the DC pulse signal from the tube to a 4-20 MA DC signal. The signal converter/transmitter shall be microprocessor based, and have a LCD back-lit display with forward/reverse/net flow register, flow rate indication register, and alarm monitoring icon housed in an IP65/NEMA 4X enclosure. The transmitter shall provide empty pipe detection, have an integral self-test feature to verify proper operation of the electronics, provide high and low alarms, and an automatic zero adjustment.

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

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

Flow Tube: IP68/NEMA 6X Designed for continuous submergence
Transmitter: IP65/NEMA 4X Remote signal converter
Accuracy: 0.40% of reading or +/-0.003 ft/sec up to a maximum velocity of 49ft/sec
Repeatability: 0.05% or +/-0.008ft/sec.
Rangeability: 1000:1
Temperature: Up to 80°C.

Power: 90 to 260VAC. Power consumption <20VA with transmitter
Output: 4 to 20 MADC into 800ohms. Isolated and fully programmable
Two pulse/frequency outputs

W-35.03 FLOW METERING TUBE

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

The flow meter tube shall be constructed of type 316 stainless steel. The magnetic field generating coils shall be located around the metering tube. The coils shall be potted with an epoxy-base compound. An insulating interior liner of elastomer shall be inserted and turned out against the flange faces. The metering tube shall be capable of withstanding a test pressure of at least 100 PSI. The flow meter shall have 150 pound ANSI or AWWA Class D flanges and built in grounding electrodes. The flow meter shall be rated for continuous submergence to a depth of 30 feet in accordance with the requirements of IP68. The metering tube shall have an internal neoprene liner that is certified for use with raw sewage. The flow meter electrodes shall be of the protruding self-cleaning design made of type 316 stainless steel. Removable electrodes or ultrasonic cleaners are not acceptable. The input impedance of the electrodes shall be greater than ten million (10,000,000) mega ohms to achieve a meter accuracy that is completely unaffected by coatings. The laying length shall be the current standard for magnetic flow meters (24”). 316 stainless steel grounding rings shall be included with the flow metering system. The grounding rings shall insert between both flanges and shall not interfere with the internal flow profile. All gaskets for proper metering tube installation shall be included. The gaskets shall be made of a material suitable for raw sewage service and shall not be affected by any petroleum products or byproducts.

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

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

W-35.04 FLOW TRANSMITTER

The signal converter for the flow meter shall be housed in an IP65/NEMA 4X enclosure. This enclosure shall be suitable for pipe stand or wall mounting.

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

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

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

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

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

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

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

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

* * * END OF SECTION * * *

SECTION 36 - PAINTING

W-36.01 General

Painting includes furnishing all labor, materials, and services to paint all structures and equipment specified and required to complete the work, including, but not limited to, the following: preparation of surfaces; field painting of existing and proposed structures, piping, conduit, ductwork and equipment as specified, and the marking of existing piping and electrical conduit. The work shall include furnishing samples of paints and color charts.

Paint and other materials shall be of the type and quality of the manufacturer on which the coating schedule is based. All coats of paint for any particular surface and thinners used shall be from the same manufacturer. The treatment of the surface to be painted and the application of paint shall be in accordance with the instructions of the manufacturer and as approved by the Engineer. The colors of paints shall be as approved by the Engineer. Specimens, approximately 8 by 10 inches in size, shall be prepared and submitted to the Engineer. The minimum number of specimen custom mixed colors submitted shall be 6 not including color coding colors. Only paint of approved manufacturers shall be delivered and stored at the site.

All painting shall be in accordance with the schedules included in this specification. A supplementary schedule of paint products shall be submitted, with mil thickness, to cover all paint applied. The schedule shall be in accordance with the recommendations of the manufacturer of the paint. The total mil thickness of all coatings shall be not less than the schedule included in this section.

W-36.02 Delivery and Storage

Paints, stains, varnish, or ingredients of paints to be mixed on the job shall be prepared, packed and labeled, and guaranteed by an approved manufacturer. All material shall be delivered to the site in original, unbroken containers.

The manner of and place for storing the painting materials at the site shall be as approved by the Engineer. The storage space shall be kept clean at all times. Every precaution shall be taken to eliminate fire hazards.

W-36.03 Surface Preparation

Prior to painting, all surfaces shall be prepared and cleaned in strict accordance with the paint manufacturer's recommendations and as directed by the Engineer. Surfaces shall be dry before any paint is applied. Special surface preparation work shall be as directed by the manufacturer of the paint specified to be applied to the surface.

Metal Surfaces:

This includes all exterior and interior steel surfaces and all nonferrous metals. This applies to structural and miscellaneous steel, motors, designated housings and protective guards, piping, valves, stairs, and in general, all surfaces to be painted as designated in these specifications.

All surfaces shall be cleaned in accordance with Steel Structures Painting Council standards SSPC - SP1 Solvent Cleaning for removal of grease and oil. This standard allows for pressure washing, detergent cleaning, etc. Additional rust, loose paint, loose mill scale, etc., shall be removed in accordance with SSPC - SP2 Hand Tool Cleaning or SSPC - SP3 Power Tool Cleaning. All welds, beads, blisters or protuberances, other than identification markings shall be ground smooth. Pits and dents shall be filled with a suitable product as approved by the Engineer, and other imperfections shall be removed. Painted edges shall be sanded smooth with adjacent bare metal surfaces.

Where aluminum surfaces come in contact with incompatible metals, lime, mortar, concrete or other masonry materials, these areas shall be given two coats of asphalt varnish conforming to Fed. Spec. TT-V-51F.

Concrete and Wood Surfaces:

Surface preparation of all exterior concrete and wood surfaces shall be pressure washed to remove cobwebs, dirt, dust, and other surface contaminations. Mildew shall be treated with a 22% chlorine solution or otherwise by mixing equal parts solution bleach and water to the affected area. Loose paint and other defects shall be removed by hand; brushing, sanding, chipping or other hand tools or by power; brushes, impact tools, grinders, sanders or other power tools or by any combination thereof. Painted edges shall be sanded smooth to match adjacent bare surfaces.

All interior concrete and wood surfaces including ceilings, walls, and floors shall be cleaned similar to SSPC - SP1 Solvent Cleaning standards. Loose paint and other defects shall be removed by hand; brushing, sanding, scraping, chipping or other hand tools or by power; brushes, impact tools, grinders, sanders or other power tools or by any combination thereof. Painted edges shall be sanded smooth to match adjacent bare surfaces.

Priming shall be performed with Porter Acri-Pro 100, 100% Acrylic, or equal. First and second coats shall be performed with Porter Acri-Shield, 100% Acrylic, or equal. Concrete, concrete masonry, and wood shall be thoroughly dry prior to painting."

W-36.04 Coatings

All paints and similar materials shall be mixed in galvanized iron pans or pails or other approved containers of adequate capacity. All paint shall be stirred thoroughly before being taken from the containers, shall be kept stirred while using, and all ready-mixed paint shall be applied exactly as received from the manufacturer without addition of any kind of drier or thinner, except as specified or as permitted or directed by the Engineer. Successive coats of paint shall be tinted to make various coats easily distinguishable. Undercoats of paint shall be tinted to the approximate shade of the final coat of paint. The paint shall be a minimum temperature of 60 degrees F before application.

Only skilled painters shall be used on the work, and specialists shall be employed where required. Paint shall be applied by brush, roller, or sprayer in accordance with the manufacturer's recommendation. Finished surfaces shall not show brush marks or other irregularities. Top and bottom edges of doors shall be painted. Undercoats on hollow metal work shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal abrasive to remove all surface defects and provide a smooth, even surface.

Painting shall be a continuous and orderly operation to facilitate adequate inspection. All paint

application methods shall be in accordance with the instructions of the paint manufacturer and as approved by the Engineer. Access panels, pipes, pipe covering, ducts, and other building appurtenances built into or adjoining walls to be painted shall be painted the same color as adjacent walls, unless otherwise directed by the Engineer. Hardware and accessories, fixtures, and similar items placed prior to painting shall be removed or protected during painting and replaced on completion of painting. All wall surfaces to be concealed by equipment shall be painted before installation of the equipment.

Areas under and adjacent to painted work shall be fully protected at all times and dripped or splattered paint shall be promptly removed. Painting shall not be done when the temperature is below 60 degrees F, or in dust-laden air, or until moisture on the surface has completely disappeared. If necessary, sufficient heating and ventilation shall be provided to keep the atmosphere and all surfaces to be painted dry and warm until each coat of paint has hardened. Any painting found defective shall be removed and repainted or touched up as directed by the Engineer.

Coatings must be allowed to cure before being recoated or placed into service. Drying time requirements recommended by the manufacturer should be followed exactly.

The final colors shall be as noted on the color schedule.

Coverage shall be complete. When color on undercoats shows through the final coat of paint, the work shall be covered by additional coats until the paint is of uniform color and appearance and coverage is complete, at no additional cost.

Rooms or areas being painted shall be supplied with sufficient temporary ventilation during painting operations to keep the atmosphere safe from harmful or dangerous fumes and harmful dust levels for personnel.

All application tools and equipment shall be in good working order and suitable for proper applications. It shall be the Contractor's responsibility to ensure that no paint mist or spatter falls or blows to other objects, vehicles, equipment, buildings, etc.

Coating Schedule:

All painting shall be in accordance with the following schedule. The number of coats shall not be less than the number shown on the schedule.

COATING SCHEDULE (NEW)					
			Coats		
Surfaces	**SHOP COAT**	**Primer**	**1ST**	**2ND**	**3RD**
Aluminum	NA	B	E	NA	NA
Electrical Conduit	NA	B	E	NA	NA
Steel Pipe, Valves, and Fittings	C	Shop	C	E	NA
Galvanized Steel	NA	B	E	NA	NA
Ductile Iron Pipe, Valves, and Fittings	A	Shop	C	E	NA
Miscellaneous Steel and Ironwork	C	Shop	C	E	NA
Machinery, Interior, and Nonsubmerged	Shop Standard	I	E	NA	NA
Exterior Concrete or Masonry	NA	H (CMU)	F	G	NA

COATING SCHEDULE (PREVIOUSLY PAINTED)					
			Coats		
Surfaces	**Spot Coat Bare Surface**	**Full Prime Coat**	**2nd**		
Aluminum	I	I	E		
Electrical Conduit	I	I	E		
Steel Pipe, Valves, and Fittings	I	I	E		
Galvanized Steel	I	I	E		
Ductile Iron Pipe, Valves, and Fittings	I	I	E		
Miscellaneous Steel and Ironwork	I	I	E		
Machinery, Interior, and Nonsubmerged	I	I	E		
Exterior Concrete or Masonry	H (CMU) or F (Concrete)	F	G		

The designations in the following list are given solely for the purpose of indicating the type and quality of materials desired. Approved equivalent material of other manufacturers may be substituted. All coats of paint for any particular surface shall be from the same manufacturer.

ALPHABETICAL DESIGNATIONS OF PRODUCTS		
Symbol	**Product Name and Number**	**Minimum Dry Film Thickness Mils per Coat**
A	Tnemec N140 Pota-Pox II	3.0-5.0
B	Tnemec N69 Polyamidoamine Epoxy	2.5-3.5
C	Tnemec N69 Polyamidoamine Epoxy	4.0-6.0
D	Tnemec Series 446 Perma-Shield	5.0 - 7.0
E	(Above Grade) Tnemec 1074U Endurashield (Below Grade) Tnemec Series 446 Perma-Shield	3.0-5.0 5.0 – 7.0
F	Porter Acri-Pro 100, 100% Acrylic	1.2

G	Porter Acri-Shield, 100% Acrylic	1.4
H	Block Filler	85 -100 SF / Gal
I	Tnemec 135 Chembuild	3.0-5.0

W-36.05 Safety

The Contractor shall be responsible for exercising all necessary precautions to ensure that no accidents or damage to personnel, equipment, or buildings shall occur. The Contractor shall further determine any special operations which could influence the safe workmanship of his personnel with respect to electrical, mechanical, or chemical fumes or fire hazard situations.

When painting in confined areas or otherwise in areas where explosive fumes or gases need to be ventilated, the Contractor shall use suction type fans designated specifically for the safe removal of explosive fumes or gases, and all equipment involved shall meet all OSHA (Occupational Safety Hazard Act) requirements and MSHA (Mine Safety and Health Administration) approved. The Contractor shall be responsible in all respects for the safe conduct of his personnel when using any of the rigging or equipment involved in the accomplishment of the work specified herein.

W-36.06 Cleaning

The Contractor shall touch up and restore any damaged finish. Paint or other finishes spilled, splashed, or splattered shall be removed from all surfaces. Care shall be taken not to mar any surface finish or item being cleaned.

* * *

SECTION 49 - GRAVITY SEWER REHABILITATION BY CURED-IN-PLACE PIPE (C.I.P.P.)

W-49.01 Scope of Work

This specification covers the materials and method of application for the rehabilitation of gravity sewers through the use of C.I.P.P.

The proposed location for gravity sewer rehabilitation by C.I.P.P. is as shown on the Plans.

The Contractor shall furnish all labor, materials, and special equipment required to accomplish the work in accordance with these specifications. The installation shall affect the complete interior relining of the existing sanitary sewer piping and shall result in a smooth, hard, strong, and chemically inert interior finish closely following the contours of the existing piping. The Contractor shall provide a completed system with trunk sewer and all lateral connections in operational condition.

The Contractor shall provide all necessary television monitoring and cutting equipment and perform all work required to cut out unnecessary liner material at the locations of all existing lateral pipes and reestablish service to all laterals entering the trunk sewer. **All television inspection videos to be provided to the City shall be in DVD or USB format.**

The actual sizes, lengths, and materials of the pipes to be relined shall be as indicated in the contract documents, subject to verification by the Contractor prior to commencing the lining installation.

The Contractor shall provide all water, piping, hoses, valves, or connections necessary to complete the lining process.

W-49.02 ASTM Standards

The proposed rehabilitation by CIPP shall be in accordance with these specifications and the applicable reference standards from the American Society for Testing and Materials, such as: ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube), ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)), ASTM D5813 (Cured-in-Place Thermosetting Resin Sewer Pipe), ASTM D790 (Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials), and D2990 (Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics) which are made a part hereof by such reference and shall be the latest edition and revision thereof. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

W-49.03 Qualification of Pipelining Contractor

The prospective Contractor must be approved, in writing, by the Engineer prior to the award of the contract. The Contractor shall provide any information or documentation which the Engineer may require as proof of the Contractor's competency to perform work of the type herein specified.

Minimum requirements for approval by the Engineer shall be as follows:

(1) The Contractor shall have been engaged in the business of furnishing and installing the C.I.P.P., and shall have been performing work of similar type, magnitude, and difficulty for a period not less than 5 years and shall also have successfully installed at least 1,000,000 feet of a cured-in-place product in wastewater collection systems. Work performed in non-wastewater systems will not be accepted.

(2) The Contractor shall submit a resume' and list of projects of similar complexity in wastewater collection systems only, which have been successfully completed by him in the past.

(3) The Contractor shall be capable of providing test data supporting the long-term strength, corrosion resistance, and 50-year design life of the liner. These tests shall be based on the following standards:

a) Material tested shall be identical to those proposed for installation and from samples of material in final resting place after the trauma of installation and/or reforming of the product. Testing shall be in accordance with applicable ASTM standards. Laboratory samples will not be acceptable.

b) Short-term tests can be extrapolated using actual short-term test data and applicable ASTM standards for plastic pipe.

c) All test data (whether theoretically extrapolated or actual) must be validated by an independent third party qualified in these testing procedures.

(4) The Contractor shall be responsible for providing one (1) restrained CIPP sample test at a frequency of 1 test per every 5,000 ft lined or 1 test per every work order issued, or as directed by the Engineer, at the Contractors own expense.

The test shall be based on the following standards:

a) The physical properties and thickness shall be tested in accordance with applicable ASTM standards and the report shall be submitted for review by the Engineer. The restrained sample shall be a minimum of 8-inches in length and full diameter of the pipe size being lined.

b) If any test sample results are unsatisfactory, the City reserves the right to increase the testing frequency at no additional cost.

c) The sample test must be validated by an independent third party qualified in these testing procedures such as Specialty Testing Services, Birmingham, Alabama or equal. If the minimum thickness and physical properties are not met as set forth in the contract documents the contractor shall repair or replace the liner. The proposed repair method shall be submitted to the Engineer for approval.

W-49.04 Accuracy of the Plans

To the greatest practical extent, the Plans will depict the details of the work, including the locations and numbers of all manholes, distances between manholes, locations of junctions, pipe sizes, manhole depths, etc. However, the Contractor shall verify all dimensions, including lengths between manholes by field measurement. The Contractor shall also be aware that minor variations in pipe diameter and circumference will occur, and that it is not intended that such minor variations be indicated on the Plans.

W-49.05 Inspections

Prior to commencing the C.I.P.P. installation, the Contractor shall thoroughly clean all piping to be relined and shall inspect the piping utilizing closed circuit television. All television inspection shall utilize a radial view (pan and tilt) camera capable of viewing the entire circumference of the pipe. DVD(s) or USB(s) of the piping to be lined shall be made available to the City for inspection before proceeding with the work. Only certified trained personnel of the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) shall perform the inspection.

The Contractor shall prevent sand or debris from becoming trapped between the existing pipe and its finished liner, or infiltration caused by damage done during the cleaning process. Grouting of laterals or cracks may be required to prevent infiltration and the sand or debris entrapment. If grouting is required, it shall be considered incidental to the lining procedure, and no additional payment shall be made therefor. The grouting of damaged pipelines is required within 48 hours of discovery.

The City reserves the right to inspect the manufacturing of materials. The Contractor shall give appropriate prior notice in order that the City inspector may be on hand to observe the various processes.

No work shall be performed by the Contractor except in the presence of the City of Tampa Inspector unless otherwise approved by the Engineer. The Contractor shall coordinate his work schedule and give timely prior notice regarding his intentions to perform any and/or all parts of the work, in order that the Department's inspector may be on hand. The Contractor shall provide a work schedule a minimum of 2 weeks in advance of starting work to allow for public notification letters to be distributed by the Department. Any work performed in the absence of the Department's inspector is subject to removal and replacement at the Contractor's expense.

Upon substantial completion of the work, the Contractor shall, in the presence of the Department's inspector, inspect the line using a radial view, closed circuit television. The DVD or USB drive thus produced shall be accompanied by a simultaneously produced, narrated sound. The sound narration shall draw attention to all recognizable defects, imperfections, etc., and the location along the length of the piping shall be accurately noted. In addition, the Contractor shall provide a condition assessment inspection report following the latest version of PACP coding and scoring. Also, the locations and all pertinent details regarding the entrance of service laterals into the main trunk sewer shall be accurately noted on the DVD/USB and inspection report. One copy of the DVD/USB and inspection report shall become the property of the City.

W-49.06 Materials

All materials used in the lining and in the insertion process shall be of the best respective kinds and shall be as approved in advance by the City. Any materials not approved by the City prior to insertion into the piping shall be rejected and shall be removed and replaced with approved materials at the Contractor's expense.

The finished C.I.P.P. shall generally consist of a polyester or epoxy resin impregnated, needle interlocked, terylene felt thoroughly bonded to the internal circumference of the existing pipe, and an internal polyurethane membrane integrally bonded to the internal circumference of the felt, thus forming a smooth, chemically inert internal flow surface.

Felt Content: The liner felt content shall be determined by the Contractor to ensure a cured thickness of liner as indicated on the Plans. The thickness of the cured liner is to be as specified and shall not include the thickness of the polyurethane inner liner.

Resin Content: The resin content of the liner shall be 10-15% by volume greater than the volume of felt in the liner bag.

Liner Sizing: The liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the pipe to be lined. Allowance for longitudinal and circumferential stretching of the liner during insertion shall be made by the Contractor.

Length: The length of the liner shall be that deemed necessary by the Contractor to effectively carry out the insertion and seal the liner at the inlet and outlet of the manhole. Individual inversion runs may be made over one or more manhole to manhole sections as determined.

Because the actual strength and characteristics of the finished liner will vary considerably, depending on the types and mixing proportions of the resin and hardener used, the type of felt used, the type and amount of filler material used, and the degree of cure, it shall be the sole responsibility of the Contractor to control these variables and to provide a finished liner possessing the following minimum properties:

Design Parameter	Unit	ASTM Test Method	Minimum Value
Tensile strength at yield-20°C	psi	D638	3,000
Flexural Modulus	psi	D790	250,000
Flexural strength	psi	D790	4,500

The Contractor shall provide a liner exhibiting the above minimum properties. Prior approval of shop drawings related to any or all materials or methods of installation shall not relieve the Contractor of this responsibility.

The Contractor shall provide a finished liner which exhibits excellent resistance to those chemicals, liquids, and gases normally found in raw sewage, in particular, hydrogen sulfide gas.

The resin to be used shall be an epoxy or polyester resin with characteristics compatible with the required mechanical and chemical properties previously specified. A sample of each batch shall be made available to the City for testing.

W-49.07 Execution

Manufacture

It will be necessary for the Contractor to obtain the City's prior approval for all materials or processes and the City shall have the power at any time to order the Contractor to modify or discontinue any practice. All such orders shall be given in writing.

The liner shall be vacuum impregnated with resin not more than 24 hours before the proposed time of installation and stored out of direct sunlight at a temperature of less than 4°C, unless otherwise approved by the Engineer. The Contractor shall designate a location where the CIPP will be vacuum impregnated prior to installation.

The Contractor shall provide all appropriate transport, handling, and protection equipment including refrigerated, or otherwise suitably cooled, transport equipment.

All fabricating and Contractor testing shall be carried out under cover and no materials shall be exposed to the weather until they are ready to be inserted. All materials should be protected from the weather and exposure to ultra-violet light as far as practicable during the manufacture and installation process.

Each liner shall be accompanied by suitable documentation such as a wet out report, indicating time and date of manufacture, felt thickness, number of layers, length of liner, resin types, resin content, catalyst, relevant batch numbers, etc. and provided to the City of Tampa inspector for approval prior to installation.

W-49.08 Installation

Each liner may be manufactured at any time but shall be impregnated with resin not more than 24 hours prior to the intended installation time, unless otherwise approved by the Engineer. The City shall notify the Contractor upon approval of the line cleaning and inspection report, at which time the Contractor may proceed with operations on the site. The Contractor shall coordinate his schedule for impregnation and insertion of the liner bag with the City, and with due regard for site and weather conditions prevailing at the time.

On the event of insertion being delayed after impregnation by unexpected site conditions but prior to the start of the insertion process, the Contractor shall store the liner, at his own cost, for a further period below 4°C for use when conditions allow.

Prior to beginning insertion of the liner bag, the Contractor shall inspect the cleaned line by use of radial view, closed circuit television cameras, and shall confirm to his own, and the City's, satisfaction that the lines are adequately cleaned. No sewage shall flow through the cleaned line between final acceptance of the cleaned line and insertion of the liner bag. If, however, sewage does flow through the clean line prior to the insertion of the liner, then the Contractor shall, at minimum, reinspect the line by use of a radial view, closed circuit television camera in order to evaluate whether further cleaning is warranted. The decision whether or not to employ additional cleaning operations will be made by the Engineer. Insertion of the bag by the Contractor shall serve as evidence of his acceptance of the condition of the piping.

The liner shall be inverted into the pipeline from a suitable platform located above the manhole or other approved point of inversion. The free open end of the liner bag shall be firmly secured to the inversion platform and the folded liner passed down a suitably reinforced column to a shute or bend leading to the opening of the pipe to be lined. Clean water at ambient temperature shall be supplied to the inversion platform at a rate sufficient to cause controlled inversion of the liner into the pipeline.

Alternatively, the liner may also be pulled into position through a manhole or other entry point with the aid of a power winch that is equipped with a device to monitor the force and prevent excessive tension and liner elongation. Extreme care shall be taken during the installation to prevent damage to the liner. After the liner is in place, the calibration hose shall then be securely attached to the standpipe and clean water at ambient temperature shall be supplied to cause a controlled inversion inside the liner.

By either method, the installation forces exerted on the liner shall be limited so as not to stretch the liner longitudinally by more than 5 percent of the original length.

Rehabilitation by fold and form pipe into existing pipes will not be approved on this contract.

The Contractor shall supply a suitable heat source and water recirculation equipment capable of delivering hot water to the far end of the liner to quickly and uniformly raise the water temperature in the entire liner, once inverted in the pipeline, above the temperature required to commence the exothermic reaction of the resin as determined by the catalyst system employed.

The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply to determine when uniform temperature is achieved throughout the length of the liner. Liner installation and curing utilizing steam is considered an acceptable alternative for certain applications and therefore must be approved by the Engineer on a case by case basis.

The finished pipelining shall be continuous over the entire length of an insertion run between two manholes or structures and be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, air bubbles, pinholes, dimples, and delamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to the inside of the lined pipe.

The polyurethane inflation bag, permanently bonded and attached to the felt bag, shall remain as an inner liner. This bag shall not be considered as contributing to any of the specified properties required of the liner.

Any defects which, in the judgement of the Engineer, will affect the integrity or strength of the lining, shall be repaired or the liner replaced at the Contractor's expense. Prior to proceeding with any repair work, the Contractor shall recommend the proposed plan to the Engineer for his approval.

End sections, where cut or terminated within manholes, shall be repaired with City-approved products, cut flush with the face of the manhole, and suitably sealed with "Hydro-Tite" waterstops, as manufactured by Gundle Lining Construction Company, Houston, TX, or equal.

All defective work shall be removed and replaced with new material to the full satisfaction of the City.

W49.09 Service Connection

The existing service connections shall be reconnected after the curing process has been completed. A radial view television camera-guided cutting device, in conjunction with the service locater log from pre-lining inspection, shall be used to identify and restore the service connections to not less than 90% capacity. A smoothing device shall be utilized to smooth all rough edges after re-establishment. A locater log shall be provided to the City which identifies the location of the lateral connection and which connections were re-established. This work shall be done without excavation.

W 49.10 Back-up Equipment

It shall be the Contractors responsibility that all critical equipment necessary to complete the installation of the CIPP liner shall be in good working condition prior to starting construction. Critical equipment shall include service cutting device, brushing tools, CCTV camera, and cleaning equipment. The Contractor shall be required to have one working back-up CCTV camera and cutter and all appurtenances necessary onsite prior to starting construction.

W 49.11 Warranty

All C.I.P.P. will be warranted to be free from defects in materials and workmanship for a period of one year from the date of rehabilitation. Should a defect occur during this one year period that is attributable to the C.I.P.P. installation, then this defect shall be repaired at no additional cost to the City within 30 days.

* * *

SECTION 52 - MANHOLE AND STRUCTURE REHABILITATION

W-52.01 General

It is the intent of this specification to provide for the rehabilitation of the existing brick and concrete manholes, junction chambers and structures shown on the drawings, specified and directed by the Engineer. The rehabilitation shall consist of a spray applied 100% solids epoxy system, or urethane resin system, as specified herein. All aspects of the rehabilitation shall be done in strict accordance to the manufacturer's instructions.

It is the Contractor's responsibility to comply with OSHA standards and all regulations pertaining to work in confined space entry.

W-52.02 Submittals

Prior to the commencement of any rehabilitation work, the Contractor shall submit the following to the Engineer for approval:

1) A rehabilitation plan detailing the methods, materials and procedures proposed for the rehabilitation of all manholes and junction chambers.

2) Mortar and hydraulic cement mix designs detailing the compressive strengths, cement/water ratios, slump, etc.

3) Written certification by the protective coating manufacturer stating that the proposed repair material is compatible and acceptable as a substrate for the protective coating to be applied.

4) Detailed method of complete containment of debris

5) Description of all the equipment to be used for the rehabilitation.

6) Safety plan describing all safety equipment to be utilized in compliance with OSHA standards pertaining to work in confined space entry.

W-52.03 Surface Preparation

Surface preparation shall be in strict accordance with the approved coating manufacturer's instructions. All surfaces to be coated shall be cleaned with a high pressure water spray (minimum 5000 psi). The use of acid for cleaning purposes will not be allowed. All deteriorated concrete and loose or protruding brick and mortar shall be removed from the wall and benches in order to obtain a smooth and even substrate suitable for the proposed coating system. Surfaces shall be cleaned and abraded to produce a sound and uncontaminated surface with adequate profile and porosity to provide a strong bond between the proposed material and the substrate. All corroded materials shall be disposed of at an off-site location in accordance with all Federal, State, and local regulations. All infiltration shall be stopped with hydraulic cement or other approved means before installation of the coating system. Any voids in the manhole walls shall be sealed with hydraulic cement.

Repair materials shall be applied in strict accordance with the manufacturer's instructions and shall be finished as recommended by the protective coating manufacturer. At minimum, the repair material shall be troweled or brushed to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating.

The Contractor shall install bulkheads or plugs in order to prevent extraneous material from entering the sewer lines.

W – 52.05 Epoxy Coating System

The sprayed applied epoxy coating system shall be as manufactured by Raven Lining Systems, Broken Arrow, Oklahoma, or equal. The product shall be a 100% solids, solvent-free ultra high-build epoxy. The finished epoxy shall be resistant to sulfuric acid attack associated with domestic sewage. The epoxy shall be manually sprayed onto the structures or manholes to provide a uniform smooth and even surface.

The minimum finished thickness shall be as specified on the plans. The coating system shall be capable of being applied over wet surfaces without degrading the final product.

The existing manhole and junction chambers shall be prepared for the application of the epoxy system by cleaning and stoppage of infiltration as specified above. Prior to applying the epoxy liner, the entire manhole surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the liner will adhere.

The cured epoxy system shall conform to the minimum physical standards, as listed below:

CURED EPOXY	STANDARD	LONG-TERM DATA
TENSILE STRENGTH	ASTM D-638	7,500 psi
FLEXURAL MODULUS	ASTM D-790	600,000 psi
FLEXURAL STRESS	ASTM D-790	13,000 psi
COMPRESSIVE STRENGTH	ASTM D-695	18,000 psi

The Contractor shall provide certified independent, third party test results verifying the minimum physical properties listed above. The tests shall be in conformance with the ASTM specifications listed.

The finished liner shall be cured in strict accordance with the manufacturer's instructions.

Composite systems containing layers of different materials or cured-in-place resin systems that are inflated in the manholes will not be considered as equal.

W- 52.06 Epoxy Paste (Fast Curing and Moisture Tolerant Coating)

The epoxy paste shall be a two-component moisture tolerant, high adhesive 100% solid strength epoxy paste. The epoxy paste shall be a Concrete Polymer Paste (CPP) as manufactured by EpoxyTec or approved equal. The coating shall be capable of curing underwater and shall be trowel applied up to 1.5-inches thick without sag.

Concrete surfaces shall be prepared for the application of the epoxy paste by cleaning and stoppage of infiltration as specified above. Prior to applying the epoxy paste, concrete surfaces shall be repaired to the extent needed to provide a smooth and even surface to which the liner will adhere.

The epoxy paste shall conform to the minimum physical standards, as listed below:

CURED RESIN	STANDARD	LONG-TERM DATA
TENSILE STRENGTH	ASTM D-638	8,900 psi
FLEXURAL STRESS	ASTM D-790	8,020 psi
FLEXURAL MODULUS	ASTM D-790	720,000 psi

The tensile bond to wet concrete shall be a minimum 525 psi. The Contractor shall provide certified independent, third party test results verifying the minimum physical properties listed above. The tests shall be in conformance with the ASTM specifications listed.

The finished liner shall be cured in strict accordance with the manufacturer's instructions.

W-52.07 Urethane Resin System

The sprayed applied urethane resin system shall be SprayWall as manufactured by Sprayroq, Inc, Birmingham, Alabama or equal. The finished urethane shall be resistant to sulfuric acid attack associated with domestic sewage. The urethane shall be manually sprayed onto the structures or manholes to provide a uniform smooth surface. The minimum finished thickness shall be as specified on the plans. The coating system shall be capable of being applied over wet surfaces without degrading the final product.

The existing manhole and junction chambers shall be prepared for the application of the urethane system by cleaning and stoppage of infiltration as specified above. Prior to applying the urethane liner, the entire manhole surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the liner will adhere.

The cured urethane system shall conform to the minimum physical standards, as listed below:

CURED URETHANE	STANDARD	LONG-TERM DATA
TENSILE STRENGTH	ASTM D-638	5,000 psi
FLEXURAL STRESS	ASTM D-790	10,000 psi
FLEXURAL MODULUS	ASTM D-790	550,000 psi

The Contractor shall provide certified independent, third party test results verifying the minimum physical properties listed above. The tests shall be in conformance with the ASTM specifications listed.

The finished liner shall be cured in strict accordance with the manufacturer's instructions.

Composite systems containing layers of different materials or cured-in-place resin systems that are inflated in the manholes will not be considered as equal.

W-52.08 Contractor Qualifications

The manufacturer and installer of the rehabilitation system shall be specialized in the design and installation of the rehabilitation system for at least 5 years. The installer shall be approved and certified in writing by the manufacturer and shall be completely trained in leak repair, surface preparation, and installation of the rehabilitation system. References shall be provided upon request to demonstrate that the installer has successfully used the rehabilitation system in Florida on a minimum of 5 projects, one of which must be at least 5 years old. The installer shall be the contractor or personnel in responsible charge, such as a superintendent or project manager who has been engaged in the business of furnishing and installing the rehabilitation system for a period not less than 5 years.

W-52.09 Thickness Verification and Inspection

The Contractor shall provide a method of verifying the actual coating thickness installed to ensure it meets or exceeds the minimum values specified. The proposed liner thickness verification method shall be submitted to the Engineer for approval.

The Contractor may utilize a wet film thickness gage meeting ASTM D4414 to ensure monolithic coating and uniform thickness during application. A minimum of three readings per 200 square foot area shall be recorded. Documentation on thickness readings shall be conveyed to the Inspector on a daily basis when the coating application occurs.

All phases of the manhole rehabilitations such as surface preparation, bench reconstruction, liner installation, annulus sealing, grouting, curing, testing, etc., will be inspected by the Department's Field Engineering personnel for conformance to the specifications, construction drawings, and liner manufacturer's instructions. The Contractor shall, therefore, coordinate his schedule for the installation of the structural coating system with the field office, and with due regard for site and weather conditions prevailing at the time.

The final manholes shall be completely free of defects.

The Contractor shall inspect all rehabilitated manholes utilizing closed circuit television 24 hours after coating system is complete. The intent of the inspection is to find any deficiencies to the finished liner. Contractor shall repair deficiencies within 1 week of notification. All television inspection videos to be provided to the City shall be in DVD format. One copy of the DVD shall become the property of the City.

W-52.10 Rehabilitated Manhole Re-Inspection

The Contractor shall be required to assist in re-inspection of all manholes 10 months after rehabilitation has been completed. The re-inspection shall be completed with but not limited to Maintenance of traffic, surface cleaning, video with a CCTV pole camera, hand tools, as necessary for inspection as required by the Engineer to ensure no system failures have occurred as listed in the Workmanship and Materials Section W-52.11 Warranty. All surfaces to be re-inspected shall be cleaned with a high-pressure water spray (minimum 5000 psi) prior to video with the CCTV pole camera. The Contractor shall repair deficiencies within 1 week of notification. Re-Inspection shall be completed at no additional cost to the City.

W-52.11 Spark Testing

The coating system shall be spark tested prior to acceptance. The holiday testing shall be in strict accordance with NACE SPO188. After the coating has set hard to touch, it shall be inspected with high-voltage holiday detection equipment. An induced holiday shall be made onto the coated concrete surface and will serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of minimum specified (not average) film thickness applied but may be increased if it is insufficient to detect the induced holiday. All detected holidays shall be marked and repaired per the manufacturer's recommendations. All costs associated with the testing shall be born by the Contractor. Testing equipment shall be in good working condition and evidence of certified calibration within the last year shall be provided before the detection test equipment shall be used.

W-52.12 Warranty

The Manhole Rehabilitation Contractor shall furnish the City of Tampa with an unconditional 5-year warranty for materials and workmanship. This warranty shall be a guarantee against failure for the warranty period. Failure shall be defined to occur if the rehabilitation system fails to:

1. Prevent the internal damage or corrosion of the structure.
2. Prevent groundwater infiltration.
3. Adhere to existing structure wall.

If any failures occur within the specified warranty period after final acceptance, the Contractor shall repair or restore the structure to its previously accepted state including all materials, labor, and at no additional cost to the City. Repair shall be completed within 30 days of written notification of the failure.

SECTION 58
SEWAGE PUMPING EQUIPMENT

W-58.01 General

The sewage pumping equipment shall include pump, motor, adjustable frequency drive and all control equipment to provide a complete pumping system for Pump Nos. 1, 2 and 3. Refer to a related specification section titled "Adjustable Frequency Drives". Vibration monitoring sensors shall be provided and installed on all pumps and all motors. Vibration testing for the pump and motor assembly shall be performed as specified in the Specific Provisions section titled "Vibration Requirements for Rotating Equipment".

Pumps shall be manufactured by Fairbanks Nijhuis Pump (Pentair). The Fairbanks Nijhuis Pump supplier (Sanders Company, Inc. – (772) 285-5483) shall be responsible for the following:

1. Furnishing the pump(s) complete with motor, adjustable frequency drives, motor high ring base with guard, intermediate shafting, necessary guards and all other specified accessories and vibration monitoring equipment for the non-clog, closed-coupled style dry pit sewage pumps. Pumps are to be connected to drivers by suitably sized solid type intermediate shafting with steady bearings and shaft guards as required.

2. Providing guidance and inspection for the installation of the new pumping equipment.

3. Testing and training for the new sewage pumping system.

It is the intent of these specifications that all pumping equipment for Pump Nos. 1, 2 and 3 be functionally identical.

Shop drawings and product data, shall include the following:

1. Certified dimensional drawings of each item of equipment and auxiliary apparatus to be furnished.

2. Certified foundation, pump support, and anchor bolt plans and details.

3. Schematic electrical wiring diagram and other data as required for complete pump installation.

4. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction, to indicate full conformance with the detail specifications.

5. Total weight of pumping unit, separately identifying the weight of the pump and the drive.

W-58.02 Quality Assurance

To assure unity of responsibility, the pumps, drives, motors, motor high ring base, adjustable frequency drive and sole plates, shall be furnished and coordinated by the pump manufacturer. The Contractor and manufacturer shall assume responsibility for the satisfactory installation and operation of the entire pumping system including pumps, motors, sole plates, and controls as specified.

The equipment covered by these specifications is intended to be standard pumping equipment of proven ability as manufactured by concerns having extensive experience in the production of such equipment. A single manufacturer shall furnish units specified herein. The equipment furnished shall be designed, constructed, and installed to operate satisfactorily when installed as shown on the drawings.

Pumps shall be manufactured in accordance with the Hydraulic Institute Standards, except where otherwise specified herein.

The pump manufacturer shall be fully responsible for the design, arrangement, and operation of all connected rotating components, including soleplate(s), if any, of the assembled pumping unit mounted on a fabricated steel base plate, to ensure that neither harmful nor damaging vibrations occur at any speed within the specified operating range.

W-58.03 Delivery, Storage and Handling

All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the unit and equipment are ready for operation.

All equipment and parts must be properly protected against any damage during shipment. Contractor shall store equipment in accordance with the manufacturer's instructions.

Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.

The finished surfaces of all exposed flanges shall be protected by wooden or equivalent blank flanges, strongly built, and securely bolted thereto.

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

No shipment shall be made until approved by the Engineer in writing.

For protection of bearings during shipment and installation, the bearing shall be properly processed. Anti-friction bearings, if prelubricated, shall be protected in accordance with the bearing manufacturer's recommendations against formation of rust during a long period of storage while awaiting completion of installation and start-up of the machine in which they are used. Anti-friction bearings, which are not prelubricated, shall be properly treated in accordance with the bearing manufacturer's recommendation against formation of rust during a long period of storage while waiting completion of installation and start-up by the application of Exxon Rust-Ban No. 392, or equal treatment.

W-58.04 Pump Characteristics

The pump shall be a vertical closed-coupled, dry pit, single stage, split case centrifugal pump with a single bottom suction and a side discharge with a clockwise rotation. The pump shall be a Fairbanks Morse 20-inch Model 2444 with an L20E1A impeller. A Letter of Standardization for the pump manufacturer has been included in the Contract documents and no other pump manufacturer will be considered.

The pumping unit shall be variable speed and designed for operating under the following conditions:

Number of Units		3 (2 operating, 1 standby)
Rating Capacity:		
Motor at 100% Speed	(505 rpm)	23.0 MGD at 29.7 ft, TDH
Motor at 75% Speed	(379 rpm)	15.5 MGD at 19.8 ft, TDH
Motor at 50% Speed	(253 rpm)	6.6 MGD at 12.4 ft, TDH
Minimum pump efficiency at rated conditions		
With motor at 100% speed		79%
Approx. shut-off head at 100% speed		60 ft
Horsepower		250
Max. Speed		505 rpm
NPSHr at max speed		14.6 ft @ 22.8 MGD
Pump suction diameter:		24 in
Pump casing discharge diameter:		20 in

Where total head (TH) is referred to in conjunction with the specified discharge requirements, it shall be understood to consist of the sum of the pressure head plus the velocity head, in feet, at the discharge nozzle of the pump minus the pressure head and the velocity head at the suction nozzle of the pump. The efficiency of the pump shall be understood to be based upon total head as just defined.

The pumps shall operate throughout the entire operating range, within the vibration limits specified herein. The pump and its driving equipment shall be designed and constructed to successfully withstand a maximum turbining speed of the unit resulting from backflow through the pump of 100 percent of the design operating speed.

W-58.05 Rotation

The pump shall have clockwise rotation when viewed from the driver end looking at the pump.

W-58.06 Impeller

The impeller shall be a Fairbanks Morse, model number L20E1A impeller. The impeller shall be balanced non-clogging type made of ASTM –A748-CA-6NM class B cast stainless steel. The impeller shall be of one-piece, single-suction, enclosed, three-vane, mixed flow design with well-rounded leading vanes and then tapered toward the trailing edge for a circular flow pattern. The waterways through the impeller will have extremely smooth contours, devoid of sharp corners so as to prevent rags or stringy, fibrous material from catching or clogging. The impeller shall be balanced and secured to the shaft by means of a bolt, washer, and key. The arrangement shall be such that the impeller cannot be loosened from torque in either forward or reverse rotation. Impeller shall be supplied with axial removable stainless steel wear ring. Wear ring shall be approximately 50 Brinell softer than the fronthead wear ring.

W-58.07 Volute/Casing

The volute shall be matched to the impeller and made of close-grained cast iron conforming to ASTM A48 Class 30. The volute is to be of one-piece circular constant flow, equalizing pressure design with smooth fluid passages large enough to pass any size solid that can pass through the impeller. The casing and impeller geometry shall be such that the rated size solid capability of the pump will pass the same size solid between the full diameter impeller and the cutwater passage. The volute shall be side flanged tangential discharge and capable of rotation in 45º increments to accommodate piping orientation. Diffusion vanes are not permitted. The volute shall be furnished with large cleanout openings located at the impeller centerline, to allow access to the impeller. Volute priming, drain, and 1/2” minimum gauge connections shall be provided. A 2” priming connection shall be located at the top of the volute, above the centerline. Flanges shall be 125 pounds flat-faced flanges per ANSI drilling. The casing shall be designed to permit the removal of the rotating assembly without disturbing the suction or discharge piping. The pump casing shall be hydrostatically tested to 1.5 times the design head or 1.25 times the shutoff head, whichever is greater. The minimum case wall thickness shall be 1.125”.

The volute shall be provided with a cleanout located on side opposite to discharge pipe as shown on the plans.

A 2” connection for vacuum priming valve shall be integrally casted to the top of the volute located on the side opposite to the discharge at the location shown on the plans.

The pump suction shall be supplied with a 24” fronthead connection. The discharge shall be a 20” connection, and the minimum case wall thickness shall be 1.125 inches.

The pump shall be supplied with a 2 sole plates, minimum 2” thick. Sole plates will rest fully on the concrete piers as shown on the plans.

W-58.08 Fronthead

The front head shall be made of close-grained cast iron conforming to ASTM A48 Class 30. The front head shall be cast separately and be connected to the suction elbow. Front head casing shall be protected from grit erosion by a 'Grit Shield" combination 600 Brinell high chrome iron wear ring and angular cast plate. The "Grit Shield" shall utilize "speed bumps" on the circumference to break up the half speed grit and sand rotation occurring in the front head area.

Fronthead shall be provided with optional hand hole to facilitate cleaning.

W-58.09 Backhead

A separately cast close-grained cast iron back head with large access openings and integral sealing box conforming to ASTM A48 Class 30 shall be provided. The sealing box shall be cast integrally with the backhead and be designed to accommodate either packing or mechanical seal without re-machining. The sealing box shall be drilled and tapped for external flushing with seal cage. A ¾" minimum backhead drain tap shall be provided. Sealing box leakage will be collected by the backhead drain trough and piped directly to drain, eliminating any drippage to the floor. A minimum of two rings of graphite-impregnated synthetic packing and a split Teflon water seal ring shall be furnished. Glands shall be two-piece split interlocking, made of cast iron (bronze), held in place by studs and nuts.

Mechanical seal drainage pipe shall be provided with an electrically actuated solenoid ball valve to prevent loss of vacuum priming through mechanical seal.

W-58.10 Bearing Frame Assembly

The bearing housing shall be close-grained cast iron conforming to ASTM A48 CL30 and of heavy, rugged design for carrying the bearings and machined for accurate and permanent bearing alignment completely enclosing the shaft between the bearings. Bearing supports are to be of heavy-duty construction providing for self-centering fit with the casing for proper alignment. The bearing housing shall be of dust-proof design, incorporating lip-type grease seals in contact with the shaft to prevent the entrance of contaminants. Zerk-type grease fittings for bearing lubrication shall be supplied at the bearing housing.

The pump shaft shall be made from type 4140 alloy steel, of sufficient diameter to carry the maximum loads imposed and to prevent vibration and fatigue. The shaft shall be accurately machined along its entire length. Keyways shall be provided at both ends.

A renewable shaft sleeve, positive adhesive sealed to prevent leakage between the shaft and the sleeve, shall protect the shaft through the sealing box area. The shaft sleeve shall be stainless steel with Brinell hardness of 300-350.

Radial (inboard) bearings shall be grease-lubricated spherical roller type, self-aligning, designed to carry the hydraulic radial loads encountered in the service conditions. Thrust (outboard) bearings on the 12" pumps shall be grease-lubricated angular contact, duplex mounted, designed to carry the pump hydraulic axial and dead load thrust. The 16" & 20" pumps thrust bearings shall be grease-lubricated tapered roller type.

Bearings shall be designed for an L10 life of 100,000 hours per AFBMA at best efficiency point. Grease relief ports with plugs shall be provided.

W-58.11 Mechanical Seal

The pump sealing box mechanical seal shall be a Chesterton 442-50, 6.25" Seal, CR/CB-Viton or shall meet Chesterton's published specifications for this unit.

A throat bushing shall be used in conjunction with the mechanical seal. The throat bushing shall be a Spiral Trac Adaptor bushing, CWS version and shall be designed for use without flush water, or shall meet EnviroSeal's published specifications for this unit.

W-58.12 Fits and Hardware

The volute/casing, fronthead, backhead, and frame shall be manufactured with concentric shoulder fits to assure accurate alignment. All machined bolts, nuts, and cap-screws shall be of the hex-head type and will not require the use of any special tools.

W-58.13 High Ring Base

The motor high ring base shall be cast iron or fabricated steel of adequate height to permit access to the coupling and furnished with a shaft guard.

W-58.14 Electric Motors

The electric motors for the pumps shall be as specific in Section 26 27 19.19, (Electric Motors). Motors shall be type Weather Protected.

W-58.15 Vibration Monitoring Equipment

General:

The Vibration Monitoring Equipment shall consist of two components, an accelerometer mounted on the machinery, and an electronic signal conditioner / transmitter mounted adjacent to the machinery. The raw signal from the accelerometer shall be integrated by the signal conditioner to obtain a velocity signal— the peak amplitude shall be locally displayed, and also provided as a 4-20mA signal for analog recording. The monitor shall have both a vibration alert and danger relay to facilitate annunciation and machine shut down respectively.

The Vibration Monitoring Equipment shall be provided, and the accelerometers installed, by the pump supplier. The transmitters shall be mounted and wired by the electrical subcontractor.

Acceptable Manufacturers:

The Vibration Monitoring Equipment shall be by Connection Technology Center, Inc. (CTC), or equal.

Ratings, Characteristics and Features:

The Vibration Monitoring Equipment shall have the following ratings, characteristics, and performance features:

The Vibration Transmitter shall be 2-channel to allow for monitoring of both pump and motor vibration.

Vibration Transmitter shall be provided with fiberglass enclosure and be powered by a single 120V source.

Vibration Transmitter shall be as manufactured by Connection Technology Center, Inc. (CTC), VP series, Model #VPR100-2L-V0-BB.

Accelerometers shall be 100mV/g type, CTC Model #AC102 with appropriate cables and connectors.

Installation:

Two complete Vibration Monitoring Systems shall be provided— one accelerometer shall be mounted on the motor and the second on the pump. The signal conditioners / transmitters shall be mounted in a common NEMA 4X enclosure located adjacent to the machinery as shown and required. The accelerometers shall be mounted after initial vibration testing to determine the best location to mount the permanent equipment.

The limits of vibration for the pumps and the motors shall be as described in the Specific Provisions.

W-58.16 Gauges

Each pump shall be provided with glycerin-filled suction and discharge pressure gauges with a 1/4-in NPT inlet and 4.5-in dials. A 316 stainless steel, oil filled, diaphragm with a 1/2-in NPT inlet, and 1/4-in flushing tap, with T-cock, shall be installed on each gauge. The suction gauges shall be of the compound type to indicate both vacuum and pressure and be graduated to read 15-psi positive pressures and 30-in mercury negative pressures. The discharge gauges shall be graduated from 0 to 60 psi. The pressure gauges shall be equal to Figure 1980 Solfrunt standard gauges, Model 150000-4 series, manufactured by Amtek, U.S. Gauge Division. The diaphragm seals shall be equal to Model MGSG0103102 seals manufactured by Amtek, Mansfield & Green Division. The gauges shall be connected to the pump suction and discharge. All fittings, bolting, and cocks shall be 316 stainless steel.

W-58.17 Shop Testing

A certified factory hydrostatic and performance test shall be performed on each new pumping (Pump Nos. 1, 2 and 3) in accordance with Hydraulic Institute Standards, latest edition. Tests shall be conducted with the pump in a vertical position. Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency relative to capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test. At least one point of the six shall be taken as near as possible to each specified condition.

The Engineer shall have the right to witness the factory tests and inspect any equipment to be furnished under this Section prior to their shipment from place of manufacture. Notification of such test and a list of test equipment and procedures shall be furnished to the Engineer at least ten working days before the schedule test date.

Results of the performance tests shall be certified by a Registered Professional Engineer and submitted for approval before final shipment. A complete test report for each pump, including certified characteristic curves of the pump and certified copies of the hydrostatic test report, shall be submitted and approved by the Engineer before the pumps are shipped.

The pumping equipment and drive shall be tested in the field over the range of operation specified. The testing shall consist of operation of each adjustable frequency drive, motor, and pump. Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency relative to capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test. At least one point of the six shall be taken as near as possible to each specified condition.

Vibration testing shall be performed as described in the Specific Provisions.

W-58.18 Spare Parts

Furnish the following spare parts for each size pump.

Quantity	Item
1 per pump	Impeller locknut
1 set per pump	Radial and thrust bearings
1 set per pump	Pump casing gaskets
1 per pump	Mechanical seal & Spiral Trac Adaptor throat bushing
1 per size of pump	Grit shield

* * *

SECTION 67 - STEEL PIPE AND FITTINGS

W-67.01 General

Steel pipe and fittings include all wrought and fabricated steel pipe, stainless steel pipe, and fittings therefor. Steel pipe shall be used only where specifically shown or specified.

Completely detailed working drawings shall be submitted by the Contractor for approval in conformance with the requirements of the General Provisions. Such drawings shall show piping layouts and contain schedules of all pipe, fittings, valves, expansion joints, hangers and supports, and other appurtenances. When any of the steel pipeline work is of special design, such work shall be shown in large detail and be completely described and dimensioned.

W-67.02 Pipe Standards

Dimensions of steel pipe shall conform to ANSI B36.10, unless otherwise specified, shown, or required. Pipe 12 inches and smaller shall be not less than Schedule 40. Pipe 14 to 18 inches inclusive shall be not less than Schedule 30. Pipe 20 through 36 inches shall have a wall thickness of not less than 3/8 inch. Pipe larger than 36 inches shall have a wall thickness of not less than 1/2 inch.

Steel pipe 24 inches in diameter and smaller shall meet the requirements of ASTM A 53.

Steel pipe larger than 24 inches in diameter shall meet the requirements of AWWA C200, unless otherwise specified, shown, or required. Pipe conforming to AWWA C200 fabricated from plates shall meet the requirements of ASTM A 283 Grade B with not more than two longitudinal seams and with girth seams not less than 7 feet apart. Pipe conforming to AWWA C200 mill pipe shall be made with Grade B steel and spiral welded with inside and outside (double) fusion butt welds. All pipe shall be hydrostatically shop tested in accordance with AWWA C200 to the test pressure determined by the formula in Subsection 3.5 of AWWA C200. The Contractor shall provide an affidavit of compliance for all pipe and fittings furnished under AWWA C200. Stainless steel pipelines shall not be painted.

Steel pipe, including fabricated pipe, shall be furnished in the longest lengths commercially available unless otherwise shown, specified, or required. Pipe shall have the manufacturer's name, initials, or trademark rolled into the surface and the year of manufacture shall be suitably marked on the pipe.

W-67.03 Welding

Welding of pipe joints where shown, specified, permitted, or required shall meet the requirements of ANSI B31.1, Code for Pressure Piping, unless otherwise specified. Pipe and fittings with a wall thickness of 3/16 inch and greater shall have ends beveled for welding. All welding on steel pipelines shall be performed by certified welders having current certificates conforming to requirements of the ANSI Code. Such certification shall be submitted to the Engineer before proceeding with any pipe welding.

Steel pipelines, with interior lining, shall be shop welded. No field welding on such pipelines will be permitted unless authorized in writing by the Engineer. Steel pipelines shall be shop welded

and fabricated complete which includes fittings, lugs, anchors, supports, flanges, and like items, ready for field assembly before linings, as specified, are applied. Pipeline lining, where specified, shall include pipe, fittings, and specials.

W-67.04 Sleeve-Type Couplings

Except where standard solid sleeves or split sleeves are shown or specified, sleeve-type coupling for steel pipe shall be Style 38 couplings as made by Dresser Industries, Inc., or Type 411 as made by Smith-Blair, or equal. Gaskets shall be of molded rubber, Dresser Plain Grade 27, Smith-Blair 003, or equal. Middle rings shall be without a pipe stop and shall be at least 1/4 inch thick and 5 inches wide for 8-inch and smaller pipe, 3/8 inch thick and 7 inches wide for 10-inch through 30-inch pipe, and 1/2 inch thick and 10 inches wide for 36-inch and larger pipe with follower rings of appropriate thickness, unless otherwise shown or specified.

Sleeve-type couplings shall be shop coated with Dresser Red "D" Shop-Coat, Smith-Blair Standard Blue Shop Coat, or equal, nontoxic material compatible with the finished coatings specified.

The ends of pipe and fittings which are to have sleeve-type couplings shall be left free of shop coat or field coat for a distance of 12 inches, until after installation, when the pipe and couplings exposed to view shall be field painted as specified or directed.

W-67.05 Harnessing

The steel pipe joint harness shall consist of two or more steel tie rods set diametrically opposite, generally on the horizontal diameter of the pipe, extending across the joint from fabricated bent steel plate lugs welded to the pipe at either side of the joint. Steel plates used in the fabrication of bent plate lugs shall conform to ASTM A 242. Lugs and welds shall be designed to develop the full strength of the tie rods.

Harness tie rods and nuts shall be of mild steel meeting the requirements of ASTM A 307 Grade B. Nuts shall be hexagonal and have a standard chamfer on the back face.

W-67.06 Expansion and Flexible Couplings

Ample provision shall be made for flexibility in all pipelines to compensate for expansion. Expansion devices shall be adequate to allow the lines to expand and contract freely without injury to any part of the piping system. The devices may be in the form of expansion joints, expansion couplings, swivel or swing joints or pipe bends, and include such anchors as may be shown, specified, or required to make the devices effective. If expansion devices are not required, all runs of pipe subject to change in length shall be fabricated shorter than their theoretical length to the extent that there may be freedom to expand without increasing the stresses imposed when cold.

Expansion joints shall be provided with adequate tie rods to limit the axial movement at the specified test pressures, except where otherwise noted or specified.

W-67.07 Handling

During loading, transportation, and unloading, extraordinary care shall be taken to prevent injury to the pipes and coating. Loading and unloading shall be done slowly with each pipe under

perfect control at all times. Under no circumstances shall a pipe be dropped. Suitable skids or blocks shall be placed under each pipe in the shop and the pipe shall be securely wedged during transportation to ensure the least possible injury to pipe, lining, and coating.

Pipe shall be handled with equipment such as stout canvas slings and wide padded skids, designed to prevent damage to the coating. The use of bare cables, chains, hooks, metal bars, or narrow skids in contact with the coating will not be permitted. All pipe handling and hauling equipment shall meet the approval of the Engineer before use. The ends of coated pipe shall be protected with roofing paper to prevent damage to the coating during transit. Abrasions and injuries shall be promptly and efficiently repaired.

Pieces shall be examined for defects and no piece shall be installed which is known to be defective. If any defective piece should be discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor at his own expense.

W-67.08 Erection

Steel pipelines shall be furnished, fabricated, erected, and otherwise installed to the lines, elevations, locations, and dimensions shown, specified, and required for a complete installation. In all existing structures and new structures as applicable, the Contractor shall verify all dimensions shown on the Plans and shall take such field dimensions that may be necessary to properly fabricate, locate, erect, connect to existing work, and otherwise install all steel pipelines, pipe supports, pipe anchors, and structural frames required for steel pipelines. Where temporary supports are used, they shall be sufficiently rigid to prevent shifting or distortion of the pipe. Expansion devices shall be properly adjusted so that pipelines will be tight during expansion and contraction.

For sleeve type couplings, diametrically opposite bolts shall be equally tightened on the connection so that the gaskets will be brought up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.

W-67.09 Hangers and Supports

All steel pipelines shall be permanently erected and supporting devices shall be furnished and installed as specified on the construction plans.

W-67.10 Linings and Coatings - General

In general, all linings and coatings, except coatings applied as field painting, shall be shop applied.

Linings and coatings, where such are specified, shall be applied to all pipe and fittings.

All bolts, nuts, couplings, and the like shall be well coated after the joint has been made.

Painting shall conform to the Workmanship and Materials section headed "Painting."

* * *

SECTION 83 - ERECTING AND JOINTING INTERIOR PIPING

W-83.01 General

Erecting and jointing interior piping includes furnishing of supports and hangers and installation of all interior and exposed exterior piping. Piping materials, coating, and linings shall be located and installed where shown on the Plans or as specified. The work shall include providing working drawings required by the General Provisions, showing the type, quantity, design, calculations, arrangement, and location of all hangers and supports.

W-83.02 Materials

Structural and miscellaneous steel, metal castings, ductile-iron pipe, and steel pipe used for hangers and supports shall meet the requirements of the applicable Workmanship and Materials sections.

W-83.03 Design

Hangers and supports not detailed on the Plans shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions with due allowance for expansion and contraction, and having springs where necessary. Hangers and supports shall be of standard design where possible, and be best suited for the service required, as approved. They shall be screw adjustable after installation. Perforated straps will not be accepted.

All supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. The injury hazard shall be considered and minimized in all protruding supporting devices.

Hangers and supports shall be supported by threaded rods properly fastened in place by suitable screws, clamps, insets, bolts, or by welding.

Brackets for the support of piping from walls and columns shall be made of welded steel and designed for three maximum loads classified as follows:

Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

When medium or heavy brackets are bolted to walls, backplates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. When the use of backplates is not practicable, the brackets shall be fastened to the wall in a manner that the safe bearing strength of the wall will not be exceeded.

Pipe rolls or chairs shall be of cast iron. Pipe rolls shall be provided with threaded nuts or with sockets to take threaded rods.

Saddle stands shall be of the adjustable type. Each stand shall consist of a length of steel pipe fitted at the base with a standard threaded ductile-iron flange and at the top with an adjustable saddle or roll. The

base flanges shall be bolted to the floor, foundation, or concrete base.

Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with an adjustable saddle or roll, ductile-iron pipe saddle supports, or with pipe stanchion saddles with yokes and nuts. The base flanges shall be bolted to the floor, foundation, or concrete base.

Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller may be supported on ductile-iron, malleable iron, or steel hooks, hook plates, rings, or ring plates.

W-83.04 Anchors

Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines, tanks, apparatus, and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval.

Anchors for piping shall be of the ductile-iron chair type with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

Anchors detailed on the Plans shall be provided as shown and specified.

W-83.05 Inserts

Inserts for concrete shall be galvanized and installed in the concrete structures where required for fastening supporting devices. They shall be designed to permit the rods to be adjusted horizontally in one plane and to lock the rod nut or head automatically. Inserts shall be recessed near the upper flange to receive reinforcing rods and be designed so that they may be held in position during concreting operations. Inserts shall be designed to carry safely the maximum load that can be imposed by the rod which they engage.

W-83.06 Galvanizing and Painting

When galvanizing is specified, it shall be done in accordance with the Workmanship and Materials section headed "Galvanizing."

Hangers, supports, anchors, and similar devices shall be painted in accordance with the Workmanship and Materials section headed "Painting."

W-83.07 Transportation and Delivery

Every precaution shall be taken to prevent damage to the pipe during transportation and delivery to the site. Extreme care shall be taken in loading and unloading the pipe and fittings. Such work shall be done slowly with skids or suitable power equipment, and the pipe shall be under perfect control at all times. Under no condition shall the pipe be dropped, bumped, dragged, pushed, or moved in any way which will cause damage to the pipe or coating. When handling the pipe with a crane, a suitable pipe hook or sling around the pipe shall be used. Under no condition shall the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends.

If any pipe or special is damaged in the process of transportation, handling, or laying, such pipe or pipes shall be replaced or repaired by the Contractor at his own expense.

The Contractor shall furnish and install suitable blocking and stakes to prevent the pipe from rolling.

W-83.08 Flanged Joints

Flanged joints shall be made with bolts or bolt studs with a nut on each end. Bolts, stud bolts, and nuts shall meet the requirements of ASTM A 307 Grade B, and ANSI B16.1.

W-83.09 Screwed Joints

Threads for screwed joints shall be thoroughly cleaned after reaming. All threads shall be coated with a suitable pipe dope, mastic metallic compound as manufactured by James K. Harbinson & Co., graphite and engine oil, or equal, before jointing. Joints shall be screwed on until a tight metal-to-metal joint is produced without evidence of heat in the threaded portion. Once a joint has been screwed up, it shall not be backed off unless the threads are recleaned and new compound applied before rejointing.

For pipe fitted with screwed flanges, the flanges shall be fitted to the pipe in the shop unless otherwise permitted. The pipe flanges shall be accurately threaded to the American Briggs gauge, after which the flanges shall be screwed on by heavy machinery until the end of the pipe projects beyond the face of the flange and a tight metal-to-metal joint is produced without evidence of heat in the threaded portion. The projecting end of the pipe shall then be cut off flush with the face of the flange. A light refacing cut shall be taken across the end of the pipe and the face of the flange at right angles to the centerline of the pipe and the pipe shall then be reamed.

W-83.10 Mechanical joints

In making up mechanical joints, the spigot shall be centered in the bell. The surfaces with which the rubber gasket come in contact shall be thoroughly brushed with a wire brush just prior to assembly of the joint. Lubricant shall be brushed over the gasket just prior to installation. The gasket and gland shall be placed in position, bolts inserted, and nuts tightened fingertight. The nuts shall be tightened by means of a torque wrench in a manner that the gland shall be brought up toward the pipe evenly. The following range of bolt torques shall be applied:

Size Inches	Range of Torque (ft. lbs.)
5/8	45-60
3/4	75-90
1	85-100
1-1/4	105-120

If effective sealing is not obtained at the maximum torque listed above, the joint shall be disassembled and reassembled after thorough cleaning.

All bolts shall be primed by dipping with a bituminous coating, except the threads, which shall be coated immediately prior to installation of the nuts.

W-83.11 Sleeve Type Couplings

For sleeve type couplings, diametrically opposite bolts shall be equally tightened on the connection so that the gaskets will be brought up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.

W-83.12 Welding

Field welding of pipe joints where shown, specified, permitted, or required shall meet the requirements of ANSI B31.1 - Power Piping, Chapter VI (Section 136.4.2 Visual Examination)(Section 137.4 Hydrostatic Tests) or (Section 137.5 Pneumatic Tests). Pipe and fittings with wall thickness of 3/17-inch and larger shall have ends beveled for welding. Parts to be welded shall be securely held in place and in proper alignment during welding. The abutting pipe ends shall be separated before welding to permit complete fusion to the inside wall of the pipe without overlapping. Welding shall be continuous around the joint and completed without interruption. Welds shall be of the single vee butt type, of sound weld metal thoroughly fused into the ends of the pipe and into the bottom of the vee. Welds shall be free from cold shuts, pinholes, oxide inclusions, or other defects. All welding of steel pipe done off site shall conform to the requirements of the Workmanship and Materials section headed "Steel Pipe and Fittings."

W-83.13 Testing

All pipelines shall be watertight and shall be tested for leakage by the Contractor under the direction of the Engineer. Air and gas lines shall be tested with compressed air and all other pipelines shall be tested with water under the pressures specified herein.

All tests shall be conducted in a manner to minimize as much as possible any interference with the Contractor's work or progress.

The Contractor shall notify the Engineer when the work is ready for testing, and tests shall be made as soon thereafter as possible. Personnel for reading meters, gauges, or other measuring devices, will be furnished by the Engineer, but all other labor, equipment, air, water, and materials, including meters, gauges, smoke producers, blower, fuel, bulkheads, and accessory equipment, shall be furnished by the Contractor.

Pressure tests of pipelines shall be made by maintaining water in the pipe at a minimum of 125 psi for a period of 30 minutes. The pipelines shall show no leakage.

* * *

SECTION 108
VACUUM PRIMING SYSTEM

W-108.01 General

Furnish one duplex automatic vacuum priming system consisting of two oil-sealed liquid ring vacuum pumps, duplex control panel, vertical receiver, and accessories all mounted on fabricated steel baseplates. Each system shall be factory run tested to ensure proper operation. All components are to be in accordance with this specification.

W-108.02 Vacuum Pump

Each vacuum pump shall be a single stage, oil-sealed, liquid ring design and shall have a nominal flow rate of 75 CFM and be rated to an ultimate vacuum of 29" Hg when operated at standard conditions. The maximum noise level of each pump shall be 76 dBA or less. Each vacuum pump shall be integrally flanged to a 5.5 horsepower TEFC motor wired for operation on a 460 volt, 60 Hz, 3-phase power supply. Actual brake horsepower shall not exceed the motor nameplate rating at any vacuum level. Each vacuum pump shall be mounted on a fabricated steel baseplate and shall be constructed with a cast iron casing and portplates, a 316ss impeller, a 420ss shaft, and Viton elastomer mechanical shaft seals. Each vacuum pump shall be equipped with an inlet check valve, vacuum relief valve, inlet isolation valve, flex connector, 5-stage discharge separator-reservoir, oil level sight gauge, back pressure gauge, vacuum gauge, and temperature gauge. An air-cooled heat exchanger with temperature control valve and fan/motor guard shall be included and driven by the main drive motor. Seal fluid components shall include high pressure hydraulic hose, an isolation valve, Y-strainer, and check valve. A common discharge manifold assembly including (2) check valves, (2) flex connectors, (2) drip legs, and interconnecting piping shall be included to provide a single exhaust connection.

W-108.03 Receiver

The receiver shall be a galvanized 120 gallon vertical ASME coded air receiver rated for 200 PSI. The receiver shall be mounted on a fabricated steel baseplate and shall include a sight gauge for visual inspection of water accumulation within the receiver; a protective high water level switch to shut down the system and provide an alarm if the receiver begins to flood; a 4" liquid filled vacuum gauge to monitor system vacuum level; a vacuum release valve with silencer to facilitate draining; a manual drain valve for draining accumulated water; and an inlet isolation valve to isolate the priming system from the process vacuum piping.

W-108.04 Control Panel

Automatic controls shall be utilized for maintaining preset vacuum levels and to ensure peak system operation and safety. Controls shall be housed in a NEMA 4X, 316ss enclosure with UL508 panel shop rating and shall include: (1) Main disconnect switch with lockable handle assembly, (2) IEC style motor starters with UL Class 10 adjustable ambient compensated motor overload relays, (2) Through-the-door overload reset switches, (1) Control voltage transformer, (1) 24VDC power

supply, (2) Pump running lights, (2) H-O-A selector switches, (1) Vacuum transducer, (1) Alarm horn, (1) Alarm silence push button, (1) Alarm light, (1) Alarm reset button, (1) PLC controller with HMI and illuminated LCD screen, and (6) dry alarm contacts for SCADA monitoring: Pump 1 Running, Pump 1 Failure, Pump 2 Running, Pump 2 Failure, Low Vacuum, and Flooded Vacuum Receiver.

W-108.05 PLC Controller

The PLC controller will be fully programmed to provide complete automatic system control including lead-lag operation, pump alternation, frequent start protection, running status, running hours for each pump, and alarm monitoring.

W-108.06 Motor Disconnects

Each vacuum pump shall be provided with a fully mounted and wired disconnect switch factory installed in sight of the motor. Each disconnect switch shall have a NEMA 4X, 316ss enclosure with lockable handle assembly.

W-108.07 Coating System

All external ferrous surfaces shall be uniformly primed and painted by the manufacturer to provide a high quality protective finish and uniform color. Different coatings on the receiver and other major components shall not be permitted except by special request. All ferrous surfaces must be sound, dry, clean and free of oil, grease, dirt, mildew, release agents, curing compounds, efflorescence, loose and flaking paint and other foreign substances. All external ferrous surfaces must be primed with a minimum of one coat of advanced technology, premium quality, waterborne acrylic coating designed for use as a rust inhibitive direct-to-metal (DTM) primer and finish. Primer must be applied at a rate of 5.0 – 8.0 mils wet (2.2 – 3.5 mils dry) per coat with a minimum dry time of two hours between coats. All external ferrous surfaces must receive a minimum of two finish coats of premium quality, waterborne, direct to metal (DTM) acrylic semi-gloss enamel designed for the interior-exterior areas of commercial, institutional, and industrial structures and equipment for excellent durability and protection. The finish coat must be applied at a rate of 4.4 – 11.6 mils wet (1.5 – 4.0 mils dry) per coat with a minimum dry time of 4 hours between coats.

W-108.08 Water Trap

A CVA-200 inline water trap shall be furnished loose by the priming system manufacturer to protect the system from slugs of water due to a priming valve leak or failure. The water trap shall include 2” FPT isolation valves, a corrosion resistant aluminum head, clear polycarbonate housing, internal baffle, stainless steel separator screen, ball float, elastomer seat, vacuum release valve with silencer, drain valve, and liquid filled vacuum gauge.

W-108.09 Priming Valves

A QV-45P3-WLCS priming valve shall be furnished loose by the priming system manufacturer for each of the three pumps serviced by the priming system. Each priming valve shall be constructed of cast iron with 316 stainless steel trim. The internal and external valve body shall

include a fusion bonded epoxy coating for abrasion and chemical resistance. A weatherproof SPDT level switch with brass fittings shall be included to provide a proof of prime signal.

W-108.10 Spare Parts

The manufacturer shall provide the following spare parts with system delivery: (2) inlet filter elements, (2) discharge filter elements, (2) mechanical seal kits, (2) 5 gallon pails of vacuum pump oil, (1) set of control panel fuses, (3) priming valve seal kits, (2) priming valves rebuilt kits, (2) proof-of-prime level switches, (2) priming valves, and (1) water trap.

W-108.11 Testing of Vacuum Pump and Vacuum System (including piping)

Complete vacuum system must pass a vacuum test before being accepted by the City. All testing shall be performed by Contractor and witnessed by the Engineer. System, including all vacuum pumps, vacuum piping, valves, water traps, priming valves & appurtenances shall hold a vacuum of 29in Hg for a period of 2 hours with no vacuum loss.

W-108.12 Field Services

Up to two days of start-up assistance and training shall be provided by the manufacturer during one trip.

W-108.13 Warranty

The entire system and all components shall be covered by the priming system manufacturer's standard warranty of at least 18 months from the time of shipment or 12 months from the time of start-up.

W-108.14 Submittals

Submittals shall include a General Arrangement System Drawing, Control Panel Electrical Schematics, Operation & Maintenance Manual, and General Product Bulletins.

W-108.15 Manufacturers:

Packaged vacuum priming system shall be Q-VAC model QVD-75LRO-120VG (LPS) as manufactured by Combined Fluid Products Company or approved equal.

* * *

SECTION 111 – TAPPING AND LINESTOPS

W-111.01 General

The Contractor shall perform taps and linestops at the locations shown on the Plans in order to connect the proposed force main piping to both existing parallel force mains. As designated on the plans, one of the existing parallel force mains is 30-inch prestressed cylinder concrete pipe (PCCP) and the other existing force main is 30-inch reinforced concrete pipe (RCP). The original specifications for the existing force mains specify that the 30-inch PCCP pipe is an embedded cylinder pipe (ECP) and the 30-inch RCP was manufactured in accordance with ASTM C-76 with reinforcement set forth in Table II.

The tapping of the 30-inch PCCP force main and tapping valve shall be in accordance with Price Brother's (Thompson Pipe) most current published literature on tapping concrete pressure pipe, and AWWA M9 Manual (latest edition). The tapping of the 30-inch RCP pipe shall be in strict accordance with the latest applicable standards for tapping RCP.

The Contractor shall retain a subcontractor to accomplish the work. The subcontractor shall have a minimum 5 years experience in performing taps and linestops on similar size and type pipelines. The Contractor shall take all precautions necessary to protect the existing force mains and shall be solely responsible to maintain continuous sewage flow during construction.

Prior to ordering any tapping saddles, the Contractor shall carefully excavate both existing force mains at the tap and linestop locations, and also expose a PCCP joint, and shall make precise measurements of the outside diameter at a sufficient number of locations around the pipe to define its exact cross sectional configuration and size, all as recommended by the tapping saddle manufacturer to assure proper fit of the saddles to the pipe. The Contractor shall be solely responsible for the correctness of fit of the saddles to the existing force main so that no leakage occurs.

In addition, while the existing force mains are excavated and exposed, the contractor shall retain the services of a Thompson Pipe Group representative (Steve Eiff at 214- 770-6221) to inspect the PCCP pipe joint for the purpose of determining the type of joint so that the proposed PCCP adapter can be accurately fabricated. The Thompson Pipe Group representative will also determine the proposed method of restraining the joint, i.e. circumferential weld, snap ring joint or other approved method. All existing PCCP joints a minimum 40 feet downstream of the proposed linestop will need to be restrained by full circumferential welds before the linestop can be deployed into the pipe.

W-111.02 Construction Schedule

The Contractor shall submit to the Engineer, in advance of construction, a detailed step by step schedule for accomplishment of the taps and linestops. The plan shall be revised as directed by the Engineer as required for coordination with other contractor's operations and construction.

W-111.03 Shop Drawings

The Contractor shall submit to the Engineer for review, shop drawings detailing the valves, tapping saddle, tapping machine and linestops.

* * *

SECTION 550 – DECORATIVE ALUMINUM FENCE

W-550.01 General

The work specified in this section consists of furnishing and erecting decorative aluminum fencing at the locations shown in the plans, as specified, and directed by the Engineer. This work includes the furnishing and installation of all ornamental 6 feet high aluminum fencing, including all components (i.e. pickets, rails, posts, gates and hardware required), as shown on the drawings.

W-550.02 Submittals

Shop drawings shall indicate fabrication, assembly and erection details, size and gauge of all members, gate assemblies, fastenings, supports and anchors, patterns, clearances, and all necessary connections to work of other trades.

Submit signed and sealed engineered drawings indicating compliance with wind load due to 150 mph winds.

W-550.03 Installation

The fence installation shall be in accordance with these specifications and with the details shown in the plans. The Contractor shall be responsible for proper scheduling of the fence installation with the removal of existing fences where it is necessary to provide continuous security to adjacent areas already fenced. In order to meet these requirements, where necessary for maintaining security of any property during construction of the new fence, the Contractor shall install and subsequently remove temporary fencing.

Installation shall be performed only by a qualified installer with at least five (5) years of experience in installations of a similar nature, and as approved by the Engineer.

Posts shall be spaced as required to erect each prefabricated section of fence. Additional line posts shall be set at abrupt changes in grade.

W-550.04 Clearing

Where the clearing and grubbing for the project does not include the area occupied by the fence, clearing shall be done to a width of at least two feet on each side of the fence line, except that the Engineer may direct that valuable trees be left in place.

W-550.05 Construction Over Irregular Terrain and Other Obstructions

The bottom of the fence shall, in general, follow the contour of the ground with a 2-inch clearance. Over irregular ground, however, a minimum clearance of one inch and a maximum of six inches will be permitted for a length not to exceed eight feet.

Where necessary to secure proper vertical alignment and to meet the clearance requirements specified above, depressions shall be substantially filled (except where filling would obstruct property drainage) and knolls and ridges cut down; all in such manner as to provide a substantial and permanent foundation for the fence.

W-550.06 Electrical Grounding

Whenever a power line passes over the fence, a ground shall be installed directly below the point of crossing. The ground rod shall consist of an aluminum or galvanized rod, with connection of similar metal if required, or of other appropriate material, eight feet in length and at least 5/8 inch in diameter. The rod shall be driven vertically until the top of the rod is approximately six inches below the ground surface. A No. 6 conductor shall be used to connect the rod and all fence elements. The conductor shall be connected to each fence element and the ground rod by means of electrical-type clamps which will prevent corrosion.

W-550.07 Fencing Materials

Fence system shall be heavy industrial aluminum model Echelon II (Genesis 4 rail) as manufactured by Ameristar Fence Products of Tulsa, OK or approved equal.

Provide ornamental fencing and gates as a complete system controlled by a single source manufacturer, including necessary posts, pickets, rails, gates, hardware, fittings, and other accessories.

Aluminum material for fence framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T52. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T52.

The manufactured framework shall be subjected to the Ameristar thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be black.

Material for fence pickets shall be 1" square x 0.062" thick extruded tubing. The cross-sectional shape of the rails shall conform to the manufacturer's ForeRunner™ design with outside cross-section dimensions of 1.75" square. The top wall and internal web of the rail shall be 0.070" thick; the sidewalls shall be 0.070" thick for superior vertical load strength. Picket holes in the ForeRunner rail shall be spaced 4.715” o.c. Picket retaining rods shall be 0.125” diameter galvanized steel. High quality PVC grommets shall be supplied to seal all picket-to-rail intersections.

Bracket to rail attachments shall be made using specially designed one-way tamperproof security nuts with carriage bolt. Bracket to post connections shall be made using self-drilling hex-head screws.

Aluminum castings shall be used for all rings, post caps, finials, and miscellaneous adornments.

W-550.08 Fabrication

Pickets, rails and posts shall be pre-cut to specified lengths. ForeRunner rails shall be pre-punched to accept pickets.

The rail inner slide shall be fully inserted into the rail outer channel to form the raceway for the internal retaining rod. Grommets shall be inserted into the pre-punched holes in the rails, and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two-part ForeRunner rails. (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each ForeRunner rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.

Completed panels shall be capable of supporting a 300 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 25% change in grade.

Gates shall be fabricated using 1.75” sq. reinforced ForeRunner rail material, 2” sq. x .250” gate ends, and 1” sq. x .125” pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall be joined by welding.

W-550.09 Gates

Gates shall be manufactured to conform to the fence style specified herein. All gates shall be welded at corners with additional diagonal bracing.

W-550.10 Warranty

The Contractor shall provide a 15-year guarantee on material, workmanship, and finish.

* * *

SECTION 9800

AUTOMATIC BAR SCREEN

PART 1 - GENERAL

1.01 DESCRIPTION

A. Manufacturer shall provide and test mechanically one (1) 316L stainless steel vertical bar screen front cleaning, downstream return, with motors, controls and appurtenances as indicated and specified.

B. The screen and control panels shall be a complete factory manufactured.

1.02 REFERENCES SPECIFICATIONS, CODES, AND STANDARDS

A. American Gear Manufacturers Association (AGMA)

B. National Electrical Manufacturers Association (NEMA)

C. American Federation of Bearing Manufacturers Association (AFBMA)

D. American Society for Testing and Materials (ASTM)

E. Underwriters Laboratory

1.03 SUBMITTALS

A. Submit the following shop drawings:

1. Certified shop and erection drawings. Manufacturer shall submit electronic files of the proposed equipment in the capacity, size, and arrangement as indicated and specified.

2. Drawings showing materials of construction, thicknesses, operating and maintenance envelope and assembly weight.

4. Hydraulic calculations verifying compliance to the design criteria.

5. Shop drawing data for accessory items.

6. Manufacturer's literature as needed to supplement certified data.

7. Operating and maintenance instructions and parts lists.

8. Listing of reference installations as specified with contact names and telephone numbers.

9. List of recommended spare parts other than those specified.

10. Recommendations for short and long-term storage.

11. Shop and field testing procedures, set up and equipment to be used.

12. Special tools.

13. Gear reducer data including service factor, efficiency, torque rating and materials.

14. Schematic control and power wiring diagrams including interconnecting and internal wiring diagrams.

15. Control panel drawings.

16. Manufacturer's product data.

17. Equipment weight and lifting points for installation and removal purposes.

18. Number, size and weight of pieces shipped.

19. Material Certification:

    a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated.

1.04 SPARE PARTS

A. Spare parts shall be provided and shall be interchangeable with similar parts installed.

1. Spare parts:

   a. Three (3) cables.

   b. Two (2) sets of rake rolls.

   c. One (1) set of slack sides bushing.

   d. One (1) set of top detection bushing.

2. One set of all special tools required.

3. Spare parts shall be available within 150 miles radius from owner.

1.05 QUALITY ASSURANCE

A. Equipment specified shall be the product of one (1) manufacturer.

B. Owner shall obtain the screens, motors and appurtenances from the mechanically cleaned screen manufacturer, as a complete and integrated package to insure proper coordination and compatibility and operation of the system.

C. Equipment specified shall be manufacturer's standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.

D. Shop tests as specified.

E. Service of a factory-trained technician shall be provided and specifically trained on type of equipment specified.

Service technician shall be present on site for all items listed below:

1. Functional testing: calibrate, check alignment and perform a functional test.

2. Field performance testing.

3. Training: field operation and maintenance instruction including all materials, slides, videos and handouts.

4. Any additional time required of the factory trained service technician to assist in placing the equipment in operation at no additional cost to the Owner.

F. Electrical Equipment Labeling Requirements:

1. Equipment control panel shall be UL listed assembly.

G. Fabrication shall be in compliance with all applicable ASTM 967 standards.

H. Factory welding shall use shielded arc, inert gas, TIG method.

I. All stainless steel subassemblies shall be acid passivated after welding for corrosion resistance and to provide a superior surface finish. The passivation shall be done by using an acid passivation paste in the weld and heat-affected areas and spray-on acid solutions elsewhere. After passivation, the weldments shall be thoroughly rinsed with clean water and allowed to air dry.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Screening system capacities and operating data shall be indicated in the mechanically cleaned screen schedule.

B. Screen shall be installed in the channel as specified and indicated.

C. Service: Screen raw wastewater.

D. Screen shall discharge to a compactor.

E. The screen shall be capable of operating with the screen 50 percent blinded

F. Mechanically cleaned screen shall be back discharge, front-clean and installed in the existing channel.

G. Mechanically cleaned screen with submerged rotating parts, pulley, cogwheel, sprockets, bearings, shaft that require regular maintenance are not acceptable.

H. Mechanically cleaned screen with an inclination different from 90^0 is not acceptable.

I. Multiple rake technology is not acceptable.

J. The screen technology shall be straight bars. Perforated screen basket is not acceptable.

K. Interface:

1. Room for inspection, adjustment and repair shall be provided.

2.02 MANUFACTURERS

A. Aqualitec Corp. – Mechanical Bar Screen Screentec - Model 1500 or

approved equal

2.03 SEISMIC DESIGN REQUIREMENTS

A. The manufacturer shall conform to the seismic design requirements for this project and for the work of this specification section.

B. All equipment bases, anchorage, supports and foundations designed shall be in accordance with the seismic requirements indicated and specified.

2.04 SCREEN CONSTRUCTION

A. General

1. Screen: Shall mechanically front-clean and back-discharge.

2. Mechanically-cleaned screen shall be front cleaning since the shovel rake shall remove debris from the upstream side of the screen.

3. Screenings shall be discharged on the downstream side of screen through discharge chute to compactor.

B. Frame

1. Frame: Shall be constructed of type 316L stainless steel.

2. The side frames shall be suitably reinforced to support all loads imposed on the mechanism during operation, installation, assembly, or transportation.

3. Anchor support frames onto the operating floor shall be of type 316L stainless steel hardware.

4. Screen frame shall be supplied in three (3) pieces.

a. Screen manufacturer representative shall approve screen frame field assembly.

5. Screen Enclosure: screen shall be fully enclosed above the operating floor with hinged access door

6. Screen covers: screen shall be equipped of covers on the 2 sides to have an easy and safe access to the mechanic parts.

C. Bar Rack and Baseplate

1. Material: Shall be of type 316L stainless steel.

2. The bar screen shall consist of rectangular 316L stainless steel bars

3. The bar screen shall be firmly fastened at top and bottom.

4. Bar spacing shall be as specified. Provide screens accurately constructed to give clear opening of 1'' between the bars.

5. The bars shall be straight and cover the full equipment width, and extend above the bottom of the channel. The point of discharge from the bar screen shall be discharged into a compactor.

D. Dead Plate

1. Bar screens shall have a dead plate and stiffeners construct of type 316L stainless steel with a minimum thickness of $^1/_8$" (3 mm).

2. The dead plate shall be $^1/_8$" thick constructed of type 316L stainless steel plate and extends from the top of the bar screen to the point of discharge.

E. Discharge Chute

1. A discharge chute shall be added to divert screenings from screen to self-dumping hopper.

2. Material: shall be of type 316L stainless steel, minimum thickness of $^1/_8$".

F. Single Shovel Rake

1. The debris shall be removed from the bar screen by a 316L stainless steel single shovel rake assembly designed to mesh with the bar screen.

2. The single shovel rake shall consist of type 316L stainless steel teeth that penetrate completely the bar screens.

G. Scraper

1. A scraper assembly shall be installed to assist removing the debris from the shovel rake.

2. The scraper shall be type of 316L stainless steel and high-density polyethylene (HDPE) and shall penetrate completely in the shovel rake to insure effective debris removal.

H. Side Seals

1. To prevent bypass around the sides of the unit, seals shall be mounted on the upstream face of the screen and on each side of the unit.

2. The seals shall be secured in place by backing plates and constructed of type 316L stainless steel.

I. Anchor Bolts, Bolts and Nuts:

1. Bolts, nuts, lock washers shall be of type 316L stainless steel.

2. Anchor bolts type shall be of type 316L stainless steel.

J. Drive Mechanism

1. The single shovel rake shall be mounted on three, type 316 L (3) cables resistant to any chemical agents and frost.

2. Pulleys shall be used to transmit a rotational motion.

3. The cables shall be capable of lifting no less than 4,000 pounds.

4. The single shovel rake shall be guided by two (2) high-density polyethylene (HDPE) wheels.

5. Four (4) inductive proximity sensors shall be placed at the top of the equipment to command the sense of rotation.

6. The shovel rake shall be driven by two (2) motors.

    a. First motor shall insure the shovel rake to go up and down.

    b. Second motor shall open and close the shovel rake.

K. Overload Protection

1. A sensor torque overload protection device shall stop the screen and start an alarm.

    a. Contacts for screen failure shall be provided.

L. Lift technology.

1. Equipment shall be able to lift manually or automatically in case of emergency.

2. Equipment shall have two (2) heavy hydraulic jacks on each side of equipment.

2.05 DRIVE SYSTEM

Two (2) motors shall be provided. One motor shall control the single rake

Up/Down and be separate from the second motor which Open/Close the rake.

A. Motors:

1. Motor shall operate without overheating at the speeds specified and indicated.

2. Motor shall have premium efficiency with nominal and minimum efficiencies per NEMA MG1.

3. Rating: 240/480V, 3-ph, 60 Hertz.

4. Insulation: Shall be class F insulation with Class B temperature rise.

5. Motors shall have a sufficient capacity to start and operate screen at 50 percent blinded without exceeding nameplate ratings for current and power and without operating in the service factor.

2.06 CONTROLS AND INSTRUMENTATION

A. All controls shall be provided for the fully automatic operation of the screen. The screen shall be factory wired so that the electrician is only required to make the electrical connections to the control panel and from the control panel to a junction box at the screens.

B. Control panel shall UL listed and manufactured in the United States.

C. The mechanically cleaned bar screen shall be furnished with a complete control system housed in an enclosure complying with the specific requirements:

1- Design Local control panel shall be delivered to jobsite, prewired ready for installation.
2- Control panel: NEMA 4X Stainless Steel.
3- Power Requirements: 240/480 Volt, 60 Hz, 3-Phase.
4- Motor Requirements: ¾ Hp.
5- Emergency Stop Button.
6- Unit shall be controlled manually, on timer or with an ultrasonic water level.

D. The local control panel plus other accessories shall perform the functions of:

1- Circuit breaker:
2- Motor starters.
3- Control power transformer.
4- Obstruction alarm.

E. The following controls shall be provided with the control panel

1- Reversing starter for the two (2) motors
2- START, STOP and RESET pushbutton.
3- HAND-OFF-REVERSE selector switch.

2.07 DESIGN REQUIREMENTS

Mechanically Cleaned Screen	Data
Number of screen	1
Average flow	15 MGD
Peak flow	35 MGD
Clear opening between bars	1''
Angle of inclination	90 Degrees
Channel Depth	10.79'
Total Depth	19.5'
Channel Width	6' – 6''
Maximum allowable water level before screen at peak flow and 50% of blocking	4.69'
Maximum head loss at peak flow and 50% of blocking	3.38'

2.08 SHOP TESTING

A. Motors shall be shop tested.

B. Control panel shall be shop tested:

a. Test all functions and alarms of the control panel.

C. Screen shall be shop tested:

a. The bar screen shall be completely factory assembled and inspected prior to shipment.

2.09 SERVICE

A. Manufacturer field technician shall be available for field services within a 150 miles radius from the client.

B. The Screen manufacturer shall have a local service within 150 miles of the project site and provide written documentation with their bid.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All installed items shall be in accordance with shop drawings and manufacturer instructions with no exceptions.

B. Manufacturer shall furnish four copies of operation and maintenance manuals which shall be retained at the installation site to assist plant operators.

3.02 FIELD TESTING

A. Field testing shall not be conducted without a procedure with no exceptions noted, calibration certificates for all testing equipment, and a completed and signed pretesting check list.

B. After installation, inspection, operation, testing and adjustment of the equipment, a manufacturer's field service technician shall conduct performance test for the unit in presence of the owner to determine its ability to deliver its rated capacity under specified conditions.

   a. Performance Test:

      During tests, observe and record flow rates, channel water depths, head loss, and motor inputs. Repeat tests until specified results are obtained.

C. Make all adjustments necessary to place equipment in specified working order at time of above tests.

END OF SECTION

SECTION 9900
COMPACTOR AND APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide and test Compactor, motors, controls and appurtenances as indicated and specified.

B. The Compactor and control panels shall be a complete factory manufactured.

1.02 REFERENCES SPECIFICATIONS, CODES, AND STANDARDS

1. American Gear Manufacturers Association (AGMA)
2. National Electrical Manufacturers Association (NEMA)
3. American Federation of Bearing Manufacturers Association (AFBMA)
4. American Society for Testing and Materials (ASTM)
5. Underwriters Laboratory

1.03 SUBMITTALS

A. Submit the following shop drawings:

1. Certified shop and erection drawings. Manufacturer shall submit electronic files of the proposed equipment in the capacity, size, and arrangement as indicated and specified.

2. Drawings showing materials of construction, thicknesses, operating and maintenance envelope and assembly weight.

3. Shop drawing data for accessory items.

4. Manufacturer's literature as needed to supplement certified data.

5. Operating and maintenance instructions and parts lists.

6. Listing of reference installations as specified with contact names and telephone numbers.

7. List of recommended spare parts other than those specified.

8. Recommendations for short and long-term storage.

9. Shop and field testing procedures, set up and equipment to be used.

10. Special tools.

11. Gear reducer data including service factor, efficiency, torque rating and materials.
12. Schematic control and power wiring diagrams including interconnecting and internal wiring diagrams.

13. Control panel drawings.

14. Manufacturer's product data.

15. Equipment weight and lifting points for installation and removal purposes.

16. Number, size and weight of pieces shipped.

17. Material Certification.

    a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated.

1.04 SPARE PARTS

A. Spare parts shall be provided and shall be interchangeable with similar parts installed.

1. Spare parts:

   a. One (1) HDPE cover (Full Length.

   b. One (1) security door detector.

2. One set of all special tools required.

3. Spare parts shall be available within 150 miles radius from owner.

1.05 QUALITY ASSURANCE

A. Equipment specified shall be the product of one manufacturer.

B. Owner shall obtain the Compactor, motor and appurtenances from the manufacturer, as a complete and integrated package to insure proper coordination and compatibility and operation of the system.

C. Equipment specified shall be manufacturer's standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.

D. Shop tests as specified.

E. Service of a factory-trained technician shall be provided and specifically trained on type of equipment specified.

Service technician shall be present on site for all items listed below:

1. Functional testing: calibrate, check alignment and perform a functional test.

2. Field performance testing.

3. Training: field operation and maintenance instruction including all materials, slides, videos and handouts.

4. Any additional time required of the factory trained service technician to assist in placing the equipment in operation at no additional cost to the owner.

F. Electrical Equipment Labeling Requirements:

1. Equipment control panel shall be UL listed assembly.

G. Fabrication shall be in compliance with all applicable ASTM 967 standards.

H. Factory welding shall use shielded arc, inert gas, TIG method.

I. All stainless steel subassemblies shall be acid passivated after welding for corrosion resistance and to provide a superior surface finish. The passivation shall be done by using an acid passivation paste in the weld and heat-affected areas and spray-on acid solutions elsewhere. After passivation, the weldments shall be thoroughly rinsed with clean water and allowed to air dry.

PART 2 - PRODUCT

2.01 SYSTEM DESCRIPTION

A. Compactor shall be installed as specified and indicated.

B. Service: Compactor shall reduce the volume of screenings. The volume reduction shall be at least 50% and shall have a dry solid concentration of at least 30%.

C. Screenings shall enter in the inlet hopper and shall be conveyed by the shaftless auger.

D. The captured solids shall be compacted, dewatered and discharged.

E. Interface:

1. Room for inspection, adjustment and repair shall be provided.

2.02 MANUFACTURERS

A. Aqualitec Corp. Compactor Compactec Model CC250 or approved

equal

2.03 COMPACTOR CONSTRUCTION

A. General

1. Screenings shall be conveyed by a shaftless auger that operates in the forward direction. Then, the captured solids shall be compacted, dewatered and discharged in a container.

B. Inlet Hoper

1. The inlet hopper shall direct screenings material from the conveyor into the transport tube. The gap between the inlet hopper and the conveyor discharge chute shall be no larger than ¼" in order to keep a perfect odor control. The inlet hopper shall be made of type 316L stainless steel.

C. Transport tube

1. The transport tube shall be made of type 316L stainless steel with a width of no less than 7" and a thickness of ¼".

2. High-density polyethylene (HDPE) shall cover the transport tube to avoid wear.

3. The easily adjustable compression gate shall allow the screenings to be compacted and a perforated sheet strainer to dewater the screenings.

D. Discharge Chute

1. The discharge chute shall be made of type 316L stainless steel and designed in conformance with the applicable safety standards. The inspection cover shall have an easy access to the wear parts.

E. Auger

1. The shaftless auger shall be made of alloy steel with a protective polyurethane coating.

F. Spray Bars (option)

1. The wash zone shall include a spray wash system to wash organic residue from screenings.

2. The spray bars shall activate during the screw rotation in order to increase the washing efficiency.

3. The Compactor shall be directed by a timer. During peak loading conditions, the frequency of compaction and washing shall be adjusted.

4. Two (2) solenoid valves shall be located on the top of the Compactor to allow spray bars to work properly on the transport tube and on the perforated sheet strainer.

G. Perforated sheet strainer (option)

1. The drainage trough shall be a perforated inlet area that capture screenings and allows liquid to drain.

H. Adjustable feet

1. Feet shall be adjustable in order to fit every structure.

I. Anchor Bolts, Bolts and Nuts

1. Bolts, nuts, lock washers shall be of type 316L stainless steel.

2. Anchor bolts type shall be of type 316L stainless steel.

J. Lift technology.

1. In case of emergency, compactor shall be able to stay in the same position while the bar screen is lift up.

2.04 DRIVE SYSTEM

A. Motor:

1. Motor shall operate without overheating at the speeds specified and indicated.

2. Motor shall have premium efficiency with nominal and minimum efficiencies per NEMA MG1.

3. Rating: 240/480V, 3-ph, 60 Hertz.

4. Insulation: Shall be class F insulation with Class B temperature rise.

5. Motor shall have high temperature thermal overloads for motor winding high temperature and high motor brake temperature.

2.05 CONTROLS AND INSTRUMENTATION

A. All controls shall be provided for the fully automatic operation of the Compactor. The Compactor shall be factory wired so that the electrician is only required to make the electrical connections to the control panel and from the control panel to a junction box at the Compactor.

B. Control panel shall UL listed and manufactured in the United States.

C. The Compactor shall be furnished with a complete control system housed in an enclosure complying with the specific requirements:

1- Design Local control panel shall be delivered to jobsite, prewired ready for installation.
2- Control panel: NEMA 4X Stainless Steel.
3- Power Requirements: 240/480 Volt, 60 Hz, 3-Phase.
4- Motor Requirements: 1.0 Hp.
5- Emergency Stop Button.
6- Unit shall be controlled manually, on timer or with an ultrasonic water level.

D. The local control panel plus other accessories shall perform the functions of:

1- Circuit breaker:
2- Motor starters.
3- Control power transformer.
4- Obstruction alarm.

E. The following controls shall be provided with the control panel:

1- Reversing motor starter for the motor.
2- START, STOP and RESET pushbutton.
3- HAND-OFF-REVERSE selector switch.

2.06 SHOP TESTING

A. Motors shall be shop tested.

B. Control panel shall be shop tested:

a. Test all functions and alarms of the control panel.

C. Compactor shall be shop tested:

a. The Compactor shall be completely factory assembled and inspected prior to shipment.

2.07 SERVICE

A. Manufacturer field technician shall be available for field services within a 150 miles radius from the client.

B. The Screen manufacturer shall have a local service within 150 miles of the project site and provide written documentation with their bid.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All installed items shall be in accordance with shop drawings and manufacturer instructions with no exceptions.

B. Manufacturer shall furnish four copies of operation and maintenance manuals which shall be retained at the installation site to assist plant operators.

3.02 FIELD TESTING

A. Field testing shall not be conducted without a procedure with no exceptions noted, calibration certificates for all testing equipment, and a completed and signed pretesting check list.

B. After installation, inspection, operation, testing and adjustment of the equipment, a manufacturer's field service technician shall conduct performance test for the unit in presence of the owner to determine its ability to deliver its rated capacity under specified conditions.

C. Make all adjustments necessary to place equipment in specified working order at time of above tests.

END OF SECTION

SECTION 02 40 00 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Provisions 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 22 thru Division 28 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 SUBMITTALS

A. 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.

1.05 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.
Structural concrete.
Structural steel.
Lintels.
Structural decking.
Stair systems.
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.
HVAC enclosures, cabinets or covers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. 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.

PART 3 - EXECUTION

3.01 INSPECTION

A. 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.

B. 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

A. 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

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Requirements 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 building superstructure as required for foundation and structural steel work.

C. Remove designated building equipment, fixtures, partitions and components. Remove partial items as required.

D. Cap and identify exposed utilities.

E. Maintain approved means of egress from existing building exits as required by code.

F. Other items of demolition as indicated on drawings and specifications for all disciplines and systems.

1.03 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.

D. The Contractor shall visit the site and inspect all existing structures. Special care shall be taken to observe and record any defects, which may exist in building or structures adjacent to but not directly affected by the demolition work. Prior to commencing the demolition, the Contractor shall provide the Architect/Engineer with a copy of this inspection.

1.04 JOB CONDITIONS

A. Occupancy: Areas to be demolished will be vacated and discontinued in use prior to start work.

1.05 PROTECTION

A. Do not interfere with use of the building not being renovated during other phases of the work. Do not block driveways. Maintain free and safe passage to and from.

1. Do not close or obstruct streets, walks at this and other occupied facilities.

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 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 if required by authorities having jurisdiction.

E. Explosives: Use of explosives will not be permitted.

F. Damages: Promptly repair damages caused to existing property by demolition operations at no cost to Owner.

G. Where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

1.06 EXISTING SERVICE

A. Arrange and pay for disconnecting, relocating and capping utility services within areas of demolition. Disconnect and stub off. Notify the affected utility company in advance and obtain approval before starting this work. Coordinate work with Owner.

B. Place marker to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

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. Carry out demolition work to cause as little inconvenience to portions of the occupied building areas as possible.

D. No workmen shall stand on any wall to remove material except when adequate staging or scaffold protection is provided at a distance not exceeding 12 feet below the top of such walls and other reasonable precautions are taken. Whenever a workman is required to work at a height of more than 12 feet above a floor, platform, scaffold or the ground, he shall be equipped with a safety belt with a life line attached.

3.02 DEMOLITION

A. Demolish in an orderly and careful manner as required to accommodate new work. Protect existing foundations and supporting structural members.

1. Cut sidewalks from joint to joint. .

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. 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. All debris, rubbish, scrap pieces, equipment and materials resulting from the demolition shall become the property of the Contractor and shall be removed from the site, except for the items designated by the Engineer to be salvaged.

1. 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.

2. Remove demolished materials, debris, tools and equipment from site upon completion of work. Leave site in a condition acceptable to the Architect/Engineer.

3. Transport materials removed from demolished structures and dispose of off site at an approved location.

END OF SECTION 02 41 19

SECTION 03 05 00 - CONCRETE PATCHING, LEVELING AND GROUTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Provisions 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 02 40 00 - CUTTING AND PATCHING

B. Divisions 2 and 3 - CONCRETE

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: Include 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

SECTON 03300 – CAST IN PLACE CONCRETE

1.0 GENERAL

1.1 Scope

A. This section specifies cast in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. The extent of the concrete work is specified in the drawings. Cast in place concrete work includes, but is not limited to, foundations and footings, slabs on grade, slabs on metal deck and structural slabs, beams, and columns.

1.2 Quality Assurance

A. Codes and Standards: Comply with the provisions of the latest editions of the following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI):

   a. ACI 301 “Specifications for Structural Concrete for Buildings”
   b. ACI 318, ACI 318R “Building Code requirements for Reinforced Concrete and Commentary”
   c. ACI 117 “Standard Tolerances for Concrete Construction and Materials”
   d. ACI 211.1 “Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete”
   e. ACI 304 “Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete”
   f. ACI 305R “Hot Weather Concreting”
   g. ACI 306R “Cold Weather Concreting”
   h. ACI 308 “Standard Practice for Curing Concrete”
   i. ACI 309 “Standard Practice for Consolidation of Concrete”
   j. ACI 315R “Manual of Engineering and Placing Drawings for Reinforced Concrete Structures”
   k. ACI 347 “Recommended Practice for Concrete Formwork”
   l. ACI 302 “Guide for Floor and Slab Construction”

2. American Society for Testing and Materials (ASTM) – latest editions of the following standards:

   a. ANSI/ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
   b. ASTM C31 Method of Making and Curing Concrete Test Specimens in the Field.
   c. ASTM C33 Concrete Aggregates
   d. ASTM C94 Ready-Mixed Concrete
   e. ASTM C143 Test Method for Slump of Portland Cement Concrete
   f. ASTM C150 Portland Cement

g. ASTM C171 Specification for Sheet Materials for Curing Concrete
h. ASTM C173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
i. ASTM C230 Specifications for the Flow Table for Use in Tests of Hydraulic Cement
j. ASTM C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
k. ASTM C260 Air Entraining Admixtures for Concrete
l. ASTM C330 Lightweight Aggregates for Structural Concrete
m. ASTM C494 Chemical Admixtures for Concrete
n. ASTM C618 Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
o. ASTM C939 Test Method for Flow of Grout for Preplaced-Aggregate Concrete
p. ASTM C469 Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression
q. ASTM E1155 Standard Test Method for Determining Floor Flatness and Levelness Using the F-number System

3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

1.3 Submittals

A. Product Data for Proprietary Materials and Items: Reinforcement and forming accessories, admixtures, patching compounds, water stops, joint systems, curing compounds, dry-shake finish materials, etc.

B. Product Data for Concrete

1. Mix design for each class of concrete
   a. Fully document proposed materials and mix designs.
   b. Submit mix design for review.
   c. Submit mix design and documentation 28 days, minimum, prior to use in the field.
2. Manufacturer's recommendations for use of admixtures and curing compound.
3. Provide maximum expected amount of chloride ions in the mix.

C. Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Provide one sepia and additional prints as required for distribution. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangements of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Shop Drawings – Formwork: Submit shop drawings for fabrication and erection of formwork. The formwork shop drawings shall bear the signature and seal of the licensed engineer in responsible charge of their production.

E. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

F. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design tests as specified.

1.4 Pre-installation Conference

A. Mix Design Conference: At least 30 days prior to submittal of concrete design mixes, the Contractor shall hold a meeting or telephone conference to review the detailed requirements for preparing the concrete mix designs. Participants shall include representatives from the Contractor, Contractor's Testing Laboratory, Concrete Supplier, and Engineer.

B. Pre-Concrete Conference

1. At least 7 days prior to beginning concrete work, the Contractor shall conduct a meeting to review the proposed mix designs and to discuss required methods and procedures to produce concrete construction of the required quality. Also review requirements for submittals, status of coordinating work and availability of materials. Establish work progress schedule and procedures for materials inspection, testing and certifications. The contractor shall send a pre-concrete conference agenda to all attendees 7 days prior to the scheduled date of the conference.

2. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:

   Contractor's Superintendent
   Laboratory responsible for the concrete design mix
   Laboratory responsible for field quality control
   Concrete Subcontractor
   Ready-Mix Concrete Producer
   Owner's and Architect's/Engineer's Representative

3. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within 5 days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:

   Owner's Representative
   Architect
   Engineer-of-Record

4. The Engineer shall be present at the conference. The Contractor shall notify the Engineer at least 7 days prior to the scheduled date of the conference.

PART 2 - PRODUCTS

2.1 Form Materials

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct form work for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

B. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

C. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 Reinforcing Materials

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Weld Wire Reinforcement: ASTM A185 welded steel wire reinforcement.

C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable.

D. For foundation work, including slab on grade, use supports with sand plates or horizontal runners, or concrete bricks where base materials will not support chair legs.

E. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI Class 2).

F. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:

1. A multi-layer sheet membrane waterproofing system consisting of a self-healing, expandable layer of granular bentonite laminated at the rate of up to one pound per square foot to an impermeable, high density polyethylene (HDPE) “Paraseal LG” by Tremco, Inc.

2. Water resistant barrier paper consisting of heavy craft papers laminated together with glass fiber reinforcement and overcoated with black polyethylene on each side. "Moistop" by Fortifiber or approved equal.

2.3 Concrete Materials

A. Concrete design mixes, ASTM C94, 28-Day Compressive Strength:

1.	Foundations:	4000 psi
2.	Slabs on grade:	4000 psi
3.	Filled Cells in CMU:	3000 psi
4.	Column & beams:	4000 psi

B. Water-to-Cementitious Ratio: 0.40 maximum. Water content of admixtures shall be included in the water-to-cementitious ratio.

C. Portland Cement: ASTM C150, Type I, unless otherwise acceptable to Architect and/or Engineer. Use one brand of cement throughout project, unless otherwise acceptable to Architect and/or Engineer.

D. Fly Ash: ASTM C618 Class C or Class F is acceptable, but not to exceed 20 percent by weight of total cement content.

E. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

F. Water: Clean, potable and free from deleterious amounts of acids, alkalies or organic materials.

G. Air-Entraining Admixture: ASTM C260. Certified by manufacturer to be compatible with other required admixtures.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

AEA-92 and AIR MIX 200 by Euclid Chemical Company
MB-VR or MB-AE 90 by BASF Construction Chemicals
Sika AEA-14 by Sika Corp.
Darex AEA by W.R. Grace & Co.

H. Water-Reducing Admixture: ASTM C494, Type A, and contain not more than 0.1% chloride ions.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

Eucon WR-75 by Euclid Chemical Co.
Pozzolith 322 N by BASF Construction Chemicals

Plastiment NS by Sika Corp.

I. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G and contain not more than 0.1% chloride ions.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

Eucon 37 by Euclid Chemical Co.
Glenium 3030 NS by BASF Construction Chemicals
Sikament 300 by Sika Corp.
ADVA 100 by W.R. Grace & Co.

J. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494, Type E, and containing not more than 0.1% chloride ions.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

Accelguard 80 by Euclid Chemical Co.
Pozzolith 122 HE by BASF Construction Chemicals
Lubricon NCA by W.R. Grace & Co.

K. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and contain not more than 0.1% chloride ions.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

Eucon Retarder 75 by Euclid Chemical Co.
Pozzolith 300R by BASF Construction Chemicals

L. Certification: Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.

1. Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.

M. Corrosion Inhibitor Admixture: ASTM C494, calcium nitrite (30% plus or minus 2%) based liquid corrosion inhibitor admixture for the protection of reinforcing steel and accessories against chloride induced corrosion.

1. Contractor shall adjust the quantity of concrete mix water to account for the water contained in the corrosion inhibitor admixture. The mix water adjustment shall be as per the manufacturer’s published documentation.
2. The corrosion inhibitor admixture shall be compatible with all other ingredients and admixtures utilized in the concrete mix.

3. The corrosion inhibitor admixture shall be placed into the concrete mix as per the manufacturer's published documentation. Application rate shall be 4 gallons per cubic yard.
4. Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following: DCI by W.R. Grace & Co. or approved equal.

N. Synthetic Fiber Reinforcement: ASTM C1116, 100% polypropylene fibers in microfilament form for control of plastic shrinkage cracking and improved durability.

1. The fiber reinforcement shall be compatible with all other ingredients and admixtures utilized in the concrete mix.
2. Fiber reinforcement shall be alkali resistant, non-absorptive, and non-corrosive.
3. The fiber reinforcement shall be placed into the concrete mix per the manufacturer's published documentation. Application rate shall be 1 lb. per cubic yard.
4. Approved Products: Subject to compliance with applicable instructions to bidders and submittal requirements, products which may be incorporated in the work include, but are not limited to, the following: Grace MicroFiber by W.R. Grace & Co. or approved equal.

2.4 Related Materials

A. Expansion Joint Material: Preformed sections of bituminous impregnated fiberboard.

B. Expansion Joint Filler: ASTM D1751

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

W.R. Meadows, Inc.

C. Non-Shrink, Non-Metallic Grout: CRD-C 621, factory pre-mixed grout.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

Euco-NS Grout by Euclid Chemical Co.
Construction Grout or Masterflow 555 by BASF Building Systems
Crystex by L & M Construction Chemicals
Multi-Purpose Construction Grout by Symons

D. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

Moisture-Retaining Cover: One of the following, complying with ASTM C171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

E. Liquid Membrane Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A unless other type acceptable to Architect. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq ft./gal.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

Ecocure, Rez-Seal, Aqua-Cure, Diamond-Clear –VOX by Euclid Chem. Co.
Cure & Seal 1315 by Symons
Kure-N-Seal 30 by BASF Building Systems
Dress & Seal 30 by L & M Construction Chemicals

F. Bonding Compound: Polyvinyl acetate or acrylic base, re-wettable type.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

EucoWeld by Euclid Chemical Co.
Everweld by L & M Construction Chemicals

G. Epoxy Adhesive: ASTM C881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

Approved Products: Subject to compliance with applicable Instructions to Bidders and Submittal Requirements, products which may be incorporated in the work include, but are not limited to, the following:

HIT RE 500 by Hilti
Power-Fast+ by Powers Fasteners
AC100 Plus by Powers Fasteners
ET by Simpson Strong-Tie
SET by Simpson Strong-Tie
Ultrabond 1100 by Adhesives Technology
Ultrabond 2100 by Adhesives Technology

H. Reglets: Galvanizes sheet steel reglets, minimum 26 gage.

I. Water stops: Rubber or PVC water stops.

K. Vapor Barrier to be placed under all slab on grade in enclosed space must have all of the following qualities:

1. Permeance of less than 0.01 Perms [grains/(ft^2 *hr * in.Hg)] per ASTM F1249 or ASTM E96
2. ASTM E1745 Class A

Vapor Barrier products:
1. Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Zero Perm Vapor Barrier by Alumiseal
3. Or equal product that meets all performance criteria.

Vapor Barrier accessories:
1. Seam Tape: Permeance less than 0.3 perms per ASTM F1249 or ASTM E96
2. Vapor Proofing Mastic: Permeance less than 0.3 perms per ASTM F 1249 or ASTM E96
3. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

2.5 Proportioning and Design of Mixes

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect and/or Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect and/or Engineer.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect and/or Engineer.

C. Design mixes to provide concrete with the 28-day compressive strength, unit weight and aggregate sizes as indicated in the specifications or on the drawings.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect and/or Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

E. Admixtures:

1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.

2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).

3. Use air-entraining admixture in all concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content within following limits:

Max. Agg. Size	Total Air Content

1 1/2 inch	**2.5 %**
1	**3.0**
3/4	**3.5**
1/2	**4.0**
3/8	**4.5**

4. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

F. Minimum Cement Content: Provide cement content as required for strength, but not less than these guidelines:

Max. Agg. Size	Cement, lb/cy
1-1/2	**470**
1	**520**
3/4	**540**
1/2	**590**
3/8	**610**

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement between 3 and 5 inches.

H. Slab on Grade:

1. Maximum slump at point of delivery, 5 inches

2. Maximum aggregate size, 1 inch.

3. Entrained air content, 4.5%.

4. Contractor's option to use superplasticizer to increase workability (8 inch maximum slump, 0.45 maximum water cement ratio).

2.6 Concrete Mixing

A. Job-Site Mixing: Shall be used only with prior written consent of the Architect and for small amounts.

Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1 ½ minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.

Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

B. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

When air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32 degrees C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes.

When air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

3.0 EXECUTION

3.1 Forms

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads,anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set time to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

F. Exposed edges of beams and columns shall be chamfered 3/4 inch, unless otherwise noted, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

G. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.

H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement to eliminate mortar leaks and mortar proper alignment.

3.2 Placing Reinforcement

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

1. Minimum Cover:

a. Footings, 3 inches to bottom and unformed sides, 2 inches to formed sides.

b. Other, 2 inches to main reinforcing, 1-1/2 inches to ties and stirrups.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least two full meshes and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction. Welded wire fabric for slab on grade shall be WWF 6x6-W1.4xW1.4, unless otherwise noted. Place welded wire fabric 1-1/2 inches in from the top of slab on grade unless noted otherwise. Interrupt typical slab reinforcement at all construction and expansion joints. See specific details for any dowels required for shear transfer. Cut alternate wires along the line of saw cut control joints prior to placing concrete.

F. Provide minimum lap splice per ACI 318-95 for all reinforcing bars, unless noted otherwise. Stagger splices in adjacent bars at least 24 inches, except in beams and columns.

G. In wall footings, grade beams and bond beams, provide bent bars at corners and intersections of the same number and size as the straight bars.

3.3 Joints

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as approved by the Architect/Engineer.

B. Provide key ways in construction joints in walls and continuous footings, and where shown on the drawings.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

D. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on- ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated. Provide 1/2 inch preformed expansion joint material where slab abuts vertical surfaces.

E. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown.

1. Contraction joints shall be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate or raveling.

2. It is recommended that the slabs be cast in long strips, and saw cut transversely, in order to minimize shrinkage cracking.

3.4 Installation of Embedded Items

A. General: 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 drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.5 Preparation of Form Surfaces

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.6 Concrete Placement

A. Pre-placement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete, where form coatings are not used.

B. Water shall not be added to the concrete mix at the job site without prior approval by the engineer.

C. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

D. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

E. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

F. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

G. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

H. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

I. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

J. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

Maintain reinforcing in proper position during concrete placement operations.

K. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F (27 degrees C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

L. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.

4. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

M. The placement of partially hardened concrete, contaminated concrete, re-tempered concrete, and concrete remixed after its initial set shall be prohibited.

N. The placement of concrete shall be done at a rate such that poured concrete remains plastic and flows readily into spaces between reinforcement.

3.7 Finish of Formed Surfaces

A. Refer to architectural drawings as applicable to determine extent of exposed concrete and the finish desired.

B. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes, defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

C. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This is an as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum number of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 Monolithic Slab Finishes

A. Floor slabs shall be constructed to have a Minimum Flatness of Ff = 35, and a Minimum Levelness of Fl = 25, except for ramps and intentionally sloped slabs, which shall be constructed to have a Minimum Flatness of Ff = 20.

B. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

C. After placing slabs, plane surface so that depressions between high spots do not exceed 1/2" under a 10' straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

D. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when

concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane so that depressions between high spots do not exceed 5/16" under a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

E. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.

After floating, begin first trowel finish operation using a power- driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a level surface plane so that depressions between high spots do not exceed 1/8" under a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

F. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, the immediately follow with slightly scarifying surface by fine brooming.

G. Non-Slip Broom Finish: Apply non-slip broom finish to all ramps, exterior concrete platforms and steps, and elsewhere as indicated.

Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 Concrete Curing and Protection

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days at a temperature of 50 degrees F minimum.

C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

D. Curing Methods: Perform curing of concrete by liquid membrane curing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified. The Contractor may choose the method of curing compatible with project requirements and site conditions.

E. Provide moist curing by one of the following methods:

1. Keep concrete surface continuously wet by covering with water.

2. Continuous water-fog spray.

3. Cover concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

F. Provide moisture-cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

G. Provide liquid membrane curing compound to interior slabs with resilient flooring, carpet over cushion, or left exposed; and to exterior slabs, walks, and curbs, as follows:

Apply specified curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, damp-proofing, membrane roofing, flooring, (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise notified in writing by Architect that coating material is compatible with membrane curing compound.

H. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

I. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

J. Sealer and Dust-proofer: Apply a second coat of specified curing compound only to surfaces given a first coat.

3.10 Removal of Forms

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing

concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

C. 80% of the design concrete strength shall be attained prior to form removal.

3.11 Re-Use of Forms

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect and/or Engineer.

3.12 Miscellaneous Concrete Items

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Slabs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

1. Grout base plates and foundations as indicated, using specified non-shrink grout.

D. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.13 Concrete Surface Repairs

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect and/or Engineer.

1. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a

depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect and/or Engineer.

D. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete, and apply concrete bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

F. Perform structural repairs with prior approval of Architect/Engineer for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect/Engineer.

3.14 Quality Control Testing During Construction

A. The Contractor will employ a testing laboratory to perform tests and to submit test reports.

B. Sampling and testing for quality control during placement of concrete will include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143; one test at point of discharge for each strength test; additional tests when concrete consistency seems to have changed.

3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

4. Concrete Temperature: Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and every thirty minutes when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens made.

C. Compression Test Specimen: ASTM C 31; one sample set of 4 standard cylinders (6 inches by 12 inches) for each compressive strength test, unless otherwise directed. The contractor may require additional cylinders. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

D. Compressive Strength Tests: ASTM C 39; one sample set for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 50 cubic yards, or fraction thereof, of concrete nor less than once for each 5,000 square feet of surface area for slabs and walls; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

1. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

2. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

3. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.

E. Test results will be reported in writing to Architect, Engineer and Owner within 24 hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for 7 and 28-day tests.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

G. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect/Engineer. Testing service may conduct tests 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 conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTON 03300

SECTION 03415 - PRECAST PRESTRESSED CONCRETE

1.0 GENERAL

1.1 Description:

A. This section specifies precast prestressed concrete construction including design, fabrication, erection, and other related items including bearing pads and anchorage.

B. Precast prestressed concrete includes, single tees, double tees, hollow- core slabs, beams and spandrels, columns, I beams/box beams, tee/keystone joists, step units, ribbed wall panels.

1.2 Related Sections

03300 Cast-In-Place Concrete.
07920 Joint Sealant/Joint Fillers
03451 Architectural Precast Concrete Panels

1.3 References

A. American Society for Testing and Materials (ASTM) – latest editions of the following standards:

ASTM A 36/A 36M Standard Specifications for Carbon Structural Steel
ASTM A 82 Standard Specifications for Steel Wire, Plain, for Concrete Reinforcement
ASTM A 123/A 123M Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 185 Standard Specifications for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 307 Standard Specifications for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 325 Standard Specifications for Structural Bolts, Steel, Heat Treated
ASTM A 416/A 416M Standard Specifications for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
ASTM A 615/A 615M Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 706/A 706M Standard Specifications for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 767/A 767M Standard Specifications for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A 775/A 775M Standard Specifications for Epoxy-Coated Reinforcing Steel Bars
ASTM C 33 Standard Specifications for Concrete Aggregates
ASTM C 88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C 150 Standard Specifications for Portland Cement
ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C 330 Standard Specifications for Lightweight Aggregates for Structural Concrete
ASTM C 494/C 494M Standard Specification for Chemical Admixtures for Concrete

B. American Concrete Institute (ACI) Manual of Standard Practice (latest edition)

ACI 117 Standard Specifications for Tolerances for Concrete Construction and Materials.
ACI 318 Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International

C. American Association of State Highway and Transportation Officials (AASHTO) Manual of Standard Practice (latest edition):

Standard Specifications for Highway Bridges

D. Precast/Prestressed Concrete Institute (PCI) – latest editions of the following standards:

PCI MNL-120-92 PCI Design Handbook - Precast/Prestressed Concrete; Precast/Prestressed Concrete Institute
PCI MNL-116S Manual for Quality Controls for Plants and Production of Precast and Prestressed Concrete Products
PCI MNL-127 Recommended Practice for Erection of Precast Concrete

E. American Welding Society (AWS) – latest editions of the following standards:

AWS D1.1 Structural Welding Code – Steel; American Welding Society
AWS D1.4 Structural Welding Code – Reinforcing Steel; American Welding Society

F. U.S. Army Corps of Engineers – latest editions of the following standards:

CRD-C-621 Specifications for Non-Shrink Grout

1.4 Submittals

A. Shop Drawings: All prestressed concrete design shall be accomplished by, or under, the direct supervision of a Professional Engineer registered in the State of Florida, who has had a minimum of two years responsible experience in prestressed concrete design. Engineer shall affix his signature and seal to all design calculations and shop drawings certifying that all prestressed concrete products have been

designed to meet this specification and all load criteria shown on the plans. Engineer shall submit complete design calculations to the Architect when so requested.

1. Erection Drawings:
   a. Plans and/or elevations locating and defining material furnished by manufacturer.
   b. Sections and details showing connections, cast-in items and their relation to structure.
   c. Description of all loose, cast-in and field hardware.
   d. Field installed anchor location drawings.
   e. Erection sequences and handling requirements.
   f. Dead, live and other applicable loads used in design.
2. Production drawings:
   a. Elevation view of each member.
   b. Sections and details to indicate quantities and position of reinforcing steel, anchors, inserts, and essential embedded hardware.
   c. Lifting and erection inserts.
   d. Dimensions and finishes.
   e. Prestress for strand and concrete strengths.
   f. Estimated cambers.
   g. Method of transportation.

B. Product Design Criteria:
1. Loadings for design:
   a. Initial handling and erection stresses.
   b. Dead and live loads as specified on contract drawings.
   c. Other loads specified for member where they are applicable.
   d. Deflection of precast members shall be limited as follows:
      1) Vertical Live Load - Span/360
      2) Wind Load - 0.0025 x Floor to Floor Height
   e. Design shall provide for thermal movements of completed structure.

2. Design calculations of products shall be performed by a registered Professional Engineer experienced in precast prestressed concrete design.

3. Design shall be in accordance with applicable codes, ACI 318 and the PCI Design Handbook.

4. Details for waterproof joints between precast members.

C. Mix Designs: Submit proposed concrete mix designs and appropriate test data as specified in Part 2 of this section.

D. Test Reports: Concrete and other material.

1.5 Submittals for Substitution of Materials

All submittals for substitutions must be made in writing to the engineer with supporting technical data sheets and test data showing complete equivalent performance.

1.6 Pre-Bid Inspection

[Pre-bid site visits are optional on this contract.]

1.7 Project Conditions

A. Addition to an existing building.

1.8 Site Conditions

Job conditions shall be maintained at standards that allow material placement within temperature and cleanliness requirements. Unusual conditions as uncovered during the course of work shall be brought to the engineer's attention for analysis and disposition. These conditions include but are not limited to poor quality base concrete, severely corroded reinforcing steel, random cracks and deep oil penetration.

1.9 Shoring and Support

When removal of structural elements for modifications may cause temporary weakness, excessive deflections or structural instability, shoring or other suitable supports shall be provided until completion and adequate curing of the modifications and/or repairs.

The Contractor shall submit cut sheets with certified capacities for shoring to be used. Shoring plans, if required, shall be prepared, signed, and sealed by an Engineer registered in the State of Florida.

1.10 Material Delivery, Storage, and Handling

A. Delivery and Handling:
   1. Lift and support precast concrete members during manufacturing, stockpiling, transporting and erection operations only at lifting or supporting points, or both, as shown on contract and shop drawings, and with approved lifting devices. Lifting devices shall have a minimum safety factor of 4. Exterior lifting hardware shall have a minimum safety factor of 5.
   2. Transportation, site handling, and erection shall be performed with acceptable equipment and methods, and by qualified personnel.

B. Storage:
   1. Store all units off ground.
   2. Place stored units so that identification marks are discernible.
   3. Separate stacked members by battens across full width of each bearing point.
   4. Stack so that lifting devices are accessible and undamaged.

5. Do not used upper members of stacked tier as storage area for shorter member or heavy equipment.

1.11 Quality Assurance

A. Contractor

The repair contractor shall have experience, training, and proficiency specific to all work within this project.

B. Engineer

All work and materials are subject to observation by the Engineer and/or owner's representative. All work is subject to testing as deemed necessary by the Engineer. The expense of removing and replacing any concrete repair materials for observation or testing shall be borne by the Contractor if deemed necessary by the Engineer or Owner.

C. Fabricator’s Qualifications: Fabricator shall have a minimum of five years experience in producing units similar to those required for this Project, with sufficient production capacity to produce and deliver required units without causing delay in the Work. Fabricating plant shall be certified by one of the following:

1. Precast/Prestressed Concrete Institute (PCI), Group A1.
2. Applicable municipal building department.

D. Welder’s Qualifications: Provide certification that welders to be employed in the Work are certified by AWS and applicable local building officials, and have been re-certified in the last 12 months.

E. All work and materials are subject to observation by the Engineer and/or owner's representative. All work is subject to testing as deemed necessary by the Engineer. The expense of removing and replacing any concrete repair materials for observation or testing shall be borne by the Contractor if deemed necessary by the Engineer or Owner.

2.0 PRODUCTS

Any material substitutions must be approved by the engineer in accordance with Section 1.5.

2.1 Materials

A. Concrete Materials:

1. Portland Cement: ASTM C 150, Type I or III, [white] [gray] colors to achieve required finish colors. Use only one brand, type, and color from the same mill. Gray cement may be used for non-exposed backup mixes.

2. Aggregates: ASTM C 33, gradation may differ to achieve required finish characteristics. Select coarse and fine aggregate colors and screen sizes to match approved sample. Verify that adequate supply, from one pit or quarry, for each type of aggregate is available for the entire Project. Obtain entire aggregate supply prior to starting Work or have aggregate supply held in reserve by supplier.
3. Lightweight aggregate: ASTM C 330.
4. Water: Potable. Clean, clear, and free from deleterious amounts of salts, acids, alkalis, organic materials, oils, detergents, or other matter that may interfere with color, curing, or strength of concrete.
5. Admixtures: Select to be compatible in specified mix and as follows: Air entraining, ASTM C260; water reducing, ASTM C494 Type A, B, C, F or G; silica fume, ASTM C1240 for cement replacement for high performance concrete; coloring agent, ASTM C979 compatible with other concrete materials.

B. Formwork: Provide forms with acceptable form facing materials that are non-reactive with concrete or form release agents and will produce required finish surfaces. Construct and maintain forms to produce precast concrete units of shapes, lines and dimensions indicated, within specified tolerances.

C. Reinforcing Materials:
1. Reinforcing Bars: ASTM A 615, Grade 40 or 60, unless otherwise required to meet structural requirements. Use galvanized reinforcing bars; ASTM A 767, hot-dip galvanized where concrete cover is less than 1-1/2 inches.
2. Epoxy-Coated Reinforcing Steel: ASTM A775M, Grade 400 MPa, (ASTM A775, Grade 60).
3. Steel Welded Wire Fabric: ASTM A 185, plain, cold drawn.
4. Pre-stressing Tendons: ASTM A 416, Grade 250 or 270, uncoated, 7 wire, low relaxation strand.

D. Connection Materials:
1. Steel Shapes and Plates: ASTM A 36.
2. Malleable Iron Castings: ASTM A 47.
3. Carbon Steel Plates: ASTM A 283.
4. High Strength, Low Alloy Structural Steel: ASTM A 572.
5. Carbon Steel Structural Tubing: ASTM A 500, Grade B.
6. Anchor Bolts: ASTM A 307, carbon steel or ASTM A 325, high strength; bolts, nuts, and washers.
7. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon bolts, and hardened washers complying with ASTM A325, galvanized.
8. Welded Headed Studs: AWS D1.1, Type B.
9. Deformed Steel Wire Bar Anchors: ASTM A 496.
10. Stainless Steel Plate: ASTM F 593, Type 304 or Type 316; bolts and studs, nuts and washers.
11. Welding Electrodes: Comply with AWS Standards.

E. Finish for Steel Connection Materials:

1. Hot-Dip Galvanizing: ASTM A 123 or A 153, for steel exposed to weather in final assembly.
2. Shop Prime Remaining Steel Shapes: SSPC-Paint 25. Hot-dip galvanize ASTM A 153 setting bolts or projecting steel in masonry applications.
3. Anchor Bolts, Nuts, Washers: ASTM A 563, Grade C.
4. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.

F. Bearing Pads:
1. Elastomeric pads, AASHTO M251; ASTM D 412.

G. Grout Materials:
1. Cement Grout: Cement ASTM C 150; sand ASTM C 404; proportions 1:2.5 by volume, minimum water for placement and hydration.
2. Non-Shrink Grout: ASTM C 1107.
3. Non-metallic Shrinkage-Resistant Grout: Proprietary pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C-621. Minimum cube strength of 62 MPa (9000 psi) at 28 days when placed at flowable consistency.

2.2 Mixes

A. Design mixes for each type of concrete specified shall be prepared by an independent testing agency or by an architectural precast manufacturing plant at precast fabricator's option.

B. Proportion mixes by either testing agency trial batch or field test data methods in accordance with ACI 211.1, using materials to be used on the Project, to provide concrete with properties as follows:

1. Compressive Strength: 5,000 psi when tested in accordance with ASTM C 39.
2. Maximum water cement ratio 0.40 at point of placement.
3. Air-entrainment admixture to result in air content at point of placement complying with ACI requirements.
4. Water absorption maximum 6% by weight when tested in accordance with ASTM C 642.

2.3 Fabrication

A. Fabrication Procedures: PCI MNL-116.

B. Fabrication Tolerances: PC MNL-ll6 and ACI 117 for reinforcing steel placement.

C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI

recommendations. For exposed-to-view concrete surfaces, shear legs of supports are in contact with forms, provide supports with legs that are plastic protected or stainless steel protected.

D. Use epoxy coated reinforcing whenever concrete cover is less than 50 mm (2 inches) for top surfaces exposed to deicing salts, brackish water or salt spray, such as in parking garage decks.

E. Openings: Primarily on thin sections, factory fabricate those openings 250 mm (10 inches) round or square or larger as shown on drawings. Locate and field drill or cut other openings where no contact is made with pre-stressing or reinforcing steel after precast prestressed products have been erected. Opening shall be approved by Resident Engineer before drilling or cutting.

F. Patching: Patching will be acceptable providing structural adequacy of product and appearance are not impaired.

G. Defective Work: Precast concrete units which do not conform to specified requirements, including strength, tolerances, and finishes, shall be removed and replaced with precast concrete units that meet the requirements of this section. Contractor is also responsible for cost of corrections to other work affected by or resulting from corrections to precast concrete work.

H. Fasteners: Cast in galvanized hardware such structural inserts, bolts and plates as required by drawings.

2.4 Color and Finishes

A. Finishes:

1. Standard Underside: Resulting from casting against approved forms using good industry practice in cleaning of forms, design of concrete mix, placing and curing. Small surface holes caused by air bubbles, normal color variations, normal form joint marks, and minor chips and spalls will be tolerated, but no major or unsightly imperfections, honeycomb, or other defects will be permitted.
2. Standard Top: Result of vibrating screed and additional hand finishing at projections. Normal color variations, minor indentations, minor chips and spalls will be permitted. No major imperfections, honeycomb, or defects will be permitted.
3. Exposed Vertical Ends: Strands shall be recessed and the ends of member will receive sacked finish.

3.0 EXECUTION

3.1 Pre-Job Conference

At least 7 days prior to the start of concrete repairs, the contractor shall conduct a meeting to review the detailed requirements for rehabilitation work.

Surface preparation, proposed equipment, procedures, material mixing, placing and finishing procedures, and site conditions shall be discussed with the engineer prior to the beginning of the work.

The contractor shall require the attendance of all involved parties including but not limited to the contractor's superintendent, repair contractor, material supplier representative, and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by the contractor and distributed to all parties concerned within 5 days of the meeting.

3.2 Examination

A. Examine substrates and conditions for compliance with requirements for installation, tolerances, true and level bearing surfaces, and other conditions affecting performance of architectural precast concrete units. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Do not install units until supporting structure has been completed and attained allowable design compressive strength.

3.3 Erection

A. Site Access: Provide suitable access to building, proper drainage, and firm, level bearing for hauling and erection equipment to operate under their own power.

B. Preparation:

1. Provide true, level surfaces on field placed bearing walls and other field placed supporting members.
2. Place and accurate align anchor bolts, plates or dowels in column footings, grade beams and other field placed support members.
3. Shoring required for composite beams and slab shall have a minimum load factor of 1.5 times (dead load plus construction loads).

C. Installation: Installation of precast prestressed concrete shall be performed by the fabricator or a competent erector in accordance with PCI MNL-127. Lift members with suitable lifting devices at points provided by manufacturer. Temporary shoring and bracing, when necessary, shall comply with manufacturer's recommendations.

D. Alignment: Align and level precast members as required by the approved shop drawings. Level out variations between adjacent members by jacking, loading, or any other feasible method as recommended by the manufacturer and acceptable to Resident Engineer. Individual pieces are considered plumb, level, and aligned if the error does not exceed 1:500 excluding structural deformation caused by loads.

3.4 Repair

Repair damaged exposed surfaces of units to match color, texture, and uniformity of surrounding units. Remove and replace damaged units when repairs do not meet requirements.

3.5 Cleaning and Protection

A. Clean exposed surfaces of units after erection if soiled or stained.

1. Wash and rinse according to architectural precast concrete fabricator's recommendations. Protect other Work from damage while cleaning
2. Do not use cleaning materials or methods that change the appearance of architectural precast concrete finishes. Test clean a small area to verify suitability of materials and methods.

B. Protect finished surfaces from soiling or damage.

3.6 Inspection and Acceptance

A. Final inspection and acceptance of erected precast prestressed concrete shall be made by Resident Engineer to verify conformance with drawings and specifications.

END OF SECTION 03415

SECTION 04200 – UNIT MASONRY

1.0 GENERAL

1.1 Related Documents

Drawings and general provisions of Contract, including general and supplementary conditions and other Specification sections applicable to the work of this section.

1.2 Summary of Work

A. Extent of each type of masonry work is indicated on drawings and in schedules.

B. Types of masonry work required include:

1. Concrete unit masonry

1.3 Submittals

In compliance with Section 01300 (if applicable) and as specified herein.

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.

1.4 Quality Assurance

A. Standards: ACI 530, Building Code Requirements For Masonry Structures and ACI 530.1, Specifications for Masonry Structures.

B. Fire performance; ASTM E 119

C. Testing: Independent Testing Laboratory to be hired by Contractor

D. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

E. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

1.5 Delivery, Storage and Handling

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.

C. Limit moisture absorption of concrete masonry units during delivery and until time of installation

D. Store cementitious materials off the ground, under cover and in dry location.

E. Store aggregates where grading and other required characteristics can be maintained.

F. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.6 Project 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.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Do not apply uniform floor or roof loading for at least 72 hours after building masonry walls or columns.
3. Do not apply concentrated loads for at least 7 days after building masonry walls or columns.

B. 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.

1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
2. Protect sills, ledges and projections from droppings of mortar.

C. Cold Weather Protection:

1. Do not lay masonry units which are wet or frozen.
2. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
3. Remove masonry damaged by freezing conditions.

D. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout.

1. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 degrees F (6 degrees C).

40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):

a. Mortar: Heat mixing water to produce mortar temperature between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
b. Grout: Follow normal masonry procedures.

32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):

a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
b. Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce inplace grout temperature of 70 degrees F (21 degrees C) at end of work day.
c. Do not heat water for mortar and grout to above 160 degrees F (71 degrees C).

E. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):

1. Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):

1. Completely cover masonry with weather-resistive membrane for at least 24 hours.

2.0 PRODUCTS

2.1 Concrete Masonry Units

A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.

B. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding, pilasters, and other special conditions.

C. Provide square-edged units for outside corners, except where indicated as bullnose.

D. Concrete Block: Provide units complying with characteristics indicated below for Type, face size, exposed face and, under each form of block included, for weight classification:

E. Size:

1. Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thickness indicated.
2. Concrete masonry unit with dimensions as indicated in the architectural drawings and structural drawings

F. Type II, non-moisture-controlled units.

G. Cure units by autoclave treatment at a minimum temperature of 350 degrees F (176 degrees C) and a minimum pressure of 125 psi.

H. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated. Color as noted on architectural drawings.

I. Provide normal weight aggregate hollow load bearing CMU units complying with: ASTM C 90 - modified for units 8" or over in width.

J. Provide normal weight aggregate hollow non-load bearing CMU units complying with: ASTM C 129 - Type 1 for units 6" or less in width.

K. Special finish: Standard aggregate, ground finish. Refer to architectural drawings.

L. Required minimum compressive strength of masonry f'm = 1,900 psi

2.2 Mortar and Grout 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. Hydrated Lime: ASTM C 270

C. Above Grade: Type S (f'm = 1800 psi)

D. Below Grade: Type M (f'm = 2500 psi)

E. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

F. Aggregate for Grout: ASTM C 404.

G. Water: Clean and potable.

2.3 Reinforcing Steel

A. Reinforcing bars: ASTM A 615, Grade 60, No. 3 to No. 18.

B. Deformed Reinforcing Wire: ASTM A 496

C. Plain Welded Wire Fabric: ASTM A 185

2.4 Joint Reinforcement, Ties and Anchoring Devices

A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:

1. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 153, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.

   Application: All exterior walls

2. Hot-Dip Galvanized Carbon Steel Sheet: ASTM A 366, Class 2 or ASTM A 635; hot-dip galvanized after fabrication to comply with ASTM A 153, Class B.

   Application: Use for anchors.

3. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below.

4. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.

   Wire Size for Side Rods: 0.1483" diameter.
   Wire Size for Cross Rods: 0.1483" diameter.

5. For single-wythe masonry provide type as follows with single pair of side rods:

   Ladder type with cross rods spaced not more than 16" o.c.

2.5 Miscellaneous Masonry Accessories

A. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60 for bars No. 3 to No. 11.

B. Premolded Control Joint Strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Polyvinyl chloride complying with ASTM D 2287, General Purpose Grade, Designation PVC-63506.

2. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.6 Masonry Cleaners

Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.

2.7 Mortar and Grout Mixes

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.

B. Do not use calcium chloride in mortar or grout.

C. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

D. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and nonreinforced unit masonry.

1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.
2. Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.
3. The 28-day compressive strength of grout shall be at least 3000 psi. The slump shall be from 8" to 11"

3.0 EXECUTION

3.1 Installation, General

A. Do not wet concrete masonry units.

B. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.

C. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.

D. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

E. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match

work immediately adjacent to the opening.

F. Cut masonry units using motor-driven saws to provide clean, sharp, un-chipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.

G. Use dry cutting saws to cut concrete masonry units.

3.2 Construction Tolerances

A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arrises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus ½".

E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.3 Laying Masonry Walls

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately 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.

B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

C. Pattern Bond: Lay exposed masonry in the bond pattern shown or, if not shown; lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less that nominal 4" horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

E. 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.

F. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

3.4 Mortar Bedding and Jointing

A. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

B. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.

C. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

D. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.

E. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

F. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.

1. For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.

G. Intersecting Load-bearing Walls: If carried up separately, block or tooth vertical joint with 8" maximum offsets and provide rigid steel anchors spaced not more than 4'-0" o.c. vertically, or omit blocking and provide rigid steel anchors at not more than 2'-0" o.c. vertically. Form anchors of galvanized steel not less than 1-1/2" x 1/4" x 2'-0" long with ends turned up not less than 2" or with cross-pins. If used with hollow masonry units, em-

bed ends in mortar-filled cores.

3.5 Horizontal Joint Reinforcement

General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".

A. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

B. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.

C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

D. Space continuous horizontal reinforcement as follows:

1. For single-wythe walls, space reinforcement at 16" o.c. vertically, unless otherwise indicated.
2. For parapets, space reinforcement at 8" o.c. vertically, unless otherwise indicated.
3. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.
4. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.6 Control and Expansion Joints

General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in related items as the masonry work progresses.

3.7 Lintels

A. Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 1'-0" for block size units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.

B. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.8 Flashing of Masonry Work

General: Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drop.

A. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.

B. Install flashing to comply with manufacturer's instructions.

C. Provide weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.

D. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3.9 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 including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
4. Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
5. Detergent.

6. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

D. Protection: Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

3.10 Special Inspection During Construction

A. The Contractor will employ a qualified designated Structural Masonry Inspector or a Special Inspector registered in the State of Florida to perform the following inspection requirements:

1. The inspector shall be completely familiar with the plans and specifications of the project. For each inspection, the following items shall be noted on the Field Inspection Reports:
   a) Specific drawing numbers for the plans, sections and details reviewed for the inspection.
   b) Location of the inspection: note column lines, floor, direction, etc., to accurately describe the exact location of the inspection.
2. The inspector shall verify that all dowels are properly located and that the length of the dowel will provide adequate lapping. The following items shall be noted on the Field Inspection Reports:
   a) Grade of reinforcement, typical size of reinforcement.
   b) Length provided for lapping.
3. The inspector shall verify that the head joints and bed joints are full, that the head and bed joints are filled to at least the thickness of the face shell and that the width of the mortar joints are within specification.
4. The inspector shall note whether construction is low lift or high lift grouting. If construction is low lift, inspector shall note the height of the lift, which should be less than 5 feet. If construction is high lift grouting (lift is greater than 5 feet), inspector shall note the cleanouts.
5. The inspector shall note any excessive mortar fins within the masonry cells to be grouted.
6. The inspector shall note if the grout is being consolidated by mechanical vibration.
7. For columns and pilasters, the inspector shall verify that the reinforcing steel is properly tied at the specified spacing.
8. The inspector shall verify the proper embedment of reinforcing steel, bolts, etc.

END OF SECTION 04200

SECTION 04230 – REINFORCED UNIT MASONRY

1.0 GENERAL

1.1 Related Documents

A. Drawings and general provisions of Contract, including general and supplementary conditions and other Specification sections applicable to the work of this section.

B. All masonry construction shall be in conformance with "Building Code Requirements for Masonry Structures" (ACI 530-95 /ASCE 5-95) and "Specifications for Masonry Structures" (ACI 530.1-95/ASCE 6-95) except as herein modified.

C. Requirements of Section 04200 "Unit Masonry" apply to work of this section, including Special Inspection During Construction

1.2 Summary of Work

A. Extent of each type of masonry work is indicated on drawings and in schedules.

B. Types of masonry work required include:

1. Concrete unit masonry

1.3 Submittals

In compliance with Section 01300 (if applicable) and as specified herein.

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. Show wall elevations.

2.0 PRODUCTS

2.1 Materials

A. General: Refer to Section 04200 "Unit Masonry" for masonry materials and accessories not included in this section.

B. Reinforcement Bars: Provide deformed bars of following grades complying with ASTM A 615, except as otherwise noted.

C. Provide Grade 60 for bars No. 3 to No. 18, except as otherwise indicated

D. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

3.0 EXECUTION

3.1 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 normal bar diameter or 1" (whichever is greater).

C. For columns, piers and pilasters, provide a clear distance between vertical bars as indicated, but not less than 1-1/2 times the nominal bar diameter or 1-1/2", whichever is greater. Provide lateral ties as indicated.

D. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect/Engineer. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

E. Provide not less than minimum lap shown, or if not indicated, as required by governing code.

F. Weld splices where indicated. Comply with the requirements of AWS D1.4 for welding materials and procedures.

G. 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 that 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 fire-proofing, pipe enclosures and other special conditions.

H. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.

I. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.2 Installation, General:

A. Refer to Section 04200 "Unit Masonry" for general installation requirements of unit masonry.

B. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.

C. Construct formwork to conform to shape, line and dimensions shown. Make sufficiently tight to prevent leakage of mortar grout, or concrete (if any). Brace, tie and support as required to maintain position and shape during construction and curing of reinforced masonry.

D. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

E. Allow not less than the following minimum time to elapse after completion of members before removing shores or forms, provided suitable curing conditions have been obtained during the curing period.

1. 10 days for girders and beams.
2. 7 days for slabs.
3. 7 days for reinforced masonry soffits

3.3 Installation of Reinforced Concrete Unit Masonry

A. General: Do not wet concrete masonry units (CMU).

B. 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.

C. Walls:

1. Pattern Bond: Lay CMU wall units 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 of non-reinforced vertical cells, or provide units with solid bottoms.

D. Option: Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout. In which case, requirements for mortar bedding of cross-webs and closing of core spaces below bond beams do not apply.

E. Columns, Piers and Pilasters

1. Use CMU units of the size, shape and number of vertical core spaces shown. If not shown, use units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.

2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.

3. Where bonded pilaster construction is shown, lay wall and pilaster units together to maximum pour height specified.

F. Grouting

1. Use "Fine Grout" per ASTM C 476 for filling spaces less than 2" in one or both horizontal directions.

2. Use "Coarse Grout" per ASTM C 476 for filling 2" spaces or larger in both horizontal directions.

3. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.

G. Low-Lift Grouting

1. Provide minimum clear dimension of 2" and clear area of 8 sq. 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 chutes 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.

5. Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beams; lap at cor-

ners and intersections. Place grout in bond beam course before filling vertical cores above bond beam.

H. High-Lift Grouting

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3" and 10 sq. in. respectively.

2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.

3. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

4. Construct masonry to full height of maximum grout pour specified, prior to placing grout.

5. Limit grout lifts to a maximum height of 5' and grout pour to a maximum height of 24', for single wythe hollow concrete masonry walls, unless otherwise indicated.

I. Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. The vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10'.

J. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.

K. Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing indicated.

L. Place horizontal beam reinforcement as the masonry units are laid.

M. Embed lateral tie reinforcement in mortar joints where indicated. Place as masonry units are laid, at vertical spacing shown.

N. Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8-gage wire ties spaced 16" o.c. for members with 20" or less side dimensions, and 8" o.c. for members with side dimensions exceeding 20".

O. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcing and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes if required and brace closures to resist grout pressures.

P. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

Q. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.

R. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 5'. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

S. Place grout in lintels or beams over openings in one continuous pour. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.

T. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within1-1/2" of top course of first pour.

U. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

V. Concrete for unit masonry is specified on Section 03300.

W. Concrete (Grout) for unit masonry shall be tested in conformance with ASTM C1019.

END OF SECTION 04230

SECTION 04500 - MASONRY RESTORATION

1.0 GENERAL

1.1 Scope

This specification covers the furnishing of all labor, equipment, and materials required to repair/restore masonry walls. Masonry repair and restoration shall include the repointing of mortar joints, the removal of plant growth, the repairing of damaged masonry, and the cleaning of exposed masonry surfaces. The contractor shall repair/restore all masonry surfaces as shown on contract drawings or as specified in the contract documents.

1.2 Related Sections

07920 Joint Sealant/Joint Fillers (if applicable)

1.3 References

A. American Society for Testing and Materials (ASTM) – latest editions of the following standards:

ASTM C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars -- Modified.
ASTM C 144 Standard Specification for Aggregate for Masonry Mortar.
ASTM C 270 Standard Specification for Mortar for Unit Masonry
ASTM C 348 Test Method for Flexural Strength of Hydraulic Cement Mortars.
ASTM C 596 Test Method for Drying Shrinkage of Mortar Containing Portland Cement.

B. ACI 530, Building Code Requirements For Masonry Structures and ACI 530.1, Specifications for Masonry Structures.

1.4 Submittals

A. The Contractor shall submit manufacturer's product technical data, specifications, and laboratory test results that validate product compliance with the requirements for the project.

B. The Contractor shall submit warranty information confirming that the materials used will work as a compatible, warranted system.

C. The Contractor shall issue Certificates of Warranty stating that all materials have been applied in accordance with the manufacturer's published instructions. Provide a 5 year warranty against workmanship (contractor) and material failure (manufacturer).

D. Samples: Submit, for verification purposes, prior to mock-up erection, samples of each new exposed masonry material to be used for

replacing existing materials. Include in each set of samples the full range of colors, colors and textures to be expected in completed work.

1. For bricks, provide straps or panels containing not less than 4 units.
2. Each type of mortar for pointing and masonry rebuilding/repair.
3. Each type of anchor.
4. Full blocks for decorative CMU repair.

1.5 Submittals for Substitution of Materials

All submittals for substitutions must be made in writing to the engineer with supporting technical data sheets and test data showing complete equivalent performance.

1.6 Pre-Bid Inspection

[Pre-bid site visits are optional on this contract.]

1.7 Project Conditions

A. Do not use products under conditions of precipitation or freezing weather. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs. Do not repoint mortar joints or repair masonry unless air temperatures are between 40 degrees F and 80 Degrees F and will remain so for at least 48 hours after completion of work.

B. Protect adjacent work from contamination due to mixing, handling, cleaning operations, and application of repair products.

C. Surfaces shall be protected to prevent rapid drying where heavy wind or hot sunlight exists.

1.8 Site Conditions

Job conditions shall be maintained at standards that allow material placement within temperature and cleanliness requirements. Unusual conditions as uncovered during the course of work shall be brought to the engineer’s attention for analysis and disposition. These conditions include but are not limited to poor quality base concrete, severely corroded reinforcing steel, random cracks and deep oil penetration.

1.9 Shoring and Support

When repair of deteriorated structural concrete may cause temporary weakness, excessive deflections or structural instability, shoring or other suitable supports shall be provided until completion and adequate curing of repairs.

The Contractor shall submit cut sheets with certified capacities for shoring to be used. Shoring plans, if required, shall be prepared, signed, and sealed by an Engineer registered in the State of Florida.

1.10 Material Delivery, Storage, and Handling

A. Deliver products in original factory packaging bearing identification of product, manufacturer, batch number, and expiration date as applicable. Provide Material Safety Data Sheets for each product.

B. Store products in a location protected from freezing, damage, construction activity, precipitation and direct sunlight in strict accordance with the manufacturer's recommendations.

C. Condition products to approximately 60 to 70 degrees F (16 to 21 degrees C) for use in accordance with the manufacturer's recommendations.

D. Handle all products with appropriate precautions and care as stated on the Material Safety Data Sheet.

1.11 Quality Assurance

A. Contractor

The repair contractor shall have experience, training, and proficiency specific to all work within this project. Prior to start of general masonry restoration, prepare the following sample panels on the building where directed by the Engineer. Obtain the Engineer's acceptance of visual qualities before proceeding with the work. Retain acceptable panels in undisturbed condition, suitably marked, during construction as a standard for judging completed work.

1. Cleaning: Demonstrate that the materials and methods to be used for cleaning each type of masonry surface and condition on sample panels of approximately 25 sq. ft. in area.
2. Allow waiting period of duration indicated, but not less than 7 calendar days, after completion of sample cleaning to permit study of sample panels for negative reactions.
3. Repointing: Prepare 2 separate sample areas of approximately 3' high by 6' wide for each type of repointing required, one for demonstrating methods and quality of workmanship expected in removal of mortar from joints and the other for demonstrating quality of materials and workmanship expected in pointing mortar joints.
4. Masonry Repair: Prepare sample panels of size indicated for each type of masonry material indicated to be patched, rebuilt or replaced. Erect mock-up panels into an existing wall, unless otherwise indicated, to demonstrate quality of materials and workmanship.

B. Manufacturer Representative

The manufacturer shall be a company regularly engaged in the manufacturing and marketing of the products specified in this section. The manufacturer shall provide job service as required to assure proper handling and installation of materials. The field representative shall instruct as needed to assure that handling, mixing, placing and finishing of materials are in accordance with specifications.

C. Engineer

All work and materials are subject to observation by the Engineer and/or owner's representative. All work is subject to testing as deemed necessary by the Engineer. The expense of removing and replacing any concrete repair materials for observation or testing shall be borne by the Contractor if deemed necessary by the Engineer or Owner.

2.0 PRODUCTS

Any material substitutions must be approved by the engineer in accordance with Section 1.5.

2.1 Masonry Materials

Masonry materials for repair and/or replacement shall match the surrounding existing materials for both structural properties and appearance. Provide masonry and accessories, including units for lintels, arches, corners, and other special ground, cut, or sawed shapes where required to complete masonry restoration work. Provide units with color, surface texture, and size to match the existing condition.

2.2 Mortar Materials

The compressive strength of the repointing mortar shall match that of the original mortar as closely as possible. Contractor shall utilize the services of a qualified and licensed testing lab to perform the materials testing as required for obtaining the properties of the existing mortar. Cementitious content shall be limited to Portland cement and lime.

A. Portland Cement: ASTM C-150, Type I.

B. Hydrated Lime: ASTM C-207, Type S.

C. Aggregates for Mortar: ASTM C-144.

D. For pointing mortar provide sand with rounded edges.

E. Match size, texture and gradation of existing mortar as closely as possible.

F. Colored Mortar Pigments: Use only pigments with record of satisfactory performance in masonry mortars.

G. Water: Clean, potable, free of oils, acids, alkalis and organic matter.

H. Aggregate for Grout: ASTM C-404.

3.0 EXECUTION

3.1 Pre-Job Conference

At least 7 days prior to the start of concrete repairs, the contractor shall conduct a meeting to review the detailed requirements for rehabilitation work. Surface preparation, proposed equipment, procedures, material mixing, placing and finishing procedures, and site conditions shall be discussed with the engineer prior to the beginning of the work.

The contractor shall require the attendance of all involved parties including but not limited to the contractor's superintendent, repair contractor, material supplier representative, and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by the contractor and distributed to all parties concerned within 5 days of the meeting.

3.2 Preparation

A. Remove dirt, dust, algae, laitance, efflorescence, deteriorated concrete/mortar, and/or any other materials that will prohibit adequate bond from the surface.

B. Protect persons, motor vehicles, surrounding surfaces of the building whose masonry surfaces are being restored, building site, and surrounding buildings from injury resulting from masonry restoration work.

C. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.

D. Removal of Plant Growth: Remove plant, moss and shrub growth completely from masonry surfaces. Carefully remove plants, creepers and vegetation by cutting at roots and allowing drying as long as possible prior to removal. Remove loose soil or debris from open masonry joints to whatever depth it occurs. Apply ammonium sulfamate or other acceptable root killing material to plant roots, in accordance with manufacturer's instructions. Do not apply materials to plants or vegetation to remain.

3.3 Mixing

A. Follow the manufacturer's recommended procedures for mixing the mortar.

B. Measurement and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Mix materials in a clean mechanical batch mixer.

C. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix which will retain its form when pressed into a ball. Maintain mortar in this dampened condition for l-to- 2 hours. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

D. Colored Mortar: Produce mortar of color required by use of selected ingredients.

E. Do not use admixtures of any kind in mortar unless otherwise indicated.

3.4 Brick/Block Removal

A. Carefully remove by hand any brick/block which is damaged, spalled, or deteriorated beyond repair. Cut out full units form joint to joint and in manner to permit replacement with full size units.

B. Support and protect masonry to remain which surrounds removal area.

C. Salvage as much whole, undamaged masonry as possible.

D. Remove mortar, loose particles, soil, etc. from salvaged masonry by cleaning with brushes and water. Store for reuse.

E. Clean remaining masonry at edges of removal areas by removing mortar, dust, loose debris, etc. in preparation for rebuilding.

3.5 Brick/Block Rebuilding

A. Fit replacement units into bonding and coursing pattern of existing masonry. If cutting is required, use motor driven saw designed to cut masonry with clean, sharp, unchipped edges.

B. Lay replacement brick/block with completely filled bed, head and collar joints. Butter ends with sufficient mortar to fill head joints and push into place. Use wetting methods which ensure that units are nearly saturated but surface dry when laid. Maintain joint width for replacement units to match existing.

C. Tool exposed mortar joints in repaired areas to match joints of surrounding existing masonry.

3.6 Cleaning Existing Masonry

A. Proceed with cleaning in an orderly manner. Work from top to bottom of each scaffold width and from one end of each elevation to the other.

B. Use only those cleaning methods appropriate for each masonry material and location.

C. Perform each cleaning method in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.

D. Rinse off chemical residue and soil by working upwards from bottom to top of each treated area at each stage or scaffold setting.

3.7 Repointing Existing Masonry

A. Joint Raking

1. Rake out mortar from joints to depths equal to 2-1/2 times their widths but not less than l/2" (from face of original mortar) nor less than that required to expose sound, unweathered mortar.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace any masonry units which become damaged.
4. Cut out old mortar by hand with chisel and mallet, unless otherwise indicated.
5. Power operated rotary hand saws and grinders will be permitted but only based on the demonstrated ability of the operators to use tools without damage to the masonry. Saws and grinders shall be fitted with dust extraction system as required to prevent dust from being released in accordance with EPA, city, county, and other governing agency requirements.
6. Upon completion of joint raking, Contractor must obtain approval from Architect before joint pointing commences.

B. Joint Pointing

1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.

2. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8" until a uniform depth is formed. Compact each layer thoroughly and allow to become thumbprint-hard before applying next layer.
3. After joints have been filled to a uniform depth, place remaining pointing mortar in 3 layers with each of first and second layers filling approximately 2/5 of joint depth and third layer the remaining l/5. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks/blocks have rounded edges, recess the final layer slightly from face. Take care not to spread mortar over edges onto exposed masonry surfaces, or to featheredge mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in a damp condition for not less than 72 hours.
6. Where repointing work proceeds cleaning of existing masonry, allow mortar to harden not less than 30 days before beginning cleaning work.

3.8 Final Cleaning

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water spray applied at low pressure.

B. Use of metal scrapers or brushes will not be permitted.

C. Use of acid or alkali cleaning agents will not be permitted.

END OF SECTION 04500

SECTION 05120 - STRUCTURAL STEEL

1.0 GENERAL

1.1 Related Documents

Drawings and general provisions of Contract, including general and supplementary conditions and other Specification sections applicable to the work of this section.

1.2 Summary of Work

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

C. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

1.3 Submittals

In compliance with Section 01300 (if applicable) and as specified herein.

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications including specified standards.

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint.

4. Shrinkage-resistant grout.

B. Shop Drawings: Submit shop drawings prepared under supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams. Structural steel shop drawings shall be signed and sealed by the professional engineer who supervised their production.

1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

3. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type (s) of tests conducted and test results.

1.4 Quality Assurance

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges".

2. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings".

3. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" of Supplements thereto as issued.

4. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.

5. AWS D1.1 "Structural Welding Code".

6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

C. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

D. If recertification of welders is required, retesting will be Contractor's responsibility.

1.5 Delivery, Handling and Storage

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged material or structures as directed.

2.0 PRODUCTS

2.1 Materials

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Hot-Rolled Steel Beams and Columns: ASTM A992 Grade 50.
Plates, Bars, Channels, Rods, Anchor Bolts and Angles: ASTM A36

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B, Fy=46 ksi.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B, Fy=35 ksi.

E. Finish: Black, except where indicated to be galvanized.

F. All structural steel that is exposed to the exterior environment shall be galvanized as per ASTM A123.

G. Anchor Bolts shall be furnished with heavy hex nuts and flat washers, and shall be ASTM F1554, with a nut at the embedded end. Tac weld nut to bolt or strike threads.

H. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325, 3/4 inch diameter, unless otherwise noted.

2. Direct tension indicator washers may be used at Contractor's option.

I. Shear connectors shall be ASTM A108, Grade 1015 through 1020, headed stud type, cold finished carbon steel, AWS D1.1, Type B.

J. Steel joists shall conform to the joint AISC-SJI "Standard Specifications for Open Web Steel Joists and Deep Longspan Steel Joists," latest edition. All joists and joist girders shall have been designed in accordance with Steel Joist Institute criteria and submitted to and approved by the institute.

K. Electrodes for Welding: E 70 XX

1. Provide electrodes, welding rods and filler metals equal in strength and compatible in appearance with parent metal joined.

2. Welds not otherwise designated shall be 1/4 inch minimum fillet.

L. Structural Steel Primer Paint: All structural steel, including joists, shall receive two shop coats of rust inhibiting primer paint conforming to the performance requirements of Federal Specification TT-P-636, SSPC-Paint 13 or equal.

M. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

N. Available Products: Subject to compliance with Instructions to Bidders and Section 01630 (if applicable), products which may be incorporated in the work include the following. All other manufacturers must request approval.

NS Grout; Euclid Chemical Co.
Masterflow 713; Master Builders.
Five Star Grout; U.S. Grout Corp.

2.2 Fabrication

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

D. Ends of columns shall be milled to bear at all splices and attachment of base plates.

E. Connections: Weld or bolt shop connections, as indicated.

1. Bolt field connections, except where welded connections or other connections are indicated.

2. Framing connections shall be AISC Type 2 double-angle bolted connections, unless otherwise noted. Select connections to support one-half the total uniform load capacity shown in the uniform load constants, part 2 of the AISC manual, for the span and grade of steel specified.

F. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A 490 Bolts".

G. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

H. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 Shop Painting

General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

A. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

B. Do not paint surfaces which are scheduled to receive sprayed- on fireproofing.

C. Apply two coats of primer to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning".

2. SP-2 "Hand Tool Cleaning".

E. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.0 mils. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

3.0 EXECUTION

3.1 Erection

A. Temporary Shoring and Bracing: Contractor shall provide adequate temporary bracing, shoring and guying of the framing against wind, construction loads or other temporary forces until such protection is no longer required for the safe support of the structure. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary

members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

C. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

2. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. For proprietary grout materials, comply with manufacturer's instructions.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.

2. Splice members only where indicated and accepted on shop drawings.

F. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

G. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members who are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

H. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same materials as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

I. Return all welds at corners twice the normal weld size minimum.

J. All copes, blocks, cutouts and other cutting of structural members shall have all reentrant corners shaped notch-free to a radius of 1/2 inch minimum.

K. All beams shall be fabricated and erected natural camber up.

L. Structural openings, supports, anchors, etc., around or affected by mechanical, electrical and plumbing equipment shall be verified witht he equipment purchased before proceeding with structural work affected.

M. Unless detailed elsewhere in the drawings, openings in roof decking larger than 1 square foot shall be framed by angles 4 x 4 x 1/4 leg down, bearing on a joist at each end. Cope vertical leg 4 inches each end. Weld additional angles of the same size to form a rectangle of the appropriate size.

N. Provide galvanized steel lintel angles for support of masonry veneer over openings, unless otherwise noted. Install L6 x 6 x 3/8 with 8 inch minimum bearing each end.

O. Open Web Steel Joists:

1. All joists on column centerlines shall be secured by 3/4 inch diameter A325 bolts at the top chord bearing. The bottom chord shall be extended and welded to the column.

2. Continuous diagonal bridging shall be used including where cross-bracing is indicated. Weld bridging to top and bottom chords of joists.

3. All joists not requiring bolted connections shall be welded to support with 1/4 inch welds 2 inches long each side.

4. All joist bottom chords shall be angles.

5. Bridging shall be completed and approved by engineer prior to placing metal deck.

6. Joists shall bear 4 inches minimum on masonry and 2-1/2 inches minimum on steel, unless otherwise noted. Joists bearing on masonry shall bear on an embedded steel plate.

3.2 Quality Control

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

1. High strength bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints using ASTM A325 or A490 Bolts.

2. Welded connections will be inspected and tested according to AWS D1.1 procedures.

B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations there from.

C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Testing agency may inspect structural steel at plant before shipment; however, Architect/Engineer reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

E. Correct deficiencies in structural steel work which inspections and/or laboratory test reports have indicated to be not in compliance with contract document requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any noncompliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION 05120

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. This Section includes the fabrication, delivery, and complete installation of all miscellaneous metal fabrications as indicated on the Drawings and specified herein.

2. Miscellaneous metal work shall include, but not be limited to, the following:

a. Miscellaneous Steel Framing and Supports.

b. Rough Hardware.

c. Miscellaneous Metal Fabrications.

1.02 QUALITY ASSURANCE

A. The current rules and practice set forth in the AISC Specification and the AISC Code shall govern this Section, except as modified herein.

B. All welding shall be performed in accordance with AWS D1.01. All welding shall be performed by welders with current certificates for the type of weld being performed. Special care shall be taken to keep welding electrodes free of moisture.

C. Field measurements shall be taken prior to preparation of shop drawings and fabrication, where possible. Trimming and fitting shall be allowed for wherever taking field measurements before fabrication might delay the work.

D. Items shall be preassembled in the shop to greatest extent possible to minimize field splicing and assembly. Units shall be disassembled only as necessary for handling and shipping limitations. Disassembled units shall be clearly marked for reassembly.

E. All materials or operations specified by reference to the published specifications of a manufacturer, the American Society for Testing and Materials (ASTM), the American Iron and Steel Institute (AISC), the American Hot Dip Galvanizers Association (AHDGA), the American Welding Society (AWS), the Aluminum Association (AA) or other published standards shall comply with the requirements of the current specifications of standards listed.

1.03 PRODUCT DELIVERY AND STORAGE

A. Materials shall be delivered to the Site undamaged and shall be stored and protected from the elements by covering in plastic. All material damaged prior to substantial completion shall be removed from the Site and replaced at no additional cost to the Owner.

1.04 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawing for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations, and details of sections and connections. Anchorage and accessory items shall be shown. Templates for anchor and bolt

installations shall be provided.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Metal surfaces, general

1. For fabrication of miscellaneous metal work which will be exposed to view, only materials which are smooth and free of surface blemishes such as pitting, seam marks, roller marks, rolled trade names and roughness shall be used.

B. The following shall be used except where otherwise specified or required:

1. Steel Plates, Shapes, and Bars: ASTM A 36.

2. Uncoated Cold-Rolled Structural Steel Sheet: ASTM A 611, Grade A, unless otherwise indicated or required by design loading.

3. Uncoated Cold-Rolled Commercial Quality Steel Sheet: ASTM A 366.

4. Galvanized Structural Quality Steel Sheet: ASTM A 446; Grade A, unless another grade required for design loading, and G90 coating designation unless otherwise indicated.

5. Galvanized Commercial Quality Steel Sheet: ASTM A 526, G90 coating designation unless otherwise indicated.

6. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

a. Black finish, except galvanized finish for exterior installations and where indicated.

b. Type S, Grade A, standard weight (schedule 40) unless another grade or weight or both required by structural loads.

7. Aluminum Sheet: ASTM B 221, alloy as designated.

8. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails.

9. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

10. Stainless Steel, 16 Gauge Type 316 (UNS Designation S31600) of welded construction with vertical and horizontal arrows coved. Stainless steel finish #4 satin for an exposed surface unless otherwise specified.

C. Hot-dipped galvanizing or zinc coatings applied on products fabricated from rolled, pressed, and forged steel shapes, plates, bars and strips shall comply with ASTM A 123. Hot-dipped galvanized or zinc coatings for assembled steel products shall comply with ASTM A 386. Galvanized surfaces for which a shop coat of paint is specified shall be chemically treated to provide a bond for the paint. Except for bolts, nuts and other fastenings, all galvanizing shall be applied after fabrication. After welding, burned coating shall be repaired by metalizing with zinc-rich paint.

2.02 FASTENERS

A. General:

1. Zinc-coated fasteners shall be used for exterior locations or where built into exterior walls wherever possible.

2. Fasteners and connections shall be welded wherever possible.

B. Nuts and bolts shall be regular hexagon type conforming to ASTM A 307, Grade A.

C. Lag bolts shall be square head type conforming to Federal Specification FF-B-561.

D. Machine screws shall be cadmium plated steel conforming to Federal Specification FF-S-92.

E. Wood screws shall be flat head carbon steel conforming to Federal Specification FF-W-111.

F. Washers shall be round, carbon steel conforming to Federal Specification FF-W-92.

G. Masonry anchorage devices shall be expansion shields conforming to Federal Specification FF-S-325.

H. Toggle bolts shall be tumble-wing type conforming to Federal Specification FF-B-588, type, class and style as required.

I. Lock washers shall be helical spring-type carbon steel conforming to Federal Specification FF-W-084.

2.03 GROUT

A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Acceptable products/manufacturers:

1. "Euco N-S Grout"; Euclid Chemical Co.

2. "Crystex"; L & M Construction Chemicals, Inc.

3. "Masterflow 713"; Master Builders.

4. "Sonogrout"; Sonneborn Building Products.

2.04 FINISHES / PRIMERS

A. Galvanizing, where indicated and required for all exterior surfaces): Comply with ASTM A 525 for minimum G90 coating.

B. Shop Primer for Ferrous Metals: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

C. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry firm containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

D. Dissimilar Metals Coating: Protective paint shall be Scotch-Clad Brand Protective Coating No. 1706 as manufactured by 3M, Minnesota Mining and Manufacturing Co., or

approved equal.

2.05 FABRICATION AND MANUFACTURE

A. Miscellaneous Steel Framing and Supports:

1. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete the Work. Fabricate miscellaneous units to size, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate structural steel shapes, plates, and steel bars of welded construction, using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units are required to be installed after concrete is placed. Except as otherwise indicated, space anchors 24" on center.

3. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

4. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use phillips flat-head (countersunk) screws or bolts for exposed fasteners.

6. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

7. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

8. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

B. Rough Hardware:

1. Provide all rough hardware required for installation of all metal fabrications. Rough hardware shall be as specified herein and as required by manufacturer and/or for complete installation.

2. Fabricate items of sized, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

3. Provide all rough hardware as required by manufacturer and/or for a complete installation.

C. Galvanizing:

1. Provide a zinc coating for those items indicated or specified to be galvanized, as follows:

a. ASTM A153 for galvanizing iron and steel hardware.

b. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

c. ASTM A386 for galvanizing assembled steel products.

D. Shop Painting:

1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

2. Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

a. Exteriors (SSPC Zone 1B); SSPC-SP6 "Commercial Blast Cleaning".

b. Interiors (SSPC Zone 1A); SSPC-SP3 "Power Tool Cleaning".

PART 3 - EXECUTION

3.01 INSPECTION

A. The fabricator/installer shall examine the areas and conditions under which the metal fabrications are to be installed. Do not proceed until the unsatisfactory conditions have been corrected in an acceptable manner.

3.02 FABRICATION AND WORKMANSHIP

A. Materials of type, size and thickness shown shall be used, or if not shown, of required size and thickness to produce adequate strength and durability in the finished product. Metal surfaces shall be clean and free from mill scale, flake rust and rust pitting, well formed and finished to shape and size, with sharp lines and angles and smooth surfaces.

B. Exposed work shall be formed true to line and level with accurate angles and surfaces and straight sharp edges. Exposed edges shall be eased to a radius of 1/32" unless otherwise shown. Bent metal corners shall be formed to the smallest radius possible without causing grain separation, or otherwise impairing work.

C. All corners and seams shall be welded continuously, complying with AWS recommendations. At exposed connections, exposed welds shall be ground smooth and flush to match and blend with adjoining surfaces.

D. Castings shall be uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Castings shall conform to the dimensions indicated with a tolerance of plus or minus 1/8", except in the dimensions of covers and the openings to receive them shall be limited to plus or minus 1/16". Castings shall be smooth and well cleaned by shot blasting or other approved methods. Covers subject to street or foot bearing surfaces; provide machined bearing or contact surfaces for other joints where indicated or required.

E. Shearing and punching shall leave clean, true lines and surfaces. Curved work shall be evenly sprung. Weld or rivet permanent connections. Welds and flush rivets shall be finished flush and smooth on surfaces that will be exposed after installation. Do not use screws or bolts where they can be avoided; where used, heads shall be countersunk, screwed up tight and threads stripped to prevent loosening. Finish products shall represent the best in workmanship.

F. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Exposed fasteners, where used, shall be of the type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts shall be used.

G. Exposed connections shall be formed with hairline joints, flush and smooth, using concealed fasteners wherever possible. Joints exposed to weather shall be formed to exclude water. Provide holes and connections for the work of other trades.

H. Anchoring devices shall be fabricated and spaced to provide adequate support for the intended use.

I. Metal fabrications shall be cut, reinforced, drilled and tapped, as required, to receive finish hardware and similar items.

J. All steel fabrications to be installed in exterior locations (outside the building) shall be hot dipped galvanized after fabrication and 316 SS for anything close to wet well area.

.

K. All metal fabrications, except galvanized steel, or members or portions of members to be imbedded in concrete or masonry surfaces and edges to be field welded, and galvanized surfaces unless otherwise specified, shall be shop painted with primer.

L. All scale, rust and other deleterious materials shall be removed before applying the shop primer or galvanizing. Heavy rust and loose mill scale shall be removed in accordance with SSPC SP-2 "Hand Tool Cleaning" or SSPC SP-7 "Brush-off Blast Cleaning." Oil, grease and similar contaminants shall be removed in accordance with SSPC SP-1 "Solvent Cleaning."

M. Immediately after surface preparation, galvanizing shall be applied or the shop primer shall be brushed or sprayed on in accordance with the manufacturer's instructions, and at a rate to provide a uniform dry film thickness of 3.0 miles for each coat. One coat shall be applied to fabricated metal items, except two (2) coats shall be applied to surfaces inaccessible after assembly or erection.

N. All miscellaneous metal items shall be erected into place as shown on the Drawings, and adjusted to satisfactorily fulfill the use for which such is intended.

O. All metal to be prepared for painting to comply with Section 09 91 00.

3.03 INSTALLATION

A. At proper time, deliver and set in place items for miscellaneous metal fabrication work to be built into adjoining construction. Erect items which require field cutting, fitting, drilling or welding to structure.

B. 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.

C. Provide anchorage devices and fastenings where necessary for securing miscellaneous metal fabrications to in-place construction; including; threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

D. Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and

free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.

E. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dipped galvanized after fabrication, and are intended for bolted or screwed field connections.

F. For field welding, comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

G. Dissimilar Metals Coating:

1. All dissimilar metals coming in contact with each other shall be coated with asphaltic, bituminous, or otherwise protective paint to prevent chemical reaction.

3.03 ADJUST AND CLEAN

A. All exposed surfaces shall be left clean and free from all blemishes or discolorations after erection.

B. Touch-Up Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.

a. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION

SECTION 06 01 10 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Types of work in this Section include, but are not limited to, rough carpentry for:

   a. Wood grounds, nailers and blocking.

   b. Wood furring.

   c. Plywood sheathing.

2. Provide wood blocking and supports for all architectural millwork, laboratory casework, accessories and other equipment as required to properly support all Work.

3. Treatment of rough carpentry materials included under this Work is specified under Section 06 14 00 - WOOD TREATMENT.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Society for Testing and Materials (ASTM):
   a. Reference Standards.

2. Federal Specifications (FS):
   a. Reference Standards.

3. American Lumber Standards Committee (ALSC):
   a. Board of Review.

4. Southern Pine Association (SPA):
   a. SPA Standard Grading Rules.

5. American Plywood Association (APA):
   a. APA Standard Grading Rules.

6. Western Wood Products Association (WWPA):
   a. WWPA Standard Grading Rules.

7. West Coast Lumber Inspection Bureau (WCLIB):
   a. WCLIB Standard Grading Rules.

8. National Forest Products Association (NFPA):
   a. Manual for House Framing.

   b. Recommended Nailing Schedule.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Maintain materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

B. For lumber and plywood pressure treated with waterborne chemicals, provide space between each course for air circulation.

1.04 JOB CONDITIONS

A. Coordination:

1. Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber Standards, General:

1. Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee's (ALSC) Board of Review.

2. Factory mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade species, moisture content at time of surfacing, and mill.

3. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

4. Provide seasoned lumber with 19% percent maximum moisture content at time of dressing and shipment for sizes 2-inches or less in nominal thickness, unless otherwise indicated.

B. Grounds, Blocking, Nailers, Blocking, Furring, and Similar Members:

1. Grounds, blocking, nailers, furring, and similar members shall be standard grade light framing size lumber of any species or board size lumber as required. No. 2 Common or Standard grade boards per WCLIB or WWPA rules, or No. 2 boards per SPA rules.

C. Plywood Panels:

1. Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels, Form No. E 445.

2. Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

3. Where construction panels are used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, and thickness.

4. Backing Panels For Mounting Electrical or Telephone Equipment: Provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not indicated, not less than 15/32".

D. Fasteners and Anchorages:

1. Provide size, type, material, and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

2. Where rough carpentry is exposed to weather, in ground contact, or in areas of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

2.02 WOOD TREATMENT

A. Decay (Termite) treatment of the following lumber shall be in accordance with requirements described under Section 06 14 00 - WOOD TREATMENT:

Location	Treatment (General)
Wood members in contact with concrete, used in connection with roofing, or exposed to moisture	Decay (Termite)

B. Where treated lumber is cut after treatment and during installation, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPA M4.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Material with defects which might impair the quality of the work, and units which are too small to fabricate with a minimum of joints or the optimum joint arrangement, shall be discarded.

2. All rough carpentry work shall be set accurately to required levels and lines, with members plumb and true, and accurately cut and fitted.

3. 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.

4. 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.

5. Use washers where required for fasteners to avoid movement of material through loading and/or vibration.

6. 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.

C. Wood Furring:

1. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.

2. Provide size and spacing shown and/or as required for design function and durability, including attachment. Select furring for freedom from knots capable of producing bent-over nails and resulting damage to finish work.

D. Plywood Panels:

1. Comply with applicable recommendations contained in Form No. E 30F, "APA Design/Construction Guide - Residential & Commercial", for types of plywood panels and applications indicated.

2. Fastening Methods: Fasten panels as follows, in strict accordance with Florida Building Code.

END OF SECTION

SECTION 06 14 00 - WOOD TREATMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. The work required under this Section shall include the treatment of all Rough Carpentry materials specified under Section 06 01 00 - ROUGH CARPENTRY, as follows:

a. Decay and Termite Resistant Wood Treatment.

B. Related Work Specified Elsewhere:

1. PAINTING: Section 09 91 00.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Wood Preservers' Association (AWPA):

a. Referenced Standards.

2. Underwriters' Laboratories (UL):

a. Referenced Standards.

3. Federal Specifications (FS):

a. Referenced Standards.

1.03 GUARANTEE

A. Furnish a written guarantee stating that all materials and workmanship are guaranteed against defects for a period of not less than five (5) years after completion and Final Acceptance of the Work. Defects due to faulty materials and/or workmanship developed during the guarantee period shall be satisfactorily replaced.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Decay and Termite Resistant Wood Treatment:

1. All lumber and plywood specified for decay and termite resistant treatment shall be pressure treated with Osmose Naturewood for exterior and Osmose Advance Guard for protected interior, meeting AWPA Standard P-5 and FS TT-W-550.

PART 3 - EXECUTION

3.01 TREATMENT

A. Decay and Termite Resistant Wood Treatment:

1. Chemicals shall be applied in a closed cylinder by vacuum-pressure process in strict accordance with manufacturer's instructions and with the approved standards and recommended treating practices as listed in AWPA Standards C-2 and C-9 or the appropriate AWPA standard covering the commodity treated and as listed in FS TT-W-571.

2. After treatment and before shipment, lumber 2" nominal or less shall be dried to a 15-19% moisture content.

3. Plywood shall be dried after treatment and before shipment to moisture content of 18% or less.

END OF SECTION

SECTION 07 01 50
PREPARATION FOR ROOF PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Removal of existing roofing systems to substrate and patching of existing roof substructure in preparation for new roof system (flat and sloped areas), as shown on Drawings and Specifications.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Pre-installation Meeting: Convene one week before starting work of this section.

C. Schedule work to coincide with commencement of installation of new roofing system.

1.03 QUALITY ASSURANCE

A. Materials Roof Repair Firm Qualifications: Company specializing in performing the work of this section with minimum 10 years of documented experience in the roof systems specified.

1.04 FIELD CONDITIONS

A. Contractor shall inspect the project conditions before project start. Starting work constitutes acceptance of existing conditions.

B. Do not remove portions of existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.

C. Maintain continuous temporary protection prior to and during installation of new roofing system.

PART II – PRODUCTS

2.01 MATERIALS

A. Temporary Protection: Sheet polyethylene; provide weights to retain sheeting in position.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface is clear and ready for work of the roof system specified and approved by the roof manufacturer.

3.02 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose off site.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

B. Remove existing roofing and underlayment membrane, perimeter base flashings, flashings around roof protrusions, edge trim, etc. down to roof deck.

C. Verify that roof deck is dry, sound, clean and smooth free of depressions, projections and is properly secured to structure.

D. Repair existing deck surface to provide smooth working surface for new roof.

3.04 FIELD QUALITY CONTROL

A. Roof Manufacturer shall review work progress and accept conditions prior to proceeding with new roof system.

3.05 PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Do not permit traffic over unprotected or repaired deck surface.

END OF SECTION

SECTION 07 18 13 – PEDESTRIAN TRAFFIC WATERPROOF DECK SURFACING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.02 WORK INCLUDED

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the waterproof pedestrian traffic bearing surfacing as shown on the drawings and specified herein.

B. All existing first floor exposed concrete floor areas/rooms shown on Drawing Sheet A-2 and A-4 shall be prepared and receive deck surfacing with integral wall base (4” high).

1.03 RELATED WORK

A. Concrete Patch Section 03 05 00.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and General Provisions Specification Sections.

B. Product Data: Submit manufacturer's technical data, application instructions and general recommendations for the waterproof traffic bearing deck surfacing specified herein.

C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available.

1. Submit 2-1/2" x 4" samples of color chips from color chart selection designated by the Architect.

D. Material certificates signed by manufacturer certifying that the waterproof traffic bearing deck surfacing complies with requirements specified herein.

E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing waterproof deck covering system types similar to that required for this Project and who is acceptable to manufacturer of primary materials.

B. Single-Source Responsibility: Obtain waterproof traffic bearing materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

B. Comply with manufacturer's directions for materials storage to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Comply with waterproof traffic bearing manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pedestrian traffic bearing coating to be equal to Sherwin Williams system as described below:

1. First Coat: SherCrete Flexible Waterproofer applied in 2 applications in order to achieve total thickness of 16 dry mils.

2. Second Coat: SherCrete Flexible Waterproofer applied as an accent splatter with chosen colors.

3. Third Coat: Armorseal Rexthane Clear applied as a protection coat over the knockdown finish with H&C Shark Grip additive.

NOTES:

1. ALL FLOOR TO WALL TRANSITIONS WILL HAVE A CANT BEAD OF STAMPEDE 100 URETHANE SEALANT INSTALLED TO PREVENT WATER INTRUSION.

2. AT THE START OF THE PROJECT A 2’ X 2’ JOB STANDARD WILL BE INSTALLED AND APPROVED BY OWNER AND ARCHITECT.

2.02 COLORS

A. Colors: As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions where the waterproof traffic bearing deck surfacing is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

B. Evaluate level of moisture in the substrate to determine that moisture levels are acceptable for application of specified waterproof deck covering system.

3.02 SURFACE PREPARATION

A. General:

1. All surfaces to be coated shall be cleaned and prepared as specified. The installing contractor is responsible for the finish of his work. Should any surface be found unsuitable to produce a proper finish, the owner and Architect shall be notified, in writing, and no materials shall be applied until the unsuitable surfaces have been made satisfactory.

2. Perform preparation and cleaning procedures according to waterproof deck covering manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry and neutral substrate for application of waterproof deck covering.

3. Patch concrete deck cracks as indicated below (3.04) and as per manufacturer's requirements.

3.03 FLOOR CLEANING PRIOR TO SURFACE REPAIRS AND APPLICATION

A. All floor surfaces must be thoroughly pressure cleaned using a pressure washer at 3000 PSI and a 15 degree tip held at no more than 12" from the surface or a surface cleaner attached to the pressure washer to insure the surface is cleaned free of all loose, scaling and marginally adhering paint, all chalk, mildew, stains, dirt, grease or other foreign material. Surface must be firm, clean and dry before proceeding to the grinding step.

B. Remove grease and other foreign materials using a water-based degreaser such as KFUR KUTTER, SIMPLE GREEN, or GREASE LIGHTNING. Allow solution to remain on the surface for 10 minutes before rinsing thoroughly with clean water. **Caution: do not use household detergents or ammonia to the bleach solution**. Wear proper protective safety equipment.

C. Remove grease, oil, and stubborn airborne contaminants using a degreasing agent by applying to the affected area by pump up sprayer allowing to sit as described by manufacturer, typically 10 minutes and cleaning as adjacent areas.

3.04 CRACK REPAIR PROCEDURES

A. Horizontal Cracks Over 1/32": Rout out all cracks over a 1/32" to ¼" wide and ¼" deep. Flush cracks with water and allow to dry. Fill cracks with SherCrete Crack Repair Polyurea. While SherCrete Crack Filler is still wet, broadcast sand into Crack Filler to give profile. Follow all directions on back of tube, if directions are not followed the polyuria will discolor and bleed through the floor coating. Allow SherCrete Crack Filler to cure for 90 minutes. After 90 minutes, the SherCrete Crack Filler will be hard and can be coated.

B. Horizontal Floor Joints: If floor joints exist, they are to be respected and not filled with any type of sealant or filler. These joints are to be left uncoated, coat up to the edge of the joint lip.

3.05 APPLICATION / INSPECTIONS

A. General: Apply each component of waterproof traffic bearing deck surfacing system according to manufacturer's directions to produce a uniform monolithic surface of thickness indicated.

B. Apply coats per manufacturer requirements.

C. Contractor to arrange for the wet film thickness to be checked with a properly calibrated Wet Film Thickness Gauge or by specifically approved instruments by a Sherwin Williams representative. Areas will be chosen at random and measured to ensure conformance to the project specific specification.

D. It will be the installer’s responsibility to use a wet film gauge to check the application thickness as the painting proceeds.

E. A small sample area of each phase of the work shall be done and checked by a Sherwin Williams representative. This shall serve, upon acceptance, as the job standard for the remainder of that phase of work.

F. It is recommended that on a regular basis the floors be cleaned and rinsed to control dirt build up.

3.04 CURING, PROTECTION AND CLEANING

A. Cure waterproof traffic bearing deck surfacing materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

END OF SECTION

SECTION 07 32 13 – CLAY ROOF TILE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roof tiles and roof system components.

B. Metal roof flashing.

C. Underlayments and self-seal membrane.

D. Related roof accessories

NOTE: Existing roof deck (concrete slab roof panels) has slope of 5:12 (±).

1.2 RELATED SECTIONS

A. Section 06 01 10 - Rough Carpentry

B. Section 07 62 00 - Flashing and Sheet Metal

C. Division 23 - Mechanical: Mechanical work projecting through roof.

D. Division 26 - Electrical: Electrical work projecting through roof.

1.3 REFERENCES

A. ASTM A 90 - Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings; 2001.

B. ASTM A 525 - Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process; 1993.

C. ASTM A 641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 1998.

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1997a.

F. ASTM D 249 - Standard Specification for Asphalt Roll Roofing (Organic Felt) Surfaced with Mineral Granules; 1989 (reapproved 1996).

G. ASTM D 2626 - Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing; 1997b.

H. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; 2001.

I. Tile Roofing Institute (TRI) - Standard Installation Guides for Concrete and Clay Roof Tile in Cold Weather Applications. 1998

J. FRSA/TRI - Concrete and Clay Roof Tile Installation Manual Second Edition (For Florida High Wind Applications, 125 mph). January 1998.

K. ICC ER 2656 (ICBO-ES) - International Code Council Evaluation Services.

L. ICBO ER-6034P Concrete and Clay Roof Tile Installation Manual for Moderate Climate Regions

M. International Code Council Evaluation Services - ICC ES 9460C (SBCCI-ES)

N. ICC AC 180 - Acceptance Criteria for Clay and Concrete Roof Tiles. September, 2002.

O. Florida Building Code, Product Approval - FL 16618

1.4 DESIGN REQUIREMENTS

A. Roofing tile materials and installation shall conform to the requirements of ICC ESR 9914.

B. Roofing tile materials and installation shall conform to the SBCCI Standard for Hurricane Resistant Commercial Construction, and the latest Florida Building Code for wind borne debris zone.

C. Roofing tile materials and installation shall conform to the requirements of the applicable building code.

D. Submit NOA Certification (150 mph), Miami Dade or equal.

1.5 SUBMITTALS

A. Submit under Owner’s submittal requirements.

B. Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Indicate metal flashing profiles, joint locations, fastening locations, and installation details. Indicate tile layout with location of cut and special shaped tiles identified.

D. Selection Samples: For each finish product specified, two complete sets of tile colors representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two full size samples representing actual product, color, and patterns.

F. Certificates of Compliance: Submit to certify compliance with referenced standards.

G. Submit Florida Product Approval and NOA Certification.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five years documented experience producing concrete roof tile and member of National Tile Roofing Manufacturer's Association.

B. Installer Qualifications: Minimum five years documented experience installing products specified in this section and/or supervision by a manufacturers authorized installation representative.

C. Prior to scheduled commencement of roofing, Contractor is to call a pre-roofing conference to review substrate and procedures.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.

2. Mock-up shall be a minimum of a 10 foot (3.05 M) by 10 foot (3.05 M) area and include the edge, ridge, valley and other typical transition conditions anticipated.

3. Do not proceed with remaining work until installation workmanship and appearance is approved by Architect.

4. Accepted mock-up may remain as part of Work.

E. Comply with NRCA recommendations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Deliver products to project site in manufacturer's unopened pallets, labeled with data indicating compliance with specified requirements.

C. Maintain dry storage area for products of this section until installation of products.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not overload the roof. Distribute stacks of tile uniformly on roof at not greater than 12 inches (305 mm) in height.

1.9 WARRANTY

A. Manufacturer’s Warranty against defects in roof tile for the life of the structure.

B. Contractor’s Roofing Guarantee/ Installation Warranty: Warrants products of this section, as installed, to be in accord with the Contract Documents and free from faults and defects in materials and workmanship for a period of 3 years after Substantial Completion.

1.10 EXTRA MATERIALS

A. Provide an additional 1 percent of installed roof tiles, but not less than one full square, for Owner's use in roof maintenance.

B. Furnish extra materials packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer for Clay Tile: Alfreria Del Turblo S.A. (Altusa) for InterClay, Corp. (305-428-0200) or equal.

B. Requests for substitutions will be considered in accordance with bidding provisions.

2.2 ROOF TILE - FLORIDA

A. Equal to Altusa Clay Spanish “S” Tile

1. Finishing Tile: Provide manufacturer's cut and ridge tiles.
2. Size: 18-3/4 inches by 10-3/4 inches, nominal.
3. Installed weight per square: Approximately 650 lbs.
4. Color and Finish: As selected by the Architect from manufacturer’s full color range, to match existing.

2.3 ACCESSORY MATERIALS - FLORIDA

A. Underlayment:

1. Provide and install water proofing underlayment as recommended by roof tile manufacturer.

B. Nails: Conforming to ASTM A 641, Class 1. Sized to penetrate deck minimum 3/4 inch (19 mm) or through thickness of deck or batten.

1. Type: Hot dipped galvanized.

C. Cement Mortar

1. As recommended and required by roof tile manufacturer for application over concrete slab.

D. Storm Clips:

1. Roof System Components Storm Clips – Galvanized, installed to meet system requirements.

E. Flashings:

1. Valleys

a. Install preformed open valley minimum 16” width with minimum 2-1/2” high center and minimum 1” metal edge returns. Lap joints minimum 6”. Secure in place as code requires.

2. Dormers, side, chimneys and other vertical wall surface flashings shall extend upward at least 6” and be completely counter-flashed. Flashing shall extend under the tile a minimum of 5” with a 1” turn up at edge.

3. Where sloped roof surface meets the face of vertical wall surfaces at dormers, chimneys, and other walls, the flashing shall extend up the facing wall a minimum of 4” and extend downward over the top of the tile a minimum of 5”. The vertical wall surface shall be completely counter flashed.

4. Eave drip metal shall be nailed or stapled along and directly on top of sheeting, fastened 6” o.c. and ½” in from top flange. Lap all joints a minimum of 3”.

5. Material, Unless Otherwise Indicated. Steel sheet galvanized to G90/Z275 complying with ASTM A 653/A 653M; 26 gage, 0.018 inch (0.45 mm) minimum thickness.

.

6. Plumbing Stacks and Other Pipes Penetrating Roof for Medium and High Profile Tiles: Lead sheet, 2.5 pounds per square foot (12 kg/sq m) minimum thickness; or dead soft aluminum sheet, 0.032 inch (0.8 mm) minimum

thickness.

F. Adhesive:

1. Tile adhesive, must be identified by manufacturer as specifically formulated as a clay roof tile adhesive.

G. Eave Closures:

1. Prefabricated metal eave closure; profile to match tile, fastened at minimum 18 inches (457 mm) on center along eave.

H. Vertical Strapping: Set at 24 inches (610 mm), maximum, on center.

1. Size: 1/4 inch (6 mm) by 1-3/8 inch (35 mm).

I. Anchor Batten Nailer: Standard or better Douglas Fir.

1. Size: 2 inches (51 mm) by 2 inches (51 mm).

J. Hip & Ridge

1. Per manufacturer’s standard.

K. Rake & Gable End

1. Prefabricated Rake and Ridge tile to match tile profile and color.

L. Field Venting

1. Per manufacturer’s standard.

M. Miscellaneous

1. Provide any other required materials and accessories for a complete warranted installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify surfaces are uniform, smooth, clean and dry

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.

3.3 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions and the following:

1. FRSA/TRI Concrete and Clay Roof Tile Installation Manual Second Edition (For Florida High Wind Applications).

3.4 UNDERLAYMENT APPLICATION:

A. Underlayment

1. Lay per roof manufacturer’s requirements.

B. Install ridge vents; follow vent manufacturer's installation recommendations.

C. Install nailer boards at hips and ridges per manufacturer installation requirements.

3.5 FLASHING INSTALLATION

A. Install flashings to shed water and prevent water penetration under tiles.

B. Valleys: Install preformed metal flashing over underlayment.

1. Open Valley: Miter tile to form straight border a minimum of 2 inches (51 mm) back from the center of the valley on each side.

C. Side Wall Flashing:

1. Install preformed metal pan flashing at base of wall over underlayment starting at lower end and working up.

2. Vertical Flange: 4 inches (102 mm), minimum; nail vertical metal flange near top of metal edge.

3. Base Flange: 6 inches (152 mm), minimum.

4. Metal Edge Return: 1 inch (25 mm); secure to either deck or batten strip with roofing nail through metal strap.

5. Lap Joints: 6 inches (152 mm), minimum.

D. Counter Flashing:

1. Lap Top Flange of Base Flashing: 3 inches (76 mm), minimum.

2. Set metal into reglets and seal thoroughly.

3. Lap Joints: 3 inches (76 mm), minimum.

E. Install batten extender nailers to support tile over flashing.

F. Install tiles so as not to inhibit water flow on flashings.

G. Head and Apron Flashing:

1. Nail near top edge of vertical flange with minimum 4 inches (102 mm) on tile surface.

2. Lap metal 6 inches (152 mm) and seal laps with flashing cement.

H. Flashing at Plumbing Stacks, Pipes, Turbines, Vents, etc:

1. Install per roof manufacturer's requirements.

2. Install base flashing sealed or lapped by underlayment.

3. Install second flashing interlaced with tile coursing.

4. Seal with sealant.

I. Coatings: Apply color coordinated paint to all exposed metal flashings.

3.6 TILE INSTALLATION

A. Verify with manufacturer required type of installation for application to existing substrate and wind requirement.

B. For mortar on application, mark all horizontal lines at 16-1/2", which will provide a 2" nominal headlap.

C. For nail-on application, mark horizontal guidelines at 16", which will provide a nominal 2-1/2" headlap.

D. Mark all vertical guidelines at 9".

E. Set first course at 16-1/2" from the eave, this will provide a 2" overhang at the eave.

F. At the eave line, clay, rubber, mortar or metal bird stop shall be used to boost the first row of tile.

Note: Provide additional fasteners at the eave course to meet wind and hurricane requirements. Comply with NOA certification.

G. For mortar-on settings, each tile shall be set over a full trowel of mortar placed directly under the projection of the left flat side of the tile. Press tile down firmly to allow wet mortar to fill "Dove Tail Locks" for proper bond.

1. For pitches 4/12 and above, nail eave course with one nail in addition to mortar. Apply plastic cement to seal all nail penetrations.

2. For pitches 5/12, nail every third tile in every fifth course in addition to mortar. Apply plastic cement to seal all nail penetrations.

H. For nail-on installations, install tile with nails of sufficient length to penetrate the deck by ¾". Seal all nail penetrations with plastic cement.

I. Fasten and cement all gable rakes at the horizontal guidelines.

J. Where tile overlaps flashing, tile must be secured with approved tile adhesive or cemented in place.

K. Tile must be cut smooth and straight to maintain the proper width in the valley. Width in the open valleys may vary according to local conditions. It is recommended that the minimum width of exposed metal be 4".

L. Where field tile meet the hip nailers, tile should be cut along the hip boards. The joint between the cut tile and the hip nailer shall be sealed neatly with plastic cement.

M. All hip and ridge tiles shall be set in a bed of mortar and fastened with a 2-1/2" nail. It is then recommended that the mortar be pointed to a clean surface.

3.7 CLEANING

A. Remove all broken tile, debris and excess tile from roof.

B. Sweep cut tiles clean.

3.8 REPAIR AND REPLACEMENT

A. Damaged Tile:

1. Break out damaged roof tile.
2. Repair torn underlayment.
3. Drive fastener flush.
4. Apply minimum 3/8 inch (10 mm) by 2 inch (51 mm) bead of approved adhesive on tile in course below replacement tile.
5. Immediately set replacement tile in position assuring proper contact.

B. Damaged Small Valley and Hip Cuts:

1. Apply a minimum of 3/8 inch (10 mm) by 2 inch (51 mm) bead of approved adhesive at head of cut tile.
2. Immediately set tile in course above in position assuring proper contact.

3.9 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07560 FLUID-APPLIED ROOFING AND FLASHING

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Preparation of Substrate to Receive Roofing Materials

B. Base Sheet Securement to Prepared Substrate

C. Modified Bitumen Ply Sheet Application to Prepared Substrate

D. PMMA Roof Membrane Application

E. PMMA Roof Flashing Application

1.02 RELATED SECTIONS

A. Division 4: Masonry

b. Division 6: Rough Carpentry for wood blocking and nails

C. Division 7: Sheet Metal Flashing and Trim

1.03 REFERENCE STANDARDS

Agencies which may be used as references throughout this specification section include:

ASTM	American Society for Testing and Materials Philadelphia, PA
NRCA	National Roofing Contractors Association Rosemont, IL
CERTA	Certified Roofing Torch Applicator Program National Roofing Contractors Association Rosemont, IL Midwest Roofing Contractors Association Lawrence, KS
OSHA	Occupational Safety and Health Administration Washington, DC
UL	Underwriters Laboratories Northbrook, IL

1.04 SUBMITTALS

A. Submittals Prior to Contract Award:

1. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.

2. Letter from the primary roofing manufacturer stating that the proposed application will comply with the Manufacturer's requirements in order to qualify the project for the specified guarantee.

1.05 QUALITY ASSURANCE

A. Acceptable Contractor: Contractor shall be certified in writing by the roofing materials manufacturer to install the primary roofing products.

B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001:2000 audit process.

C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.

1. Underwriters Laboratories Class A acceptance of the proposed roofing system based upon testing performed in accordance with ASTM E 108 protocol.

D. Project Acceptance: Submit a completed manufacturer's application for roof guarantee form along with shop drawings of the roofs showing all dimensions, penetrations, and details. The form shall contain all the technical information applicable to the project including deck types, roof slopes, base sheet and/or insulation assemblies proposed for installation. The form shall also contain accurate and complete information requested including proper names, addresses, zip codes and telephone numbers. The project must receive approval by the membrane manufacturer, through this process, prior to shipment of materials to the project site.

E. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof membrane/flashing installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products.

F. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.

G. Manufacturer Requirements: The membrane/flashing system manufacturer shall provide direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conduct a final inspection upon successful completion of the project.

1.06 GUARANTEE/WARRANTY

A. Roof Membrane Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's twenty year labor and materials membrane guarantee. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner. This guarantee shall not exclude random areas of ponding from coverage.

> Siplast Parapro 20 year Roof Membrane Guarantee

1.07 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Store closed containers in a cool, dry area away from heat, direct sunlight, oxidizing agents, strong acids, and strong alkalis. Do not store resins at temperatures below 32°F (0°C) or above 85°F (29°C). Keep away from open fire, flame or any ignition source. Store in a well ventilated area.

C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Keep away from open fire, flame, or any ignition source. Vapors may form explosive mixtures with air. Avoid skin and eye contact with this material. Avoid breathing fumes when above the Threshold Limit Value (TLV). Do not eat, drink, or smoke in areas where materials are stored or applied.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above shall be automatically rejected, removed and replaced at the Contractor's expense.

1.08 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start

1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.

2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.

3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NIOSH, NRCA and other industry or local governmental groups. Workers shall wear a long sleeve shirt with long pants and work boots. Workers shall use only butyl rubber or nitrile gloves when mixing or applying PMMA products. Safety glasses with side shields are required for eye protection. Use local exhaust ventilation to maintain worker exposure below the published Threshold Limit Value (TLV). If the airborne concentration poses a health hazard, becomes irritating or exceeds recommended limits, use a NIOSH approved respirator in accordance with OSHA Respirator Protection requirements published under 29 CFR 1910.134. The specific type of respirator will depend on the airborne concentration. A filtering face piece or dust mask is not appropriate for use with this product if TLV filtering levels have been exceeded.

B. Environmental Requirements

1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.

2. Temperature Restrictions – self-adhesive sheets: The minimum required substrate temperature at point of application is 40°F (4°C). Maintain a minimum roof membrane material temperature above 50°F (10°C). In low temperature conditions, materials keep materials warm prior to application. Suspend application in situations where the self-adhered base ply cannot be kept at temperatures allowing for proper adhesion or the substrate temperature will not allow for proper adhesion.

3. Temperature Restrictions – PMMA-based Materials: Do not apply catalyzed resin materials if there is a threat of inclement weather. Follow the resin manufacturer's specifications for minimum and maximum ambient, material and substrate temperatures. Do not apply catalyzed resin materials unless temperatures fall within the resin manufacturer's published range.

C. Protection Requirements

1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces.

PART 2 PRODUCTS

2.01 ROOFING SYSTEM ACCESSORIES

A. Base Sheet and Base Sheet Fasteners

1. Base Sheet for Securement to Nailable Deck Substrates: A fiberglass reinforced, asphalt coated sheet with a polyolefin film backing, having a minimum weight of 20 lb/sq. The sheet shall conform to ASTM D 4601, Type II requirements.

> Parabase FS, by Siplast; Irving, TX

B. Primers Sealants and Adhesives for Bitumen Products

1. Asphalt Primer: An asphalt, solvent blend conforming to ASTM D 41 Type I or II requirements and meeting local VOC regulations.

> PA-1125 Asphalt Primer by Siplast; Irving, TX

2. Primer for Self-Adhesive Sheets: A quick drying, low-VOC, water-based, high-tack primer specifically designed to promote adhesion of roofing and waterproofing sheets to approved substrates. Primer shall meet South Coast Air Quality District and Ozone Transport Commission requirements.

> TA-119 Primer by Siplast; Irving, TX

3. Solvent-Free Flashing Cement: A single-component, solvent-free modified, 100% solids adhesive formulated in a grade suitable for application of flashing materials.

> Siplast SFT Cement by Siplast; Irving, TX

4. Elastomeric Sealant: A moisture-curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:

> PS-304 Elastomeric Sealant by Siplast; Irving, TX

C. Resin Accessories

1. Cleaning Solution/Solvent: A clear solvent used to clean and prepare transition areas of in-place catalyzed resin to receive subsequent coats of resin and to clean substrate materials to receive resin.

> Pro Prep by Siplast; Irving, TX

2. Repair Mortar: A two-component, PMMA based, aggregate filled mortar used for remediation of depressions or patching concrete substrates.

> Pro Repair Mortar by Siplast; Irving, TX

D. PMMA Primers

1. Primer for Vertical Concrete, Wood and Plywood Substrates: A fast-curing PMMA-based primer for use in vertical applications over concrete, concrete repair materials and masonry and for both wood and plywood substrates.

> Pro Primer W by Siplast; Irving, TX

2. Primer for Horizontal Concrete Substrates: A fast-curing PMMA-based primer for use over horizontal concrete substrates.

> Pro Primer T by Siplast; Irving, TX

3. Primer for Asphaltic Substrates: PMMA-based primer for use over asphaltic materials to serve as a bleed-blocker.

> Pro Primer R by Siplast; Irving, TX

E. Accessories

1. Tape: A white, flexible, coated cotton gaffers tape designed for treatment of insulation panel joints, deck/wall transitions and joints in flashing substrates.

2. Ceramic Granule Anti-Skid Surfacing: No. 11 grade specification ceramic granules suitable for broadcast into the PMMA based wearing layer.

   > No. 11 white granules by Siplast; Irving, TX

2.01 ROOFING SYSTEM COMPONENTS

A. Roofing Membrane Assembly: A roof membrane assembly consisting of one ply of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane applied over a prepared substrate, covered with a liquid applied, flexible, polymethylmethacrylate (PMMA) based monolithic membrane formed by the combination of liquid PMMA resin and fleece fabric. The reinforcement mats in the SBS ply shall be impregnated/saturated and coated each side with an SBS modified bitumen blend. The cross sectional area of the SBS sheet material shall contain no oxidized or non-SBS modified bitumen. The adhesive layer of torch-grade membranes shall be manufactured using a process that embosses the surface with a grooved pattern to provide optimum burn-off of the plastic film and to maximize application rates. The top surface of the modified bitumen ply sheet shall be coated with a white acrylic coating to enhance resin bond and to minimize surface temperatures. The composite roof system, including SBS modified bitumen ply sheet and reinforced PMMA, shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14F (-10C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147.

   > Siplast Parapro roof system with Paradiene 20 TS P base ply

   1. Backing Sheet for Wood/Plywood Surfaces to Receive Flashing Coverage

      > Siplast Paradiene SA P (where resin is to be applied)

   2. Resin for Field Membrane Construction: A flexible, polymethylmethacrylate (PMMA) based resin for use in combination with fleece fabric to form a monolithic, reinforced roofing membrane.

      a) Thickness (avg): 90 mils (2.3 mm) at 0.31 kg/ft² (3.3 kg/m²) coverage rate (ASTM D 5147, section 5). The values listed below are based upon a 90 mil (2.3 mm) resin thickness.
      b) Weight (min per 100 ft² of coverage): 68.4 lb (3.3 kg/m²)

         > Parapro Roof Resin by Siplast; Irving, TX

   4. Resin for Flashing Applications: A flexible, polymethylmethacrylate (PMMA) based resin combined with a thixotropic agent for use in combination with fleece fabric to form a monolithic, reinforced flashing membrane.

      > Parapro 123 Flashing Resin by Siplast; Irving, TX

   5. Fleece for Membrane and Flashing Reinforcement: A non-woven, 110 g/m², needle-punched polyester fabric reinforcement as supplied by the membrane system manufacturer.

      > Pro Fleece by Siplast; Irving, TX

2.02 RIGID INSULATION

A. J. M. Gesco Protection Board (½“), if required.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Pre-Job Conference: Conduct a pre-job conference to include the designer, Owner, roofing Contractor and manufacturer's representative prior to application of roofing.

B. Foremen: Provide the roofing foreman with a copy of these specifications to be available at the job site at all times. The presence of specifications and an inspector shall not relieve the Contractor of strict compliance with the manufacturer's specifications, detail drawings, and/or approved material requirements.

C. Deck Penetrations: Verify that work penetrating the roof deck, or which may otherwise affect the roofing application, has been properly completed.

D. Final Inspection – post installation meeting: Arrange a meeting at the completion of the project to be attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

3.02 PREPARATION

A. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.

B. Remove All Existing:

- BUR
- Base flashings
- Cants
- Non functional penetrations/curbs
- Flanged metal flashings
- Gravel
- Edge metal
- Drain assemblies
- Metal trim, counterflashing

C. Wet Areas: Remove any areas of the existing assembly where moisture is present and replace with compatible materials, bringing the area back to level with surrounding surfaces.

D. Blisters, Buckles: Where the existing roof assembly is to be recovered with the specified new roof assembly, all blisters, buckles, and surface irregularities are to be removed. Patch all such areas and bring back to level with surrounding surfaces using compatible materials.

E. Existing Curbs: Raise all existing curbs to accommodate a new minimum height of 8 inches.

3.03 SUBSTRATE EXAMINATION/PREPARATION

A. General: Ensure that substrates are free from gross irregularities, loose, unsound or foreign material such as dirt, ice, snow, water, grease, oil, bituminous products, release agents, laitance, paint, loose particles/friable matter, rust or any other material that would be detrimental to adhesion of the catalyzed primer and/or resin to the substrate. Some surfaces may require scarification, shotblasting, or grinding to achieve a suitable substrate. Wipe surfaces with a clean cloth saturated with the specified cleaner/solvent to remove grease, oils or dust that may affect adhesion and to cured PMMA surfaces to receive a subsequent coat of resin.

B. Concrete Substrate Requirements: Structural concrete shall be cured a minimum of 28 days in accordance with ACI-308, have a minimum compressive strength of 3,500 psi (24 N/mm^2) and have a moisture content that conforms with the waterproofing system manufacturer’s requirements prior to commencement of work.

C. Adhesion Testing for Concrete Substrates to Receive Resin Materials: Test the concrete substrate using a device conforming to ASTM D 4541 using a 50 mm dolly adhered with the specified catalyzed primer. Utilize the same concrete preparation methods as that which will be used prior to application of the roofing for areas to be evaluated for adhesion. Ensure that a minimum adhesion value of 220 psi is obtained before application of the PMMA primer. If multiple areas or substrates are involved in the scope of work, evaluate each to determine suitability. Maintain testing/evaluation records.

D. Preparation of Existing Concrete/Masonry Substrates to Receive Resin Materials: Existing concrete substrates shall have a minimum compressive strength of 3,500 psi (24 N/mm^2). Following evaluation for moisture content and confirmation that the moisture content is at an acceptable level, shot blast or scarify/shot-blast concrete or masonry surfaces to provide a sound substrate free from laitance and residue from bitumen, coal tar, primer, coatings, adhesives, sealer or any material that may inhibit adhesion of the specified primer. Generate a concrete surface profile of CSP-2 to CSP-4 as defined by the ICRI. Grinding may be used as a preparation method for localized areas that cannot be reached by a shot blasting equipment provided that a surface can be prepared to a CSP-2 to CSP 4. Repair spalls and voids on vertical or horizontal surfaces using the specified primer and preparation paste.

E. Preparation of Concrete Substrates to Modified Bitumen Base Ply: Poured reinforced concrete shall be cured a minimum of 28 days in accordance with ACI-308, with a minimum compressive strength of 3,500 psi (24 N/mm^2). Concrete decks shall be fully cured, dry, frost-free, relatively smooth, broom-cleaned and free from release or curing agents. Ensure that the moisture content is at a level suitable for proper application of the primer and roofing system components. Level projections or depressions that may interfere with proper application of roofing system components. Prime the deck with the specified asphalt primer at the rate of 1 gallon per 100-400 square feet and allow to dry thoroughly.

F. Concrete Substrate Repair: Prime areas of the concrete substrate intended for repair using the specified PMMA primer. Fill the areas using the specified paste or repair mortar and allow to catalyze. Follow the paste or repair mortar manufacturer's published minimum and maximum product thickness limitations per lift.

G. Preparation of Nailable Substrates

1. Base Sheet Securement: Lay the specified base sheet over the entire area to be roofed, lapping sides 3 inches and ends 6 inches. Using the specified fasteners, fasten each sheet as shown on details.

H. Ply Sheet Application: Bond the modified bitumen ply sheet to the prepared substrate, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.

I. Preparation of Wood/Plywood Flashing Substrates to receive Resin: Tape the joints between plywood or wood panels using the specified tape and prime wood/plywood surfaces to receive the specified flashing system with the specified PMMA-based primer and allow primer to set prior to application of the flashing system.

3.04 MIXING OF RESIN PRODUCTS

A. Preparation/Mixing/Catalyzing Resin Products: Pour the desired quantity of resin into a clean container and using a spiral mixer or mixing paddle, stir the liquid for the time period specified by the resin manufacturer. Calculate the amount of catalyst powder needed using the manufacturer's guidelines and add the pre-measured catalyst to the resin component. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. Ensure that air is not entrained into the product during the mixing process. To avoid aeration, do not use a spiral mixer unless the spiral section of the mixer can be fully contained in the liquid during the mixing process. Mix only enough product to ensure that it can be applied before expiration of resin pot life.

3.05 FLASHING AND FIELD MEMBRANE APPLICATION

A. Base Flashing Application

1. Using masking tape, mask the perimeter of the area to receive the flashing system. Apply resin primer to substrates requiring additional preparation and allow primer to set.
2. Pre-cut fleece to ensure a proper fit at transitions and corners prior to membrane application.

3. Apply an even, generous base coat of flashing resin using a roller at the minimum rate specified by the resin manufacturer to prepared surfaces requiring flashing coverage. Work the fleece into the wet, catalyzed resin using a brush or roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2 inch (5 cm) and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again using a roller, apply an even top coat of catalyzed resin at the minimum rate specified by the resin manufacturer immediately following embedment of the fleece, ensuring full saturation of the fleece. Ensure that the flashing resin is applied to extend a 0.25 inch (6 mm) beyond the fleece. Remove the tape before the catalyzed resin sets. Make allowances for saturation of roller covers and application equipment.
4. Should work be interrupted for more than 12 hours or the surface of the catalyzed resin becomes dirty or contaminated by the elements, wipe the surface to be lapped with new flashing resin using the specified cleaner/solvent. Allow the surface to dry for a minimum 20 minutes and a maximum 60 minutes before continuing work.

B. Field Membrane Application

1. Using the specified cleaner/solvent, wipe flashing membrane surfaces to be lapped with field membrane. Allow the surface to dry for a minimum 20 minutes before continuing work.

2. Apply an even, generous base coat of field membrane resin using a roller at the minimum rate specified by the resin manufacturer to prepared surfaces. Work the fleece into the wet, catalyzed resin using a roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2 inch (5 cm) and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again using a roller, apply an even top coat of catalyzed resin at the minimum rate specified by the resin manufacturer immediately following embedment of the fleece, ensuring full saturation of the fleece. Make allowances for saturation of roller covers and application equipment. Allow 2 hours cure time prior to exposing the membrane to foot traffic.

3.06 SKID RESISTANT SURFACING

A. Quartz/Granule Anti-Skid Application: Utilize masking tape to outline the areas to receive the anti-skid system. Apply an additional top coat of the catalyzed roof resin at the minimum rate specified by the resin manufacturer; and broadcast #11granules before the resin sets. Remove tape before the resin sets.

3.07 FIELD QUALITY CONTROL AND INSPECTIONS

A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.

B. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.

C. Final Inspection

1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

D. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Provide all Flashing and Sheet Metal Work, including all sheet metal flashings, counter flashings, copings, fascia and all miscellaneous sheet metal items required for roofing and related work specified under Sections 07 32 13 and 07 56 00.

1.02 QUALITY ASSURANCE

A. Fabricator's Qualifications:

1. Flashing and sheet metal work shall be fabricated by a qualified sheet metal fabricator with at least five (5) years experience in installations of a similar nature.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Sheet Metal Material:

1. Aluminum sheet metal shall comply with ASTM B 209. Minimum thickness shall be .040" or as noted on Drawings.

B. Lead Pipe Flashings:

1. Lead pipe flashing sleeves shall be preformed and soldered with a minimum 4" perimeter flange and a sleeve opening fabricated to fit closely around the penetration without forcing, complying with Federal Specification (FS) QQ-L-201. Lead sleeves shall be of sufficient height to allow a minimum of 1" to be crimped inside of the pipe stack.

C. Provide pre-finished (Kynar 500 or equal) .040 aluminum roof edge stops, drip edge, fascia, copings and related flashings and counter flashings for a complete installation. Colors to be selected.

2.02 FINISH

A. All "exposed" aluminum flashing surfaces shall be prefinished (embossed) with Kynar 500 and color to be selected.

2.03 FABRICATION

A. Sheet Metal Fabrication:

1. Shop-fabricate work to greatest extent possible, with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with

expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work.

2. Form work to fit substrates. Comply with material manufacturer instruction and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Execution of Flashing and Sheet Metal Work is to comply with roof manufacturer's requirements under Sections 07 32 13 and 07 56 00.

B. Sealants for Flashing and Sheet Metal Work are as specified under Section 07 92 00.

END OF SECTION

SECTION 07 71 23
GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Includes gutters, downspouts and box gutter head as shown on drawings.

PART 2 - PRODUCTS

2.01 DOWNSPOUTS

A. As shown on drawings, and if not shown on drawings, a minimum of 5" square and smooth finish 0.040 inch thick baked-on enamel aluminum including necessary elbows.

B. Provide concrete downspout splash blocks at every rain leader.

2.02 GUTTERS

A. 0.051 inch thick baked-on enamel aluminum, color to match metal roof fascia.

B. Hanger system shall be as detailed in Figure A, Page 41 of SMACNA Manual, 3rd Edition.

C. Cross-sectional configuration of gutter shall be Style G, Page 9 of SMACNA Manual, 3rd Edition, and match existing.

2.03 Downspouts, gutters, hangers, fasteners, and accessories shall be compatible material.

A. Color of Gutter: To be selected.

B. Color of Downspouts: To be selected.

PART 3 - EXECUTION

3.01 Before starting work, verify governing dimensions at building. Inspect for conditions which would prevent installation of first class system. Do not install over improper conditions.

3.02 Furnish and install outlet tubes and gutter ends where required. Furnish and install expansion joints in runs exceeding 50'-0" and in runs which are restrained at both ends.

3.03 Join gutter sections according to Manufacturer's recommendations.

3.04 Lap joints in downspouts at least 1-1/2 inches in direction of water flow.

3.05 Fabricate and install in accordance with SMACNA Manual, 3rd Edition.

3.06 Properly secure gutters and downspouts to withstand wind load of 150 mph.

3.07 At completion of this work, block downspouts and flood gutters in presence of Architect. Repair leaks and adjust gradients for proper drainage.

3.08 Coordinate installation requirements with Sections 07 32 13 (Clay Roof Tile) and 07 56 00 (Fluid Applied Roofing) and Section 07 62 00 (Sheet Metal Flashing, Fascia and Trim).

END OF SECTION

SECTION 07 92 00 – JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General provisions of contract, including General and Supplementary Provisions, and General Requirements sections apply to this section.

1.02 SUMMARY

A. Provide labor, materials, and equipment necessary to complete sealant work, both interior and exterior of the project. The extent of each type of sealant and caulking work is indicated.

1. Work of this section shall be subcontracted to a single firm specializing in sealant and caulking installation.

2. All building interior sealants to be used are to be low VOC. Coordinate requirements.

B. Surface Hardness: Provide types of sealant to withstand anticipated abrasive or possible indentation as recommended by manufacturer.

C. Related Work Specified Elsewhere

1. For sealants used in glazing, refer to Division 8: Openings.

1.03 SUBMITTALS

A. Submit product data and installation recommendations, including joint preparation instructions for each material provided.

B. Submit at jobsite complete color charts or sample kits for each exposed sealant and caulking material provided.

1. Samples for selection purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available for each product exposed to view.

C. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

1.04 QUALITY ASSURANCE

A. Obtain elastomeric materials only from manufacturers who will, if required, send a qualified technical representative to project site for the purpose of advising the Installer of proper procedures and precautions for the use of the materials.

B. Installer: Shall be a sealant and caulking subcontractor with a minimum of 5 years of successful experience in the application of the types of materials required, and who agrees to employ only skilled tradesmen for the work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.06 PROJECT CONDITIONS

A. Preparation of joint surfaces, backing, and the conditions under which the sealant and caulking is to be installed shall conform to manufacturer's recommendations.

1. Use of bond break tape is prohibited without the expressed permission of the Architect. Each situation will be evaluated with regard to inability to properly use backer rod to prevent adhesion.

B. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When joint substrates are wet.

C. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

D. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:

1. DAP, Inc., Dayton, Ohio
2. Dow Corning Corp., Midland, Michigan
3. General Electric Co., GE Silicones, Waterford, New York
4. Mameco International, Inc., Cleveland, Ohio
5. Pecora Corp., Harleysville, Pennsylvania
6. Sonneborn Building Products Div., Minneapolis, Minnesota
7. Tremco, Inc., Beachwood, Ohio
8. Sherwin-Williams, Cleveland, Ohio

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for Architect's approval must be accompanied by the "Substitution Request Form" and complete technical data for evaluation.

2.02 MATERIALS

A. General

1. Where the term "Acceptable Standard" is used within this section, it refers to the manufacturer and product listed, which is specified as the type and quality required for this project.

2. Single source responsibility for joint sealer materials: Obtain joint sealer materials from a single manufacturer for each different product required.

3. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and final experience.

B. Caulking Compounds (Acrylic Latex Sealant)

1. Latex rubber modified, acrylic emulsion polymer sealant compound; manufacturer's standard, one part, nonsag, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.

2. Acceptable Standard:

a. "Sonolac"; Sonneborn Building Products, Inc.
b. "Acrylic Latex Caulk 834"; Tremco, Inc.
c. "Acrylic Latex Caulk with Silicone"; DAP
d. "AC-20"; Pecora Corp.
e. "950 A Acrylic Latex"; Sherwin-Williams

C. One-Part Elastomeric Sealant (Silicone)

1. One component elastomeric sealant, complying with ASTM 920, Class 25, Type NS (nonsag), unless Type S (self-leveling) recommended by manufacturer for the application shown.

a. Acceptable Standard:

1) Pecora 864 Architectural Silicone Sealant; Pecora Corp.
2) Dow Corning 791; Dow Corning Corp.
3) Silpruf; General Electric
4) Omniseal; Sonneborn Building Products, Inc.
5) Spectrem 2; Tremco Mfg. Co.

2. One component mildew resistant silicone sealant (around countertops and backsplashes and other wet interior locations):

a. Acceptable Standard:

1) Dow Corning 786; Dow Corning Corp.
2) Sanitary 1700; General Electric
3) SiliconUltra White Lightning; Sherwin-Williams

3. One component high movement joints (+100/-50) (where locations of high movement are indicated):

a. Acceptable Standard:

1) Dow Corning 790; Dow Corning Corp.
2) Spectrem 1; Tremco
3) Stampede 100, Sherwin-Williams

D. Elastomeric Sealant (Polyurethane)

1. One component polyurethane sealant, complying with ASTM C 920, Type S, Grade NS, Class 25 (nonsag).

a. Acceptable Standard:

1) Sonolastic NP 1; Sonneborn Building Products, Inc.
2) Dymonic; Tremco Mfg. Co.
3) Dynatrol I; Pecora Corp.
4) Vulkem 921; Mameco
5) Stampede-1; Sherwin-Williams

E. Miscellaneous Materials:

1. Provide joint cleaner and joint primer sealer as recommended by the sealant or caulking compound manufacturer.

2. Sealant backer rod shall be compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam, or other material as recommended by the sealant manufacturer.

3. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer substrate tests and field tests.

4. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in service performance.

5. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt; and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 SELECTION OF MATERIAL

A. Caulking compounds shall be used for interior nonmoving joints and at locations indicated.

B. One component elastomeric silicone sealants shall be used at exterior and interior joints where thermal or dynamic movement is anticipated including, but not limited to, the following locations:

1. Metal to metal joints.

2. Sheet metal flashing, coping, preformed metal caps, fascias, extenders, trim, and panels.

3. Glass to metal joints.

C. Elastomeric polyurethane sealants shall be used at exterior and interior joints where weatherproofing or waterproofing is required and at exterior joints between dissimilar materials including, but not limited to, the following locations:

1. Expansion and control joints.

2. Exterior side of hollow metal frames to adjacent materials.

3. Exterior side of aluminum frames to adjacent dissimilar materials.

4. Lintels and shelf angles to masonry construction.

5. Louvers to adjacent construction.

6. Vertical, horizontal, and wash joints at brick work.

7. Joints in concrete site improvements (sidewalks, ramps) and the joint between the concrete slabs and dissimilar materials.

8. Sealant in pipe sleeves where materials must perforate the floor slab.

9. Perimeter of floor slabs or concrete curbs which abut vertical surfaces.

10. Exterior joints between dissimilar materials where the joining of the two surfaces leaves a gap between the meeting materials or components as may be dictated by the various methods of construction to make watertight.

11. Exterior locations which are noted "caulked" or "sealant" and not specifically listed herein or included in the work of other sections of the specifications.

D. One part self-leveling polyurethane sealants shall be used for exterior and interior horizontal joints subject primarily to pedestrian traffic and light and moderate vehicular traffic.

3.04 INSTALLATION

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

1. Interior joints which require caulking are to be caulked with the specified caulking compound, unless noted otherwise.

2. Exterior joints which require sealant are to be filled with one of the specified sealants even though the note may read "Caulked".

3. Joints to be filled shall be thoroughly dry and free from dust, dirt, oil, and grease at the time of application of caulks or sealants.

4. Expansion and control joints in exterior walls shall have the joint filler material built into the wall, or between wall and slab, at the time of construction.

5. Masking: metal shall be masked with masking tape, as well as other surfaces where it's required to prevent the sealant smearing the adjacent surface. Upon completion of the caulking, remove the tape.

B. Prime or seal the joint surfaces.

C. Install sealant backer rod of the proper size for the joint to be sealed at locations receiving sealants and as recommended by sealant manufacturer.

1. Do not split (longitudinally cut) backer rod, cut to length only.

2. Install expanding foam secondary sealant at 2-inch expansion joints in masonry as recommended by sealant manufacturer.

D. Employ only proven installation techniques.

E. Install sealants to depths shown or as recommended by manufacturer.

F. Do not allow sealants to spill or stain adjoining surfaces.

G. Remove spillage promptly without damage to the adjoining surfaces.

H. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curling begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

I. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately, and the repaired areas shall be made indistinguishable from original work.

END OF SECTION

SECTION 08 12 00 – ALUMINUM DOORS, FRAMES AND DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aluminum Doors and Frames

B. Door Hardware

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.

1.3 SUBMITTALS

A. Comply with Contract Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.

C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, finish, options, and accessories.

D. Samples:

1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, finish, and accessories.

2. Color: Submit manufacturer's samples of full color range of doors.

E. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.

F. Manufacturer's Project References: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.

G. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.

H. Warranty: Submit manufacturer's standard warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 15 years successful experience.

2. Door and frame components from same manufacturer.

3. Evidence of a compliant documented quality management system.

B. Provide Florida Product Approval and NOA Certification for use in wind borne areas (150 mph).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials and finish from damage during handling and installation.

1.6 WARRANTY

A. Warrant doors, frames, and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.

B. Warranty Period: Ten years starting on date of shipment.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Special-Lite.

B. Acceptable manufacturers for Aluminum Doors/Frames meeting these specifications:

1. Cline

2. Kawneer “Flushline”

2.2 ALUMINUM DOORS AND FRAMES

A. Door Opening Size: As indicated on the Drawings.

B. Manufacturer/Style: Equal to Special-Lite Door/Frame Model SL-17 (FRP Outswing Flush Door) or Model SL-16 (Alum Outswing Flush Door) on clear anodized door frame (4” frame header or double 2” header acceptable).

C. Door Finish / Color:

1. Aluminum clear anodized.

D. Frame Finish: Clear anodized.

E. Hardware:

1. Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

2. Factory-install hardware and provide all door hardware as shown on 2.5.C.

2.3 FABRICATION

A. Sizes and Profiles: Required sizes for door and frame units, and profile requirements shall be as indicated on the Drawings.

B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.

C. Assembly:

1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.

2. Remove burrs from cut edges.

D. Fit:

1. Maintain continuity of line and accurate relation of planes and angles.

2. Secure attachments and support at mechanical joints with hairline fit at contacting members.

2.4 DOOR FRAME SYSTEMS

A. Tubular Framing (aluminum):

1. Manufacturer's standard for door assembly, with 4" header (or double 2" header).

2. Hardware:
   a. Coordinate requirements for pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and hardware schedule.

B. Finish: Clear anodized.

2.5 HARDWARE

A. Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

B. Factory-install hardware, including stainless steel hinges, lock, weatherstripping and threshold.

C. **Hardware Schedule**: As follows for each exterior door:

1. Hinges: Either continuous aluminum (piano) hinge or stainless steel hinges (minimum 1-1/2" pair per door) unless otherwise required for exterior doors.

2. **Locking Hardware: Provide manufacturer Marine grade stainless steel lever lock. Provide stainless steel Schlage ND, Grade 2 Series or equal to meet City of Tampa requirements, including tying into City's Master Key System.**

3. Closer: Manufacturer provided aluminum (heavy-duty parallel arm with cushion).

4. Manufacturer standard door weatherstripping.

5. Threshold: Provide manufacturer standard aluminum to meet ADA equal to 5205 as manufactured by Hagger.

D. Finish: Clear.

2.6 ALUMINUM FINISHES

A. Anodized Finish: Class I finish, 0.7 mils thick.

1. Clear 215 R1, AA-M10C12C22A41, Class I, 0.7 mils thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Ensure openings to receive doors are plumb, level, square, and in tolerance.

3.3 INSTALLATION

A. Install doors and door hardware in accordance with manufacturer's instructions.

B. Install door frame with anchors required to meet wind load pressures.

C. Install doors plumb, level, square, true to line, and without warp or rack.

D. Set thresholds in bed of mastic and backseal.

E. Install exterior doors to be weathertight in closed position.

F. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

G. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.5 ADJUSTING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.6 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.7 PROTECTION

A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Manual operated overhead rolling doors.

B. Related Sections:

1. Metal Fabrications: Door opening jamb and head members.

1.02 SYSTEM DESCRIPTION

A. Design Requirements:

1. Wind Loading: Supply door as tested and approved under the Florida Building Code (App/Seq# 337.7) for minimum wind load required (150 mph). Submit Florida Product Approval and NOA Certification from Miami Dade for compliance with impact resistant assembly.

2. Cycle Life:

a. Design doors of standard construction for normal use of up to 20 cycle per day maximum.

1.03 SUBMITTALS

A. Reference Specification Submittal Procedures; submit the following items:

1. Product Data.

2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.

3. Quality Assurance/Control Submittals:

a. Provide proof of manufacturer ISO 9001:2000 registration.
b. Provide proof of manufacturer and installer qualifications - see 1.4 below.
c. Provide manufacturer's installation instructions.

4. Closeout Submittals:

a. Operation and Maintenance Manual.
b. Certificate stating that installed materials comply with this specification.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: ISO 9001:2000 registered and a minimum of five years experience in producing doors of the type specified.

2. Installer Qualifications: Manufacturer's approval.

1.05 DELIVERY STORAGE AND HANDLING

A. Follow manufacturer's instructions.

1.06 WARRANTY

A. Standard Warranty: Two years from date of shipment against defects in material and workmanship and standard warranty for paint coating.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: Cornell Iron Works, Inc., Crestwood Industrial Park, Mountaintop, PA 18707. Telephone: (800) 233-8366, Fax: (800) 526-0841. Underwriters Laboratories, Inc. (UL), ISO 9001:2000 Registered or Equal

B. Model: ESD20 with specific wind load requirements.

2.02 MATERIALS

A. Curtain:

1. Slat Material: (Listed Exterior/Interior):

a. Type 304 Stainless Steel: gauge (as required for wind load), Grade 40, ASTM A 653 galvanized steel zinc coating.

b. Total Slat Thickness: per wind load requirements.

2. Bottom Bar: Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and gauge.

3. Fabricate interlocking sections with high strength nylon endlocks on alternate slats each secured with two ¼" (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.

4. Exterior Slat Finish:

a. Stainless Steel.

5. Interior Slat Finish:

a. Stainless Steel.

6. Bottom Bar Finish:

a. Exterior Face: Match slats.

b. Interior Face: Match slats.

B. Guides: Fabricate with minimum 3/16 inch (4.76 mm) structural steel angles or heavier as required by wind load. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.

Top 16 ½" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.

1. Finish:

a. Steel: ASTM A 123, Grade 85, zinc coating, hot-dip galvanized after fabrication. Field paint.

C. Counterbalance Shaft Assembly:

1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.

2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.

D. Brackets: Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.

1. Finish:

a. ASTM A 123, Grade 85 zinc coating, hot-dip galvanized after fabrication. Field Paint

E. Hood: 24 gauge minimum Type 304 Stainless Steel

1. Finish:

a. Stainless Steel.

F. Weatherstripping:

1. Bottom Bar: Replaceable, 3-point, compressible vinyl gasket extending into guides.

2. Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain.

3. Lintel Seal: Nylon brush seal fitted at door header to impede air flow.

4. Hood: Neoprene/rayon baffle to impede air flow above coil.

2.03 ACCESSORIES

A. Locking:

1. Manual Chain Hoist: Pad-lockable chain keeper on guide.

2. Additional interior slide locks on each side of door.

B. Operator and Bracket Mechanism Cover: Provide 24 gauge galvanized steel sheet metal cover to provide weather resistance to enclose exposed moving operating components at coil area of unit. Finish to match door hood.

2.04 OPERATION

A. Manual Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.

B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.

C. Commencement of work by installer is acceptance of substrate.

3.02 INSTALLATION

A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.

B. Follow manufacturer's installation instructions.

3.03 ADJUSTING

A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.04 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer.

B. Remove surplus materials and debris from the site.

3.05 DEMONSTRATION

A. Demonstrate proper operation to Owner's Representative.

B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 08 51 13 - ALUMINUM OPERATING WINDOWS, REMOVAL OF EXISTING AND INSTALLATION OF REPLACEMENT WINDOWS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Bidding Requirements, Contractual Provisions and General Requirements shall apply to all work hereunder.

B. Work required under this section consists of providing all necessary services, tools, equipment, material, and labor required to remove existing metal-framed windows (secured to masonry/concrete/stucco structure) and provide and install all replacement windows, window accessories and items essential to complete the work required by the Specifications, including (but not limited to) the following:

1. Windows
2. Anchors and fastenings
3. Glazing beads
4. Hardware pertaining to operating windows
5. Inserts
6. Necessary break-metal
7. Sub-sills and sills
8. Mullions and mullion anchors
9. Metal screens
10. Muntins
11. Manual Operators

C. Provide windows, operating hardware, accessories and related work as indicated in Summary of Work and specified herein.

D. Provide the following type of replacement windows as follows:

1. Provide projected and fixed window units meeting 2017 Florida Building Code, Dade County for Large Missile Rating (hurricane) as indicated in 2.02 A.
2. Provide window units similar to existing window configuration in style, mullion and muntin spacing muntins to be applied to interior and exterior faces as shown on drawings. Provide muntins in all replacement window units. Window units are to have the awning/projected-out window unit where shown on drawings.

E. All window units shall be factory glazed. Glazing shall be as indicated in Specifications.

F. Provide sealants and caulking of window units in conformance with Section 07 92 00 – Joint Sealants.

G. Contractor is responsible to field verify all dimensions, detail and installation conditions and requirements prior to bidding, and shall be responsible to accommodate such conditions

and details in the replacement of the windows.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. All windows shall meet or exceed AAMA P-HC-90 for projected window construction and performance standard.

B. Air Infiltration: Units shall be designed, fabricated and installed in a manner that the air infiltration rate for P-HC-60 Heavy Commercial Grade/Optional Performance Class Projected Series shall not exceed 0.10 CFM/FT in accordance with ASTM E 283-84 at a static air pressure difference of 6.24 PSF.

C. Water penetration: Units shall be designed, fabricated and installed in a manner that allows no water penetration or uncontrolled leakage as defined in ASTM E331 Static Air pressure difference, 9 PSF as Water Test Pressure. There shall be no uncontrolled water leakage. The finished installation may be field quality control tested for compliance.

D. Structural performance: Units and attaching structure (including mullions) shall be designed, fabricated and installed in a manner that allows no glass breakage, or permanent damage to hardware or parts and no failure or permanent deflection with a minimum positive (inward) and a negative (outward) test pressure of 97.5 PSF as Structural Test Pressure, when tested per ASTM E330-79, and must meet or exceed 150 mph wind load.

E. Forced-entry resistance characteristics of the units as designed, fabricated, and installed shall conform to AAMA 1302.5.

F. Test reports: Provide, at no expense to the Owner, from an independent testing laboratory acceptable to the Project Architect, test reports indicating compliance (of each type and size window and its assembly) with the requirements of the above paragraphs. The following criteria shall be utilized in testing:

1. Air infiltration ASTM E 283-83

2. Water penetration, for HC Series ASTM E 331-83

3. Structural performance ASTM E 330-79

4. Forced entry AAMA Certification

G. Test reports must include the following:

1. Series/Model Number (to indicate the pertinent window being tested).

2. Type, sizes overall, and vent size tested.

3. Glazing - (inside with snap-in glazing bead).

4. Weather stripping (same as used on tested units).

5. Frame construction (must be certified that the unit tested in the "average" assembly line unit and satisfies the minimum size as required by ANSI/AAMA 101.88).

6. Vent construction (must be certified in the report to insure that the unit tested is the "average" assembly line unit and satisfies the minimum size as required by ANSI/AAMA 101.88).

7. Hardware (must be certified that the unit tested is the "average" assembly line unit

and must be the same as used on the tested unit).

8. Test procedure (certification as to conformance to specification).

9. Title of test (air, water, uniform load structural, torsion test, horizontal and vertical load, torsion test on intermediate rails, etc.).

1.03 SUBMITTALS

A. Manufacturer's data:

1. Submit manufacturer's data establishing series to be supplied, metal thickness and profile finishes, details, structural characteristics and properties.

2. Evidence indicating compliance with these specifications. Testing laboratory reports must be upon current product manufactured and in no event older than four (4) years.

3. Warranties, as specified herein.

4. Submit NOA Certification that manufacturer has passed the Dade County requirements. Window test submitted to be equal in size or larger than window unit for this project.

B. Shop drawings: Submit shop drawings depicting series, profiles and thicknesses, elevation views and dimensions, mullions, anchorage, quantities, finish and other pertinent data. Also furnish the actual Section Modules (S) and Moment of Inertia (I) of the mullion proposed to be used. Submit mullion anchorage details. Submit details of periphery anchorage. (See paragraphs on anchorage).

C. Submit sample of hardware fastening as required below.

D. Submit calculations, structural properties, connection information and product information to verify that system performance and anchorage complies with the loading criteria required by 2017 Florida Building Code. All calculations shall be signed and sealed by a professional engineer, whose discipline is structural engineering. Note all wind loading pressures shall meet ANSI A58.1 1982 requirements as a minimum, in addition to Dade County requirements.

1.04 PRODUCT DELIVERY AND STORAGE

A. Deliver materials to the site in manufacturer's original sealed containers with the labels legible and intact.

B. Comply with manufacturer's recommendations and with the AAMA Voluntary Guide Specifications for Aluminum Architectural Windows as to transportation handling, storing and protecting materials.

1.05 WARRANTY

A. A five (5) year manufacturer’s warranty against defects in workmanship and materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Frames, ventilators, mullions and muntins: Solid aluminum alloy 6063-T5 (except where otherwise specified), with minimum tensile strength of 22,000 p.s.i.

B. Operating items (slide bars, hinge link, torque shaft, etc.): Vent hinges shall be of four (4)

arm design for added support, of 1/8" thick (minimum) by 3/4" (minimum) width stainless steel with brass slide shoes. The vent hinge shall meet the requirements of the "Voluntary Specification for Friction Hinges in Window Applications: AAMA 904.1.87, hinge grade "C".

C. Vent hinges shall be mounted with stainless steel machine screws into a minimum material thickness of .125. Where material thickness is less than .125 it shall be reinforced with steel grommet inserts.

The following products are approved, subject to compliance with the above specification:

1. Anderberg - Four Bars
2. Bronzecraft
3. Truth

D. Weatherstripping: Shall be compatible with window material and of the following, as appropriate:

1. Elastomeric, Dense NAAMM #0-I-L CS230
2. Elastomeric, Cellular - ASTM C509
3. Fineseal Woolpile with Mylar fin

E. Hardware, General: Install latches and other hardware with stainless steel machine screws into a minimum material thickness of .125. Where material thickness is less than .125 it shall be reinforced with steel grommet inserts. In no event will sheet metal screws or pop rivets suffice.

F. Latches: Solid cast white bronze US25D with clear lacquer finish.

G. Glazing Beads: Extruded, screwless snap-in type, of aluminum.

1. Type: Square cornered, interior type.
2. Color: Matching window sash.

H. Finish (windows and accessory items): Clear anodized aluminum.

I. Glazing compound: As specified in the Glass and Glazing Section of these Specifications.

J. Sealant: As specified in the Caulking and Sealant Section of these specifications.

K. Glass: As specified in the Glass and Glazing Section of these Specifications and as scheduled on the Drawings, and shall be factory installed. In no event shall any glass be less than as required to meet the “large missile impact test”.

2.02 PROJECTED WINDOWS

A. Projected and Fixed Windows: Aluminum, P-HC90 Commercial Grade Optional Performances Non-Thermal Projected Series with main frames and fixed sash of .090" minimum thickness by 2¼ " minimum depth capable of accommodating laminated glass up to 7/16" thick, equal to Kawneer Series 7225. Provide grid mullions/muntins on all window units as per drawings. Provide vertical and horizontal structural mullions as required to meet required design pressures where window will exceed the approved Dade County maximum tested window size in order to maintain the wind load integrity of the existing opening.

B. Approved manufacturers subject to compliance with these specifications include:

1. Kawneer

3. EFCO

3. Traco

C. Windows shall be projected out, fixed projected in (at clearstory) units to match existing window openings (unless otherwise indicated), with window units having muntins. Window Schedule is shown on drawings.

D. Provide weather drips at heads.

E. Frame:

1. All main framing corners shall be coped and butt-type construction, neatly joined and mechanically secured by means of two (2) screws per joint anchored into integral screw races.

2. All framing joints shall be sealed with quality grades sealant meeting AAMA 803.3 to ensure a water tight joint.

F Ventilators:

1. The vent frame shall be tubular and corner construction shall be mitered with an internal clip, epoxy sealed, and mechanically staked.

G. Provide manufacturer standard aluminum bug screen for commercial use at each vent, that are removable.

H. Hardware:

1. Hardware shall be of corrosion resistant materials compatible with aluminum.

2. Hinging hardware shall be heavy duty 4-bar hinges confirming to AAMA 904.1. Hinges shall have a positive stop and an adjustable friction shoe.

3. Locking hardware, strikes, keepers, and pole rings shall be cast white bronze. All hardware fasteners penetrating frame or inside plane of window shall be factory sealed with resilient non-hardening compound.

4. Verify existing conditions and provide proper hardware and poles (2 of 8 feet and 2 of 14 feet) of required length to operate the lower projected-out windows and the clearstory projected-in windows.

I. Latch (each operable vent):

1. Provide one cam latch of handle operated type for each vent up to 41" width (and a second one for larger widths) for ventilators with bottom rail no more than 72" above the floor.

2.03 GLAZING

A. Windows furnished under this Section shall be factory glazed to match glazing specified in Section 08 81 00 and match application qualified by Dade test. Use exterior tape with interior EPDM wedge gasket and interior aluminum glazing bead.

1. Glazing materials shall be compatible with aluminum and those sealants and

sealing materials used in composite structure which have direct contact with the gasket.

2. Standard exterior and interior glazing gaskets shall be a dry glazed elastomer in accordance with ASTM C509-91.

2.04 MULLIONS

A. Horizontal and vertical mullions shall meet requirements of appearance and design details to match existing, and shall have structural properties equal or greater to those required by code and the previously noted design pressure. If manufacturer's load tables require greater structural characteristics (for specified wind loads), then the greater requirements shall be provided. In any event the specified (S) and (I) defined below (Paragraph B.) shall be provided as a minimum.

B. Mullions shall be designed as "simple beams" to normal engineering design criteria. The Section Modules (S) and the Moment of Inertia (I) of the mullions proposed to be furnished shall be calculated and submitted for review. Deflection shall be limited to 1/175 of the mullion span under full 120 mph base line sustained wind load (factored to be 120 mpg (193 km/hr) in accordance with ANSI, interpreted into wind load psf in Paragraph 1.02 above.

2.05 ANCHORAGE

A. Periphery Anchorage: Anchor periphery materials to building and anchor windows to periphery of openings at intervals not exceeding 16 inches O.C. nor further from the end of the frame by more than 8" for the first fastening, with 3/16 inch countersunk flat head screws or with hardened steel studs of equal capacity driven by power actuated tools, or other equal fastenings around each edge of opening. The fastening bolt/screw shall itself by 3/16" in diameter (prior to cutting of threads). The expansion shield shall be larger to accommodate. Fastenings shall penetrate wood by 7/8 inch, aluminum screws into aluminum 3 full threads, and into concrete/masonry/pre-cast concrete with expansion shields or rawl plugs by 3/4 inch. Conceal all fastenings as may be practical. Exposed fastenings shall be flush and flat headed. Submit anchorage details and samples with the shop drawing submittal, including type, size, length and spacing. Provide blocking as required. It is essential that bucks and blocking into which window anchorage is secured, be themselves similarly secured to the building to meet wind load requirements, and Dade County Impact Loading Requirements.

B. Mullion Anchored: 3/16 inch thick by 3/4" steel angle or equivalent with leg extended along mullion 3 inches minimum with minimum of three (3) each 3/16 inch diameter bolts (or equivalent). Leg of angle securing to periphery materials shall be set perpendicular to sill and head line (opposing wind direction), and a sufficient length to allow satisfactory use of two (2) each 3/16 inch diameter bolts embedded into construction by 3 inches minimum. Design to allow adjustability for installation. The above described anchorage shall be minimum to be used; greater anchorage shall be provided if required to transmit loads to supports to meet Dade County Impact Loading Requirements. Submit anchorage details to with the shop drawing submittal.

C. All anchorage shall meet 2017 Florida Building Code for wind load requirements, including Dade County Impact Loading Requirements.

2.06 WORKMANSHIP

A. Frame and ventilator shall be as described above for projected windows.

B. Seal joints in concealed manner with liquid rubber type sealant to form weathertight joint.

C. Fastenings other than welded, shall be made with stainless steel, stainless steel bolts or other stainless steel devices, except where other materials are referenced in these specifications.

D. Give metal surface to be placed in contact with unlike materials, metals, concrete, cast stone or masonry, a heavy coating (6 mil) of alkali-resistant bituminous paint. Designate on shop drawings which surfaces the coating is to be applied to, as well as the type of paint and its manufacturer.

2.07 MUNTINS

A. Provide exterior and interior muntins at each window unit. Muntins shall be tubular design, extruded aluminum muntins shall be of trapezoidal shape to simulate old colonial style steel muntins, and shall be field applied with double faced tape and sealed.

B. Aluminum Finish: Clear anodized.

PART 3 - EXECUTION

3.01 INSPECTION

A. The Contractor shall examine the areas and conditions where window work is to be replaced/installed for the proper and timely completion of this phase of the work. Commencement of work shall be construed as acceptance of the conditions by the installer.

3.02 REMOVAL OF EXISTING WINDOWS AND PREPARATION FOR NEW WINDOW INSTALLATION

A. Existing windows to be carefully removed and disposed of off-site by the Contractor.

B. Contractor shall remove stucco as required to remove windows and repair/replace all stucco/concrete block work or other damage caused by said contract work to match existing. The contractor shall repaint all repaired areas of stucco or concrete block with a primer and two (2) finish coats of best grade latex exterior paint. Contractor shall be responsible for repair/touch-up or recoating of damage or scratches to new window units.

C. Contractor shall use all due care in removing and installing window units to keep physical building damage to a minimum.

3.03 INSTALLATION OF REPLACEMENT WINDOWS

A. Set windows plumb, square, level, at proper elevation and locate in proper alignment. Properly anchor and properly operable.

B. Install work in a water-tight manner and caulk in accordance with requirements of the "Caulking and Sealant" Section of these Specifications.

C. Install windows in accordance with manufacturer's recommendations and the AAMA Voluntary Guide Specifications for Architectural Windows except where requirements of this Specification are greater. Where such are in conflict with these Specifications, these Specifications shall govern.

D. Contractor shall verify, modify and adjust all existing window jamb conditions as required to receive new windows including jambs, head and sill details, and patch masonry wall(s) as required due to installation requirements.

E. Thoroughly clean aluminum with product as recommended by the manufacturer. Use no abrasive cleaning agents.

F. Protect aluminum from dissimilar materials.

G. Fasteners shall be non-magnetic stainless steel of type which shall not cause electrolytic

action or corrosion. Secure window units with fasteners of size and spacing as recommended by manufacturer and required to code for loads applied over the entire window area.

H. Moving parts shall be made to operate uniformly and smoothly with light manual effort. Adjust as required to insure proper operation and setting of gaskets.

3.04 PROTECTION AND CLEANING

A. Aluminum shall be protected from scratches and stains from subsequent construction operations.

B. Aluminum shall be cleaned in accordance with manufacturer's recommendations to a clear, uniform finish free from scratches, stains and other blemishes.

3.05 WARRANTIES

A. Original copies of the warranties, properly executed, shall be delivered via the Contractor and the Architect to the Owner with the Close-Out Documents, as required by the Owner/ Contractor contract.

END OF SECTION

SECTION 08 81 00 - GLASS AND GLAZING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. This work includes the furnishing and fabrication of all glass and glazing materials required for:

   a. Glazed aluminum frames and windows.

2. Installation of glass and glazing materials required for glazed wood doors is specified under Section 08 51 13 – Aluminum Operating Windows.

1.02 QUALITY ASSURANCE

A. Design Criteria:

1. Provide monolithic glazed assemblies that have been produced and fabricated to comply with requirements for system performance characteristics listed below as demonstrated by testing manufacturer's corresponding stock systems:

   a. Single Vision Clear Tempered Glass:

      Light Transmittance: 89% (visible)
      Reflectance: 8% in and out
      U Value: 1.13
      Shading Coefficient: 0.95

B. Single Source Responsibility:

1. Obtain glass products from one manufacturer.

C. Source Quality Control:

1. All glass shall bear the manufacturer's identifying label.

D. Reference Standards:

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

   a. ASTM C 1036 "Standard Specification for Flat Glass".

   b. ASTM C 1048 "Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass".

2. American National Standards Institute (ANSI):

   a. ANSI Z 97.1 "Safety Glazing Material Used in Buildings, Performance Specifications and Methods of test, for".

1.03 SUBMITTALS

A. Samples:

1. Provide two (2) 12" x 12" samples of each type of glass scheduled for installation.

2. Provide two (2) 12" lengths of each type gasket employed.

B. Manufacturer's Literature:

1. Provide two (2) copies of manufacturer's descriptive data on glass and glazing materials.

C. Product Approval:

1. Provide Florida Product Approval Certification

2. Provide NOA for Impact Resistance Certification (150 mph)

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Product Delivery:

1. Deliver glass to Job Site in suitable containers that will provide protection from weather and breakage.

B. Storage and Handling:

1. Store all glass in original containers in which glass was shipped, labels intact, indoors, away from water or moisture accumulations and condensations; and keep glass free from contamination by materials capable of staining glass.

2. Workman shall be of sufficient number to ensure the safe handling and storage of glass when transporting or handling lites of glass.

3. Do not slide one lite of glass over another.

1.05 JOB CONDITIONS

A. Measurements:

1. Sizes of glass shall be measured from the actual installed frames, doors, and sash.

B. Sequencing, Scheduling:

1. Schedule glass deliveries to coincide with glazing schedules.

1.06 GUARANTEE

A. Furnish a written guarantee that all materials and workmanship are guaranteed against defects for a period of not less than three (3) years after completion of construction and Final Acceptance of all Work.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. All glass and glazing materials shall be a product of the following manufacturers:

1. Pittsburgh Plate Glass Industries, Inc. (PPG).
2. Pilkington, Pilkington LOF.
3. ASG Industries Inc. (ASG).
4. Viracon.

2.02 MATERIALS

A. Glass Standards:

1. Primary Glass Standard:

a. Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable; form, finish, mesh and pattern.

2. Heat-Treated Glass Standard:

a. Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, and, if applicable; form, finish, and pattern.

3. Laminated Glass Standard:

a. Provide laminated glass which complies with ANSI Z-97.1. Interlayer shall be Saflex as manufactured by Monsanto, or approved equal.

B. Glass Types:

1. Tinted (Impact Resistant) Glass:

a. 9/16” laminate glass with .090 inter layer and low ‘e’ coating.

b. Tint to be selected.

C. Glazing Accessories:

1. Glazing Tapes:

a. Glazing tapes shall be polymerized butyl, rubber tape, coiled on release paper.

2. Sill and Head Setting Blocks:

a. Sill and head setting blocks shall be identical blocks of neoprene or EPDM compatible with metal framing system used.

3. Anti-Walk Jamb Setting Blocks:

a. Anti-walk jamb setting blocks shall be identical blocks of neoprene or EPDM compatible with metal framing system used.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Refer to Section 08 51 13 – ALUMINUM OPERATING WINDOWS, for installation of glass and glazing materials in frames and windows.

B. Locations:

1. Refer to Drawings for locations of all glass types.

END OF SECTION

SECTION 08 90 00 - LOUVERS AND VENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Provide all equipment, appliances, labor, material, transportation, and perform all operations required for the complete installation of exterior metal louvers located on exterior walls (including 2 round), as shown on the drawings.

1.02 QUALITY ASSURANCE

A. Performance Requirements:

1. Provide louvers whose performance ratings have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500 as follows (based on a 4' x 4' test louver):

a. Provides a minimum of 7.11 square feet of free area for 2 inch deep narrow profile louvers and minimum 6.80 square feet of free area for 4 inch deep standard profile louvers; and shall pass 1150 FPM free area velocity at a pressure drop not exceeding .20 inch W.G, based on manufacturer.

b. Water penetration shall be no more than .006 ounces of water per square foot of free area at this velocity when tested for 15 minutes per AMCA Standard 500.

2. Provide louvers with AMCA Certified Ratings Seal evidencing that product complies with above requirement.

3. Comply with SMACNA “Architectural Sheet Metal Manual” recommendations for fabrication, construction details, and installation procedures, except as otherwise indicated.

4. Louver assemblies shall be designed to withstand a wind load of 150 MPH.

5. Louvers to be wind rated to meet specified loads. Florida Product approval and Miami Dade NOA or equal, is required.

B. Requirements of Regulatory Agencies:

1. The work performed under this section shall be strictly governed by local and state authorities of this area.

C. Submittals:

In addition to manufacturer’s shop drawings, submit signed and sealed calculations from a Florida Registered Engineer certifying that the louvers and anchorage will meet the specified wind load pressures.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with specified requirements, provide products manufactured by Greenheck or approved equal.

2.02 MATERIALS

A. Louvers:

1. Louvers:

a. ESD-635D blade louver as manufactured by Greenheck, with clear anodized finish.

2. Approved manufacturers subject to compliance with Specifications:

a. Architectural Louvers

b. Ruskin Louver

3. Louvers shall bear AMCA Certified Ratings Seals for air performance and water penetration ratings.

B. Fastenings:

1. Use same materials as items fastened. Provide types, gauges, and lengths to suit unit installation conditions. Use phillips flat-head machine screws for exposed fastenings, unless otherwise indicated and/or required.

C. Screens:

1. Provide bug screens that are removable, 1/4" intercrimp aluminum wire mesh 0.063 diameter, fitted into extruded aluminum frames with mitered corners.

D. Sealant:

1. General Electric Silpruf Sealant or Tremco Spectrum 2 Silicone Sealant.

2. Color shall match adjacent aluminum color.

E. Dissimilar Metals Coating:

1. Protective paint shall be Scotch-Clad Brand Protective Coating No. 1706 as manufactured by 3M, Minnesota Mining and Manufacturing Co., or approved equal.

2.03 FINISH

A. Manufacturer standard clear anodized aluminum finish.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that all materials shall be installed in complete accordance with the original design and the approved Shop Drawings.

3.02 FIELD MEASUREMENT

A. Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work. However, proceed with fabrication and coordinate installation tolerances as necessary when field measurements might delay work.

3.03 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of metal louvers.

B. All items under this heading shall be set in their correct locations as shown on drawings and shall be level, square, plumb, and at proper elevations and in alignment with other work.

C. Install all members with adequate provisions for settling, expanding and contracting to occur without bending louver blades. Firmly anchor all members, using all anchoring devices required to ensure positive attachment of the members. Set sill members in full bed of mastic.

D. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

E. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated and/or required.

F. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations, and refinish entire unit, or provide new units, at Contractor's option.

G. Provide concealed gaskets, flashings, and joint fillers, and install as work progresses to make installations weathertight.

H. Sealant Application:

1. Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated as necessary to present a weathertight, neat, finished job.

2. Sealant shall be applied by skilled applicators and work shall be of highest quality, completely water and weathertight. 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. All beads shall be tooled immediately after application to ensure firm and full contact with the inner-face of the joint.

3. Remove all excess materials and smears adjacent to joint as work progresses.

4. Do not plug weep holes built into metal frame (if occurring).

3.04 CLEAN UP

A. Upon completion of work, promptly remove all unused material, debris and equipment from the site.

END OF SECTION

SECTION 09 20 00 - LATH AND PLASTER

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Work of this Section shall include all materials, labor, transportation, equipment and all other items necessary to complete Portland cement plastering (stucco) on new walls and patching of existing, as indicated on Drawings, herein specified and required for a complete installation

B. Related Work Specified Elsewhere:

1. PAINTING: Section 09 91 00.

1.02 DESIGN CRITERIA

A. Allowable Tolerances:

1. For flat surfaces, do not exceed 1/4-inch in 8-feet for bow or warp of surface, and for plumb and/or level.

1.03 QUALITY ASSURANCE

A. Reference Standards:

1. American National Standards Institute (ANSI):

a. Comply with applicable requirements of ANSI A42.2 "Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior", except where more detailed or more stringent requirements are indicated.

2. Portland Cement Association (PCA):

a. Comply with the recommendations of the PCA "Plasterer's Manual", except where more detailed or more stringent requirements are indicated.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's product specifications and installation instructions for each product, including data showing compliance with specification requirements.

B. Samples:

1. Submit duplicate samples indicative of proposed finish to the Architect for review and approval.

2. Approved samples shall become the basis of comparison for all plaster work.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Except for sand and water; deliver materials to the site in sealed containers or bags fully identified with manufacturer's name, brand, type, and grade.

B. Store materials in a dry, well-ventilated space, under cover and elevated so as to not come in contact with ground or concrete slabs.

1.06 JOB CONDITIONS

A. Protection of Surfaces:

1. Use all means necessary to protect the work and materials of this Section before, during and after installation; and to protect the work and materials of other trades from moisture deterioration and soiling which may occur from plastering operations.

2. Provide temporary covering or other provisions as may be necessary to minimize harmful spattering of plaster on other work.

3. Do not apply plaster immediately before or during a rainstorm.

B. Environmental Conditions:

1. Warm Weather Requirements:

a. Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial.

PART 2 - PRODUCTS

2.01 METAL LATH, SUPPORTS AND ACCESSORIES

A. Expanded Metal Lath:

1. Expanded metal lath shall be self-furring, copper alloy steel, galvanized, and shall be of the following type and minimum weight:

Type	Lbs. per Sq. Yd.
Diamond Mesh Lath	3.4
Ribbon Mesh Lath	4.0

2. All metal lath shall be backed with a heavy asphalt saturated paper firmly attached to the back surface. Paper shall conform to Federal Specification UU-B-790, Type I, Grade A, Style 2.

B. Casing Beads:

1. Casing beads shall be square-edge style, with expanded flanges and removable protective tape of the following material:

a. PVC

C. Control Joints:

1. Control joints shall be Type XJ15-3 as manufactured by Keene Corporation, or approved equal.

D. Expansion Joints:

1. Expansion joints shall be Type 40 as manufactured by Keene Corporation, or approved equal.

E. Corner Bead:

1. Corner bead shall have expanded flanges made of the following material:

a. PVC if compatible with existing when repairing stucco.

b. or zinc alloy to match existing.

2.02 PLASTERING MATERIALS

A. General:

1. Except as otherwise indicated, provide standard products recommended by the manufacturer for the application indicated, complying with ANSI A42.2. Where more than one choice of plastering material is indicated, selection is installer's option.

B. Cement:

1. Portland Cement shall conform to ASTM C 150, Type I, and be of same source to insure uniformity throughout entire project. Approved types of plasticity agents may be added to Portland cement in the manufacturing process or when mixing; but in no case shall the amount of plasticity agent exceed ten percent (10%) of the volume of cement in the plaster mix.

C. Lime:

1. Lime shall be dry Hydrated Lime, ASTM C 206, Type S.

D. Aggregates:

1. Inorganic aggregates used for plaster shall conform to ASTM C 35 except that graduation of locally produced sand shall be such that the fineness modulus is between 1.20 and 2.35.

E. Water:

1. Water shall be clean and free from deleterious amounts of acid, alkali, and organic material.

F. Integral Waterproofer:

1. SEC #1 as manufactured by SEC Manufacturing Company or approved equal.

2.03 MIXING AND PROPORTIONING PORTLAND CEMENT PLASTER (STUCCO)

A. All plaster mix ingredients shall be mixed in a mechanical mixer with the minimum amount of water needed to produce a plaster of workable consistency. Plaster shall be mixed for a minimum of two (2) minutes or until all ingredients are uniform in color after all ingredients are in the mixer.

1. Two and Three Coat Application:

Coat	Portland Cement	Lime by volume	Aggregates by volume	Integral Waterproofer
1st (base)	1	- - -	3-1/2	- - -
2nd (scratch or finish)	1	15% max.	2	1 qt. per bag of cement
3rd (finish)	1	15% max.	2	1 qt. per bag of cement

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which this Work is to be performed. Correct conditions detrimental to the proper and timely completion of this Work. Do not proceed until unsatisfactory

conditions have been corrected.

B. Remove stucco and grounds where areas are to be patched and install to meet manufacturer standards.

3.02 PREPARATION

A. All masonry surfaces shall be cleaned free of all coatings, dirt, oily and waxy films, and all other substances which would prevent a good bonding surface for Portland cement plaster (stucco).

3.03 INSTALLATION OF METAL LATH, SUPPORTS AND ACCESSORIES

A. Install metal members and lath as indicated, anchoring all components firmly into position in strict accordance with ANSI A42.3 requirements.

B. Metal reinforcement shall be furred out from the back at least 1/4-inch by an approved furring method, which shall be spaced not more than 6-inches vertically and 16-inches horizontally.

C. Metal lath shall be attached to steel framing and/or furring channels by No. 18 galvanized wire not to exceed 6-inch spacings.

D. Diamond mesh lath shall be lapped at sides not less than ½ inch. Rib metal lath with edge ribs greater than 1/8” in depth shall be lapped at sides by nesting outside ribs. Rib metal lath with edge ribs no greater than 1/8 inch in depth shall be lapped ½ inch at sides or outside ribs shall be nested. All metal lath shall be lapped not less than 1 inch at ends. Stucco mesh shall be lapped one diamond at sides and ends. Where end laps do not occur at supports, they shall be laced or tied with No. 18 galvanized wire. Where metal lath ceilings are adjacent to partitions, lath shall lap not less than 3 inches onto such partitions.

E. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or anchorage of fasteners as indicated.

F. Install casing beads at every intersection of plaster and other materials. Install expansion and control joints in locations detailed on Drawings.

G. Set accessories plumb, level and true to line, with a tolerance of 1/8-inch in 10-feet.

3.04 PLASTER APPLICATION

A. General:

1. Portland cement plaster (stucco) application shall be performed by skilled mechanics experienced in this type of work. All work shall be properly rodded true and straight, flush with grounds applied in strict accordance with ANSI A42.2 and with the recommendations of the PCA "Plasterer's Manual", unless otherwise indicated.

2. Do not use materials which are caked or lumpy, or which are dirty or contaminated by foreign materials. Use only clean water, free from impurities which might impair the plaster work; do not use water which has been used to clean tools. Do not use excessive water in the mixing and application of plaster materials.

3. Sequence plastering applications with other work in accordance with recognized industry standards. Delay application of finish coat until adjoining work has been completed, wherever possible.

B. Thickness:

1. Portland cement plaster (stucco) shall be applied in thickness as follows:

Plaster Base	First (Base) Coat	Second (Scratch or Finish Coat)	Third Coat	Total Thickness

Metal Lath	1/4”	1/4”	1/4”	3/4”
Masonry	3/8"	1/4"	1/4”	(±) 1" (match existing walls)

C. Methods:

1. First (Base) Coat:

a. Apply first (base) coat to masonry or metal lath with sufficient pressure to form a good key. Bring to plumb, true, even surface, rough in texture. When sufficiently set, float scratch with dry float. Cross scratch evenly to form bond for second coat.

2. Second Coat:

a. Apply second coat to masonry or metal lath with sufficient pressure to form a good key. Bring to plumb, true, even surface, rough in texture. When sufficiently set, float scratch with dry float. Cross scratch evenly to form bond for finish coat.

3. Third (Finish) Coat:

a. Apply finish coat as soon as possible after base coat hardens. Use float for preliminary finishing, then steel trowel for final compacting. Finish shall be "textured" to match existing.

b. Finish coat to be painted as specified under Section 09 91 00 - PAINTING.

D. Curing:

1. Damp cure Portland cement plaster (stucco) as follows:

a. Surfaces shall be protected from the sun, hot-dry winds, or excessive ventilation using canvas, cloth, or plywood barriers; then kept moist with a fog spray of water until proper hydration takes place (usually 48-hours for temperatures ranging 50-degrees and above.

b. Do not damage finished surface by water erosion during damp curing operation.

3.05 CUTTING AND PATCHING

A. Cut, patch, repair and point-up Portland cement plaster (stucco) as required and as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items which are built into or penetrate plaster surfaces. Repair or replace plaster work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar imperfections. Repair or replace the work as necessary to comply with specified tolerances and required visual effects.

3.06 PROTECTION

A. Remove temporary covering and other provisions made to minimize splattering of plaster on other work. Repair surfaces which have been stained, marred or otherwise damaged during plastering work.

END OF SECTION

SECTION 09 91 00 – ARCHITECTURAL 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.

2. Re-painting existing surfaces and painting new surfaces.

3. **GENERAL NOTES: "RE-PAINTING"**

a. Prepare and paint the interior and exterior surface areas as specified below and the Project Manual and as indicated on drawings. In general, the **INTERIOR** surfaces include masonry walls, concrete, doors, ceilings, previously painted metal items, including steel framing, angles, beams, etc. including existing sealed joints to be re-sealed. The **EXTERIOR** surfaces include metal doors, steel, stucco walls, concrete wall, and all existing sealed joints to be resealed. Surfaces not included in the project are metal surfaces with factory painted finishes and aluminum window frames. The colors shall match existing.

Note: For concrete floor finish, refer to Section 07 18 13.

b. Included in the project is to clean all the building interior and exterior surfaces and remove stains, and repaint.

Note: Stucco patching is to be completed prior to painting.

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.

4. Refer to General Notes Section 36 "Paining" for painting of pump station piping, fitting and valves.

5. Refer to Section 52 "Manhole and Structure Rehabilitation" for wet well/sump well structural coating

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. 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.

C. 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. 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 5 year from the date of substantial completion, as established by the Owner and the Architect.

1. Warrantee shall include all labor equipment 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. Vandalism.

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.

C. The paint applicator, in conjunction with the Contractor 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 some color fading is expected; however, 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. Vandalism.

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. 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, 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. All exterior surfaces must be thoroughly pressure cleaned using a pressure washer and insure the surface is cleaned free of all loose, scaling, and marginally adhering paint, all chalk, mildew, stains, dirt, grease or other foreign material. Surface must be firm, clean and dry before proceeding. All loose and scaling paint not removed by

pressure cleaning shall be removed by wire brushing or other suitable power tool cleaning. **NOTE: AN AREA SHOULD BE TESTED FOR INDICATION AS TO THE AMOUT OF PSI TO BE USED ALONG WITH TIP SELECTION AND THE DISTANCE AWAY FROM SURFACE.** If a surface shows damage or breeching during testing adjustments should be made to achieve the above without damage.

2. 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.

D. RUSTED METAL SURFACES

1. Hand Tool clean rusty areas per SSPC-SP2 or Power Tool clean per SSPC-SP3. Surface must be clean, dry and sound. Spot prime cleaned rusted areas with specified primer.

E. PREVIOUSLY PAINTED EXTERIOR MASONRY, CONCRETE, OR STUCCO

1. Surface must be clean, dry & sound. Repair cracks and imperfections as described in Section 3.04.

F. PREVIOUSLY PAINTED WOOD SURFACES

1. Painted wood surfaces shall be carefully inspected for evidence of deterioration or surface imperfections. All deteriorated wood shall be replaced. Glossy or very hard surfaces of old paint film must be cleaned and dulled/roughened before repainting. Surface must be clean, dry, and sound. Spot prime or full prime as necessary or as specified with the Sherwin-Williams specified primer.

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 MASONRY/STUCCO REPAIR PROCEDURE

A. All construction joints and expansion joints shall be carefully inspected for caulking deterioration, loss of adhesion, cracking or loss of properties. Failing caulking shall be removed and the area cleaned prior to re-caulking with the specified caulk to assure desired

adhesion to both surfaces. Where the existing caulking is removed, a Neoprene rope shall be installed as a back-up surface if opening is more than 1/8".

B. HAIRLINE OR SHRINKAGE CRACKS (1/32" or smaller)

1. Coat affected area by applying one coat of Sherwin-Williams Loxon Masonry Acrylic Primer (A24W300) at 7.0 wet mils.

C. HAIRLINE OR SHRINKAGE CRACKS (1/32" to 1/16")

1. Apply Sherwin-Williams' ConSeal Brush Grade Smooth Patching Compound (A5W620) generously over the center of the crack. Use a broad knife or a brush and "feather" the material to either side of the crack so as to go from 1/16" to 0, over a 2" area.

D. LARGE CRACKS (1/16" up to 1/4")

1. Do not attempt to repair cracks caused by structural deficiencies in the building. Nonstructural movement cracks can range from 1/16" to in excess of 1/4" Rout out cracks larger than 1/16" to 1/4" wide by 1/4" deep. Flush with water. Prime with Sherwin-Williams Loxon Surface Conditioner, Guide Coat White. Insert Bond Breaker Tape. Fill joint completely with Sherwin-Williams ConSeal Knife Grade Patching Compound. Build a small crest to compensate for shrinkage. Allow to cure for a minimum of 24 hours and apply a cap of Sherwin-Williams' ConSeal Brush Grade Patching Compound (A5W620). Refer to diagrams for details and to the Specification Guidelines Booklet by Sherwin-Williams for specific application and recommendations.

E. Sound all masonry cracks to determine bond substrate. If hollow sound or disbonding is present, notify owner or owner's agent before proceeding. Loose substrate must be removed and area primed with concrete to concrete primer. Concrete patching must be applied in void and finished with appropriate material to match the adjacent substrates in texture and uniformity.

F. Remove all tape, patching compound, caulking or sealant in any previously patched areas, and re-patch as specified.

G. All masonry surfaces to be painted are to be pressure cleaned and sealed with Sherwin-Williams specified masonry conditioner, unless otherwise specified.

H. Rust areas under stucco, corner beads, etc. Stucco must be removed to metal surface. Metal should be cleaned of rust scale. Treat with rust inhibitor according to label directions. Repair stucco accordingly before coating.

3.05 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.

3.06 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.

3.07 EXTRA MATERIALS

A. Provide one (1) gallon of each type of coating specified with color mixed clearly marked for maintenance use.

3.08 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.

3.09 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.

3.10 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:

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

2. Metal (Steel) Surfaces:

Full Prime: S-W Pro-Cryl Universal Primer, B66A310 at 5.0 – 10.0 mils wet, 2.0 – 4.0 mils DFT. VOC (less exempt solvents) <115 g/L.

Finish Coat #1: S-W Waterbased Acrolon 100 Urethane, B65-720 series/B65V720 at 4.0 – 8.0 mils wet, 2.0 – 4.0 mils DFT. VOC (less exempt solvents) <100 g/L

Finish Coat #2: S-W Waterbased Acrolon 100 Urethane, B65-720 series/B65V720 at 4.0 – 8.0 mils wet, 2.0 – 4.0 mils DFT. VOC (less exempt

solvents) <100 g/L

INTERIOR

1. CMU / Masonry / Concrete:

   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 (Steel Framing and Beams, Miscellaneous Steel Framing, Angles, etc.):

   First Coat: 1-coat SW KEM KROMIK Universal Metal Primer, B50 Series: 3.0 mils DFT

   Second Coat: SW DTM Acrylic Coating Semi-Gloss, B66 Series: 2.5 mils DFT each coat.

   Third Coat: SW DTM Acrylic Coating Semi-Gloss, B66 Series: 2.5 mils DFT each coat.

4. Hollow Metal Doors and Frames:

   Full Prime: S-W Pro-Cryl Universal Primer, B66A310 at 5.0 – 10.0 mils wet, 2.0 – 4.0 mils DFT. VOC (less exempt solvents) <115 g/L.

   Finish Coat #1: S-W Waterbased Acrolon 100 Urethane, B65-720 series/B65V720 at 4.0 – 8.0 mils wet, 2.0 – 4.0 mils DFT. VOC (less exempt solvents) <100 g/L

   Finish Coat #2: S-W Waterbased Acrolon 100 Urethane, B65-720 series/B65V720 at 4.0 – 8.0 mils wet, 2.0 – 4.0 mils DFT. VOC (less exempt solvents) <100 g/L

END OF SECTION

SECTION 10 28 00 - TOILET ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. Provide all toilet accessories as specified herein (verify location).

1.02 QUALITY ASSURANCE

A. Inserts and Anchorage: Furnish inserts and anchoring devices which must be set in metal framing; masonry or concrete; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products:

1. Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas.

2. Toilet accessories shown or scheduled are based upon standard units of ASI. It is intended that similar units by other listed manufacturers will be acceptable, provided they comply with size, material and operation requirements as shown and/or specified and match basic design concept of listed units.

D. Keys:

1. Accessories having keys shall be keyed alike. Deliver three (3) keys for each keyed alike accessory group to Owner at completion of work.

1.03 SUBMITTALS

A. Shop Drawings/Product Data:

1. Include manufacturer’s data, catalog cuts, elevations, and sections.

a. Submit four (4) copies of catalog cuts of all toilet accessories proposed by listed acceptable manufacturers to be used in project in lieu of specified toilet accessories, including catalog cuts of specified toilet accessory item it is proposed to be substituted for. Mark-up choices and option in data on both proposed and scheduled toilet accessory cut sheets, as necessary to indicate characteristic of actual product being provided for the project.

2. Include setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide toilet accessories by the following (no exceptions):

1. American Specialties Inc. (ASI)

2. A & J Washroom Accessories.
3. Bobrick.

4. Continental

2.02 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gauge minimum, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 386- hot-dip galvanized after fabrication.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.03 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish three keys for each lock, properly identified.

B. Surface-Mounted Toilet Accessories: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

2.04 TOILET ACCESSORIES

A. Locations: Provide the following accessories in locations as directed by Owner.

B. Single-Roll Toilet Tissue Dispenser – Surface Mounted.

1. Manufacturer/Model: ASI 0040.

2. Provide at water closet.

C. Soap Dispenser:

1. Manufacturer/Model: ASI 0371

2. Provide one at sink.

D. Mirror with Frame:

1. Fabrication: Stainless steel angle frame, concealed mounting.

2. Manufacturer/Model: AJW, unless shown otherwise, provide 24” x 36” mirror over sink.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.02 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

END OF SECTION

SECTION 10 44 00 - FIRE PROTECTION SPECIALITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope

1. Type of products in this section includes:

a. A "Portable Type" fire Extinguisher.

2. Refer to Paragraph 3.01 for Schedule.

1.02 QUALITY ASSURANCE

A. Single Source Responsibility

1. Provide portable fire extinguishers, cabinets and accessories by one manufacturer, unless otherwise approved by the Architect.

B. Requirements of Regulatory Agencies:

1. Materials and installation procedures shall conform to National Fire Protection Agency (NFPA) 10 "Portable Fire Extinguishers".

2. Work shall be strictly governed by local and state authorities of this area.

C. Submittals:

a. Submit electronic product information.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of the following:

1. J.L. Industries
2. SM Products (U.S.A.), Inc.
3. Larsen's Mfg. Co.

2.02 FIRE EXTINGUISHERS

A. Multi-Purpose Dry Chemical Type (60BC-FE), General:

1. UL Rated 4-A: 60B: C, 10 lb. nominal capacity, in enameled steel container, for Class A, Class B, and Class C fires: Cosmic 10E as manufactured by J.L. Industries.

PART 3 - EXECUTION

3.01 EXTINGUISHER SCHEDULE

A. Provide as follows (wall hung with bracket):

LOCATION	TYPE
Electrical Room	10 ABC
Pump Room	10 ABC
“Balcony” Level	10 ABC

NOTE: Verify exact location with Owner

END OF SECTION

SECTION 22 00 00 – PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions Division 01 and of Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Division 22.

B. Examine other Sections of the Specifications and Contract Documents for work that may affect or is related to the work of this Division 22 whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE OF WORK

A. Provide the labor, materials and equipment for the installation and testing of the plumbing systems shown on the drawings and herein specified.

B. All systems shall be complete, tested and ready for operation at time of Substantial Completion. Refer to Specifications General Provisions and Sections 22 01 00 and 22 02 00.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 02 00 Operation and Maintenance Manuals
22 08 00 Painting and Identification
22 10 00 Plumbing – General
22 20 00 Piping General
22 21 00 Piping
22 51 00 Insulation

1.04 RELATED WORK NOT INCLUDED IN THIS DIVISION

A. Refer to related Sections of the Contract Documents for work to be provided by others such as but not limited to:

Finish Painting
Electrical Work - Refer to Division 26
Equipment foundations: Masonry, concrete or structural steel
Access doors
Flashing, but counter flashing shall be included herein
Cutting and patching

1.05 DEFINITIONS

A. Specific items of terminology, as used herein, shall have the following meanings:

1. BY OTHER TRADES: Shall mean work that is to be provided by persons or parties responsible for work at the project other than the party or parties who have been awarded a contract for work under this Division 22. In the event that this document is used to acquire work as part of a general construction contract, the words "by other trades" shall mean by persons or parties who are not anticipated to be the installers for the work shown under this Division 22. In this context, the words "by other trades" shall not be interpreted to mean, “not included” in the overall contract.

2. CONCEALED: Shall mean work is embedded in masonry or other construction, installed behind

walls, above ceilings, in crawl and attic spaces or shafts.

3. DEMOLITION: Shall mean the removal of any existing equipment, piping, ducts, etc. and the temporary or permanent capping or plugging of indicated existing services.

4. EXPOSED: Shall mean work that is not concealed.

5. FURNISH: Shall mean purchase and deliver to the project site indicated equipment and/or materials complete with necessary rigging, appurtenance and supports.

6. INSTALL: Shall mean unload equipment and materials at site delivery point; store in a dry safe protected location at site and perform every operation necessary to establish secure mounting and correct operation at proper location in the project. Include necessary connections to required services.

7. PIPING: Shall mean pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, vents, and any other items customarily required in connection with the installation of systems for the transfer of fluids. Include the tests and the test and balance of such systems.

8. PROVIDE: Shall mean FURNISH and INSTALL.

9. WORK: Shall mean to include all materials, labor, equipment, tests and test and balance required for a complete and operable installation.

10. CONTRACTOR / INSTALLER: Shall mean the licensed plumbing contractor responsible for providing the work under this Division 22.

B. Except where modified by specific notation to the contrary, it shall be understood that the indication and/or description of any item, in drawings or specifications or both, carries with it the instruction to furnish and install item, regardless of whether or not this instruction is explicitly stated as part of indication or description.

1.06 QUALITY ASSURANCE

A. General

1. It is the intent of the drawings and specifications to obtain a complete and operable installation. Refer to Specifications Division 01.

2. All work shall comply with applicable Codes and Standards at the time the project is bid including the requirements of the State and local Board of Health.

3. All materials shall be new, properly labeled and/or identified, and in full compliance with the contract documents and applicable Codes and Standards.

4. The quality and weight of the materials furnished and installed in this project shall comply with the requirements and specifications of the appropriate standards of the American Society for Testing and Materials (ASTM).

5. Manufacturer's model names and numbers used in this Division 22 are subject to change per manufacturer's action. Contractor shall therefore verify applicable information with manufacturer's representative before ordering any product or equipment. Notify Architect / Engineer of any changes and promptly furnish, for their review, information on new or replacement product. Changes shall be at no cost to the contract.

B. Installer's Qualifications

1. Installers performing work under this Division 22 shall be both a State and local licensed firm regularly engaged in providing the work specified under these sections. Provide copy of license upon request.

2. Installer shall provide, upon request, a list of at least five similar jobs he has completed in the last two (2) years.

C. Drawings and Specifications

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

2. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Notes or details on drawings which refer to an individual element of work and that may conflict with the specifications shall be brought up to the attention of the Architect / Engineer for clarification before any equipment or materials are purchased or work is installed. Failure to follow these guidelines may cause the contractor to replace / correct the work at no cost to the contract.

3. The separate divisional drawings and specifications do not relieve the contractor from the responsibility to provide the work, which is indicated on any of the drawings or division of the specifications.

4. The drawings of necessity utilize notes, details, symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of such notes, details, symbols and diagrams that any elements of work necessary for a complete installation are excluded. Any discrepancies shall be brought to the attention of the Architect / Engineer for clarification before bid time and the purchasing and installation of any equipment or materials. No work shall proceed until issues are resolved. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract.

5. Details, sections and enlarged plans that appear on the drawings are intended only for the purpose of establishing general feasibility. They do not supersede field coordination of the indicated work among the various trades working in that area.

6. Examine and coordinate site provisions with civil engineering documents. Examine and coordinate building provisions with the architectural, structural, electrical, mechanical and fire protection drawings and specifications prior to submitting bid. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

7. Architectural and structural drawings take precedence over and plumbing drawings with reference to building construction. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

8. Architectural drawings take precedence over plumbing drawings with reference to the location, type and number of plumbing fixtures, cabinets and any other similar fixed items. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

9. The Architect shall be notified of any discrepancies, omissions, conflicts or interferences, which occur between drawings and specifications. If such notification is received in adequate time prior to bid time additional data or clarifications will be issued by addendum to all bidders. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract. See note 4 above.

10. When extra work involving Division 22 trades is authorized, the work as shown on drawings, sketches, described by Addendum or Change Order is subject to this specification in all respects.

D. Standards

1. Certain materials and installation procedures are described by reference to industry standards published by nationally recognized organizations such as, but not limited to, those listed below:

Hydraulics Institute Standards
American Society for Testing Materials (ASTM)
American Society for Mechanical Engineers (ASME) Code of Unfired Pressure Vessels
National Fire Protection Association (NFPA)

National Electrical Manufacturers Association (NEMA)
Underwriter's Laboratories (UL)
American National Standards Institute (ANSI)
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

2. Additional standards may be listed in other Sections of the Specifications and in the Florida Building Code 2017.

3. Whenever a reference is made to a standard, installation and materials shall comply with the latest adopted and published edition of the Standard at the time project is bid.

E. Requirements of Government Agencies

1. The work under this contract shall comply with the standards and requirements of City of Tampa Fire Department and City of Tampa.

2. The contractor, at no cost to the contract, shall correct any work found to be in noncompliance with those Standards.

1.07 PERMITS, FEES AND INSPECTIONS

A. Contractor shall give the necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work. The City will submit the plans for CSD permitting.

B. Obtain all required certificates of inspection for work and deliver them to the Architect / Engineer before requesting acceptance and final payment for the work.

1.08 CODES

A. All work specified and installed under Division 22 shall comply with the Florida Building Code (FBC) 6th Edition 2017 and Chapter 5 of the City of Tampa Code.

B. applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

C. Installer's of work specified under Division 22 shall include in the work, without extra cost to the contract the labor, materials, services, apparatus and drawings required to comply with applicable laws, ordinances, rules and regulations before submitting his bid.

E. Installer shall inform the Architect / Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.09 FIELD CHANGES DURING CONSTRUCTION

A. Occasionally during construction changes that deviate from the approved permit documents may occur.

B. Local authorities may require that the changes be submitted for their review via signed and sealed documents indicating the design professional concurrence with said changes. Contractor shall therefore notify the design professional of any changes before proceeding with the work and provide justification for the change including supporting sketches detailing the extent and nature of the change.

C. Failure to follow this procedure may delay the design professional response until the need for the change is justified.

D. When changes are made for the contractor's sole convenience, contractor assumes full responsibility for reimbursing the design professionals for his / her time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

PART 2 - MATERIALS

2.01 GENERAL

A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number represent a standard of quality or performance on which the design of this project is based.

B. Since manufacturers reserve the right to change, at anytime, the design and quality of their products, installers shall verify such information to assure that the equipment and materials being submitted are in compliance with the intent of the drawings and specifications. Shop drawings shall clearly note such changes. Any required changes shall be made at no cost to the contract.

C. A list of all materials and equipment, which the installer proposes to furnish, shall be submitted for approval within then (10) days after the contract has been awarded. Data shall be complete in all respects.

2.02 ACCESS DOORS AND/OR PANELS

A. Access doors or panels are required for access to service valves, electrical disconnects and other Division 22 equipment concealed in or behind walls, above ceilings, other than lay-in tile, and where it may be necessary for the test and service of equipment.

B. Access doors and panels shall conform to the finish of adjacent construction as indicated on the Architectural construction documents. Access doors/panels shall be as specified in another section of the specifications and be provided by the contractor for general construction.

C. Access doors or panels installed in fire rated assemblies shall meet all the requirements of the assembly.

D. Each installer providing work under this Division of the specifications shall be responsible for determining the size of each door/panel required for access to his work. Dimensions shall be determined in the field prior to ordering doors or panels.

E. All doors and panels shall be of the hinged type with easy to open locking devices. Provide locks when security or fire rated considerations so require and as directed by Owner and Architect / Engineer.

F. Submit shop drawings for review by Architect / Engineer.

2.03 FIRE STOPPING

A. Unless otherwise noted on drawings; modified by Architect and/or authorities having jurisdiction, the following materials may be used to seal penetrations of fire rated assembly by work installed under this Division 22.

1. Rock wool: Minimum four pounds for cubic foot density; flame spread 15, smoke developed 0, fuel distribution 0 by ASTM E84; minimum melting point 2000ºF.

2. Concrete and masonry are also approved firestop materials by NFPA 90A.

3. UL approved products such as Dow-Corning and 3M.

B. When using any of these products, UL, NFPA and manufacturer's recommendations shall be followed.

PART 3 - EXECUTION

3.01 ORGANIZATION OF THE WORK

A. At all times, a competent superintendent shall be on site in charge of the work. Replace if performance is unsatisfactory to the Owner and/or Architect / Engineer.

B. Maintain a complete file of all contract and shop drawings at the site available for review by Owner's representatives and Architect / Engineer. A set of drawings shall be dedicated as the “As Built Record

Set" where all changes and / or deviations from the contract documents are noted as they occur. Refer to Specifications Division 01 and Section 22 01 00.

C. Upon installation of equipment, shop drawings shall be initialed and dated. This procedure will ensure proper scheduling and allow Owner's representatives and Architect / Engineer to check the work in progress.

3.02 COORDINATION WITH OTHER TRADES

A. Coordinate work to be installed under this Division 22 with other trades and existing field provisions to avoid interferences and delays. Assist in working out space requirements to make a satisfactory installation. Notify the Engineer of any major conflicts that cannot be resolved through normal field coordination with other trades.

B. When work by others is installed before it is coordinated with the work of Division 22 trades, and as a result interferes with the Division 22 work, the installer responsible for causing the conflict shall make the necessary changes in his work to correct the condition at no cost to the contract. Notify Architect / Engineer of such conflicts. Contractor is responsible for reimbursing the Architect / Engineer for his time and cost in assisting in the resolution of such issues.

C. Furnish to other trades all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. All work outside buildings shall be coordinated with site utilities contractor. Verify grade and invert elevations before proceeding with any work.

E. Local authorities may require that field changes that deviate from the contract documents be submitted for their review via signed and sealed documents that indicate design professional concurrence with said changes. Contractor shall notify the design professional of such changes before proceeding with work and provide justification for the change. Failure to follow this procedure will make the contractor responsible for all costs associated with the change including design professional's time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

3.03 EXCAVATION AND BACKFILL

A. Provide the excavation and backfill necessary for the installation of the underground piping work specified under this Section and shown on the plans. Include work incidental to excavation such as cutting, shoring, pumping, sheeting, piling, etc.

B. Before proceeding with excavation, review civil engineering and site survey drawings for location of utilities, grades, invert elevations and any other information in the area affected by the work under this section. Comply with State and Local environmental regulations and protect surrounding areas.

C. All excavation shall be unclassified and shall include the removal of all materials encountered. Cutting and removal of concrete slabs is included.

D. Trenches shall be of sufficient depth to allow adequate cover over piping. Provide minimum of two feet (2') cover under non-traffic areas and three feet (3') cover under traffic areas.

E. When minimum cover under traffic areas cannot be maintained, pipes must be encased in concrete.

F. In traffic areas that are under the jurisdiction of a city, county or state, excavation and backfill shall be done to their standards. Obtain required permits, pay fees and coordinate inspections by authorities having jurisdiction.

G. Bottoms of trenches shall be instrument graded in direction of flow. Pipes shall have solid bearing on undisturbed earth. Concrete or other approved supports shall be provided for all piping installed in filled ground.

H. Where trenches run under building footings or come within a 2 to 1 slope from the bottom of such

footings, backfill with a lean concrete mix to a point at or above the bottom of such footing. Review with and obtain approval of project Structural Engineer before proceeding with work.

I. Where trenches must be excavated in rock, a 6" layer of crushed stone or gravel shall be placed in trench to support pipes. Trenches shall be of sufficient depth to install cushioning layer.

J. Backfill shall be made with clean earth free of rocks, debris or other foreign material. Deposit backfill in uniform layers not over 6" thick. Tamp each layer before applying next one. Cinders in backfill in any amount are prohibited. Complete backfill shall conform to surrounding ground and finish grade.

K. Excavated materials remaining after the backfilling operation is completed shall be either deposited on the site or removed by the contractor as directed by the Architect.

L. Repair all streets, sidewalks, pavements, lawns, curbs and other finished surfaces damaged by excavation and restore to original condition and to the Owner's satisfaction.

3.04 ACCESS DOORS AND/OR PANELS

A. Each installer shall be responsible for coordinating with the project superintendent the number, size and location of the access doors/panels required by his work. When field provisions allow it, one single, larger door/panel shall be used when several items furnished by different trades are located in the same area.

B. Doors/panels that are found to be of inadequate size to allow proper removal, access to service equipment and other concealed devices shall be replaced with larger doors/panels at no cost to the contract.

C. Doors/panels that are found to be improperly located with relation to the equipment or concealed devices they serve, shall be relocated at no cost to the contract. Climbing above ceilings to reach concealed devices or equipment is not an acceptable option.

3.05 FIRE STOPPING

A. Pipe penetrations of fire rated walls and/or floors shall be sealed to maintain integrity of construction and prevent the passage of flame and hot gases.

B. All products, materials and methods of installation shall be UL labeled and approved and meet NFPA 251 requirements.

C. Fire rated construction assemblies are specified under Architectural Section of the Contract Documents.

3.06 CUTTING AND PATCHING

A. The cutting and patching of walls, partitions, ceilings and floors necessary for reception of work indicated in this Section of the contract documents or caused by the installer's failure to provide or properly locate sleeves, forms and inserts, or caused by incorrect location of the work shall be the installer's responsibility.

B. When it becomes necessary to cut finished materials, submit for the Architect approval, drawings showing the work required and obtain approval before doing such cutting.

C. Chases and openings in walls/roofs and floors may be provided under the work of other sections. Furnish exact dimensions and locations of these openings to suit the apparatus to be used before such walls are built.

D. No structural members shall be cut without the previous written approval of the Structural Engineer and the Architect.

3.07 SEQUENCING AND SCHEDULING OF WORK

A. All work to be performed under this contract shall be carried out in accordance with an approved construction sequence and schedule.

3.08 STORAGE OF EQUIPMENT AND MATERIALS

A. All equipment and materials stored on site shall be located in a dry location where they are properly protected from the weather, injury or deterioration. Materials shall not be stored in contact with the ground or floor.

B. Do not remove manufacturer's packing materials until ready to install.

C. Materials showing signs of corrosion or damage due to improper handling or storage shall be replaced at no cost to the contract.

D. Provide continuous protection for all equipment and materials already installed.

3.09 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before 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.

3.10 TESTS

A. Include all tests specified and/or required under applicable codes, laws, rules and regulations. Additional tests shall also be performed as indicated herein and other sections of the specifications.

B. Notify the Architect / Engineer at least 72 hours in advance of all tests. Furnish all necessary instruments, gauges and other equipment required for tests. Make preliminary tests prior to giving notice of final tests.

C. All parts of the work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition.

D. Correct defects disclosed by these tests without any additional cost to the Owner. Repeat tests on repaired or replaced work.

E. Maintain a log of all tests being conducted and have it available for review by the Architect / Engineer. Log to indicate date, type of tests, duration, and defects noted and when corrected.

3.11 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code, owner standards and equipment manufacturer for the proper maintenance or removal of equipment. Most stringent requirements shall apply.

B. Coordinate with other trades so no conduit, pipes, ceiling hangers and / or other equipment, etc. interfere with the required clearances.

C. Notify project superintendent when work by other trades needs to be relocated in order to maintain required clearances. Notify Architect / Engineer if provisions persist and are not corrected by the responsible trade.

END OF SECTION – 22 00 00

SECTION 22 08 00 – PAINTING AND IDENTIFICATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions, Supplementary General Conditions Division 01 and Section 22000 are part of this Section.

B. Examine other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE OF WORK

A. All piping and equipment provided under Division 22, which is exposed to view, to the weather and/or as indicated on the drawings and specifications shall be painted unless otherwise noted.

B. All galvanized metals that are to be field painted shall be properly prepared to accept specified paint. If paint peels, retreat and repaint at no cost to the contract.

C. All piping and equipment shall be labeled and/or identified as herein specified.

D. Field finish painting may be specified in another section of the Specifications. This installer shall leave his work clean and free from oil, dirt and grease. Apply primer ready to field painting, where required.

E. All unfinished ironwork installed under Division 22, which is exposed to view within the building or exposed to the weather, shall be painted as herein specified.

F. Provide permanent identification on equipment and piping systems. Coordinate with City of Tampa Wastewater Department the numbering sequence of equipment. City of Tampa Standards take precedence over these specifications.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 00 00 Plumbing General Requirements
22 02 00 Operations and Maintenance Manuals
22 10 00 Plumbing
22 20 00 Piping General
22 21 00 Piping

B. Refer to Division 09 – Finishes of the Specifications for additional information regarding paints, finishes, preparation, etc.

1.04 SHOP DRAWINGS

A. Submit catalog data, color samples, and other requested data for following in accordance with the requirements of Division 01 and Section 22 00 00 of the Specifications.

1. Paints

2. Treatment of galvanized metals

3. Markers

4. Labels

PART 2 - PRODUCTS

2.01 PAINT

A. Rust inhibitor paint shall be red chromate base made up in a synthetic resin vehicle.

B. Finish paint where specified shall meet the requirements of the Paint Section of the Specifications.

2.02 PAINT SCHEDULE

A. Painting schedule for equipment and piping:

Equipment and system components	Factory applied manufacturer's standard color and finish.

2.03 PIPING IDENTIFICATION

A. All plumbing piping, insulated and uninsulated shall be identified as herein specified.

B. Identify piping systems by either stenciling the name of the service or applying plastic pipe markers similar to Set Mark as manufactured by Seton.

C. Arrows indicating direction of flow shall be shown next to the pipe identification name.

D. ANSI Standards recommend that the size of the identification letters and the length of the color field be as follows:

Outside Diameter Of Pipe or Covering (in.)	Length of Color Field (in.)	Size of Letters (in.)
3/4 to 1-1/4 (19 to 32 mm)	8 (200 mm)	1/2 (13 mm)
1-1/2 to 2 (28 to 51 mm)	8 (200 mm)	3/4 (19 mm)

E. Install markings after painting or insulation of pipes has been completed.

PART 3 - EXECUTION

3.01 GENERAL

A. Ironwork installed under this Division of the Specifications exposed to view within the building, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as pipes, pipe hangers, structural supports, supports for equipment, black iron partitions or casings, tanks, etc., shall be painted with one (1) coat of rust inhibiting paint. Finish paint may be specified in another section of the contract documents, color as selected by Owner.

B. Ironwork installed under this Division of the Specifications which is exposed to the weather, and not otherwise specified to be galvanized, stainless steel, copper or chrome

plated, such as pipe supports, vent pipes, etc., shall be painted with two (2) coats of rust inhibiting paint and one (1) coat of an acrylic base UV and mold resistant white paint. The Owner or the Architect / Engineer may select a different color of the finish paint.

C. All field finish painting to be as directed by the Architect and specified in another section of these specifications.

D. Painted galvanized metals from which paint peels shall be stripped, retreated and repainted at no cost to the contract.

3.02 PIPE AND VALVE IDENTIFICATION

A. On exposed piping apply identification lettering and flow arrows on 30-foot centers of straight runs, at valve locations, at points where piping enters and leaves a partition, wall or ceiling.

B. On concealed piping installed above non-removable ceilings apply markers on pipes near a valve or other devices that can be reached by means of access doors or panels. Identification markings shall be clearly visible from access doors and/or panels.

C. On concealed pipes installed above removable ceilings apply markers in the manner described for exposed piping.

D. Apply markers at exit and entrance point to each vessel, tank or piece of equipment.

E. Provide approved ceiling tile markers in areas with removable ceiling to indicate location of valves and/or other devices, concealed above ceiling.

3.03 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include but not limited to: plumbing equipment, control cabinets, starters and power disconnects, and others as directed by Architect / Engineer.

B. Identification numbers and names shown on the contract documents are for reference only. They shall be changed to meet owner's numbering sequence and standards. Contractor shall request a copy of such standards before proceeding with work under this Section.

C. Contractor shall mark record construction documents to reflect the labeling and numbering sequences when different from contract documents.

3.04 CONCEALED EQUIPMENT IDENTIFICATION

A. Provide approved ceiling tile markers in areas with removable ceilings to indicate location of valves and/or other devices, concealed above ceiling.

END OF SECTION – 22 08 00

SECTION 22 10 00 – PLUMBING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions Division 01 and Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Section of the specifications.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure the steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE

A. Provide plumbing system(s) as shown on drawings and listed herein. Include all accessories required for a fully functional, safe and complete installation ready for use.

B. Provide following plumbing system:

1. Storm water system including roof drains, area drains, and others as shown. Make final connection to site storm water system five feet (5') outside building or as shown on drawings. Coordinate work outside building with Civil Engineering Site Utility Plans and Site Utilities Contractor.

2. Sanitary sewer system waste and vent lines including connection to all fixtures. Make final connection to site sanitary sewer system five feet (5') outside building or as shown on drawings. Coordinate work outside building with Civil Engineering Site Utility Plans.

3. Domestic cold-water supply including connection to all fixtures and other systems or equipment indicated on contract documents. Make final connection to site water main ± five feet (5') outside building or as shown on drawings. Coordinate work outside building with Civil Engineering Site Utility Plans and Site Utilities Contractor.

4. Domestic electric hot water heaters and piped hot water supply to indicated fixtures. Include mixing valves or dedicated water heaters to supply different water temperatures as shown in the contract documents.

5. Plumbing fixtures as scheduled. Refer to Architectural plans for final number, type and location of fixtures.

6. Oil and sand interceptor including all indicated piping and floor drains. Make final connection to building sanitary disposal system.

7. Insulate indicated piping systems. Refer to Specifications Section 22 51 00.

8. Provide kitchen grease waste collection system. Provide grease trap or interceptor as indicated on contract documents.

9. Provide electric tank/heater system with recirculating pumps.

10. Provide vacuum breakers and backflow prevention devices as required by code for any system or equipment installed under this Division 22 of the Specifications that is directly connected to a potable water supply. Coordinate with other

trades.

11. Provide water hammer arrestors to protect hot and cold-water piping systems.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 02 00 Operations and Maintenance Manuals
22 08 00 Painting and Identification
22 20 00 Piping General
22 21 00 Piping
22 51 00 Insulation

1.04 CODES AND STANDARDS

A. 2017 Florida Building Code, Plumbing.

B. Design and installation standards:

Hydraulics Institute Standards
Florida Accessibility Code 2012

C. For additional codes and standards, refer to Specifications Section 22 00 00.

1.05 QUALITY ASSURANCE

A. The quality and weight of the materials furnished and installed in this project shall comply with the requirements and specifications of the appropriate standards of the American Society for Testing and Materials (ASTM) and the latest requirements of the Florida State Board of Health Sanitary Code.

B. To the extend possible, American made products shall be used.

C. For additional Quality Assurance requirements refer to Specifications Division 01 and Section 22 00 00.

1.06 SUBMITTAL DATA

A. Submit catalog data and/or shop drawings for the following items specified herein and shown on the contract documents.

Plumbing fixtures and accessories.
Electric water coolers.
Floor drains.
Cleanouts.
Hose bibbs.
Manufacturer's guarantees / warranties for electric water coolers and heaters.
Pipe Clamps.
Vacuum breakers.
Backflow preventors.
Grease interceptor.
Sand / oil interceptor.
Water hammer arrestors.

B. For additional submission requirements refer to Section 22 00 00

PART 2 - PRODUCTS

2.01 GENERAL

A. Pipes, fittings, valves, hangers, supports and installations procedures shall be provided as

herein specified.

B. All materials shall be new, of quality as specified and when required be clearly labeled and/or stamped.

2.02 PIPING

A. Materials for following piping systems are specified under Specifications Sections 22 20 00, Piping General and 22 21 00, Piping.

1. Domestic hot and cold water.

2. Sanitary (soil, waste and vent).

2.03 INSULATION

A. Insulation materials for following piping systems are specified under Specifications Section 22 51 00, Insulation.

1. Domestic hot water pipes

B. Insulate all piping below ADA compliant lavatories and sinks including P-traps with Handi Lav-Guard Insulation Kit No. 102 made by Truebro Co. or McGuire Pro-Wrap. Velcro and twist tie joints are not acceptable. Refer to Architectural Drawings for location of ADA compliant fixtures.

2.04 PLUMBING FIXTURES

A. Provide plumbing fixtures as scheduled on the drawings. Equip each fixture with a water-sealing trap. Install a tight-fitting chromium plated escutcheon plate at each pipe penetration through cabinet walls, floors, walls and ceilings. Escutcheon shall completely seal opening around pipe.

B. Each individual fixture and piece of equipment shall have a shutoff valve in each water supply, which shall permit each fixture and piece of equipment to be shut off without interfering with the water supply of other fixtures or equipment.

C. Contractor shall verify location, type, number and installation of plumbing fixtures as shown on the latest Architectural Drawings issued at bid time including all addendums. Architectural drawings take precedence over plumbing documents. Notify Architect / Engineer of any noted differences.

D. Contractor to verify clearances needed for fixtures being installed in casework, to ensure a proper installation and service clearances. Notify Architect / Engineer of any conflicts.

E. After wall hung plumbing fixtures are set, the space between the fixture and the wall shall be sealed. Use Tub-Tite caulk as manufactured by American Fluoresite Co., or approved equal. Seal shall not retain water, dirt etc.

F. Fixtures shall be protected from damage during construction, and shall be thoroughly cleaned prior to final acceptance.

G. Porcelain or vitreous china fixtures shall be clean, smooth and bright. They shall be warranted not to craze, discolor or scale.

H. Fittings and piping shall be brass and when exposed, shall be polished chrome-plated. Protect against damage from cleaning fluids used by tile setter.

I. Replace fixtures and piping damaged during construction.

J. Acceptable manufacturers are:

1. Plumbing Fixtures (water closets, lavatories, urinals): American Standard,

Briggs, Eljer, Gerber, Kohler, Sloan or Toto.

2. Faucets: Delta, Gerber and T&S Brass.

3. Flush Valves (water closet and urinal): Delaney, Hydrotek, Sloan, Toto or Zurn-Aqua Flush. Flush valves shall be listed by plumbing fixture manufacturer as being compatible with their product.

4. Security / Specialty fixtures: Acorn, Bradley and Encon

5. Showers: Delta, Lawler, Powers or Symmons.

6. Sinks – Stainless Steel: Elkay

7. Water Coolers: Elkay, Halsey or Taylor

8. Mop Sinks: Fiat

9. Water Heaters: A. O. Smith, Lockinvar, Rheem, Rudd, State

10. In all cases, listed manufacturers must provide proof that their product is equal or better than the Basis of Design.

K. Plumbing fixtures and water supply devices shall be of the water saving type as required by the State of Florida Model Energy Conservation Code 2010. Flow restrictor devices shall be factory installed. Submit information with shop drawings.

L. All wall-mounted fixtures shall be provided with floor-mounted carriers. Carriers for lavatories shall have concealed arms. Verify adequacy of wall or chase space with project superintendent before installing carriers. Notify Architect / Engineer of any conflicts.

M. New toilets to be floor-mounted elongated bowl low water consumption fixture. Toilets to meet or exceed ASME A112.19.2M and 19.6M specifications for vitreous china fixtures. This includes flush performance, ball pass diameter, trap seal depth and all dimensions. The fixtures must be American made in order to fully meet these specifications.

N. When scheduled and indicated on plans, provide electrically actuated hands free flush valves and faucets complete with sensors. Coordinate power requirements with Division 26 installer.

2.05 FLOOR DRAINS

A. Provide floor drains as scheduled and at locations shown on the drawings.

B. Provide floor drains in all toilet rooms.

C. Provide trap primer connection on all floor drains and/or hub drains.

D. Provide flashing clamp devices where required by floor construction.

E. Acceptable floor drain manufacturers are: Josam, J. R. Smith, Zurn or Wade.

2.06 TRAP PRIMERS

A. In restrooms, trap primers shall be connected to nearest lavatory / sink P-trap waste pipe. Traps equal to J.R. Smith No. 2698

B. When a waste pipe trap primer cannot be used, install Precision Products Inc. or equal trap primers.

2.07 HOSE BIBBS

A. Provide hose bibbs at locations indicated on contract documents. Hose bibbs shall be brass construction, with brass or chrome plated finish as required by location or as indicated on contract documents.

B. Unless otherwise noted on contract documents, hose bibbs shall be 3/4-inch size, hose end and with vacuum breaker - backflow preventor attachment and loose key feature.

C. For outdoor applications, hose bibbs shall be in a box with lockable door similar to Woodford Model B24 or Freezeless Model 14 Series as required by local weather provisions.

D. For indoor applications hose bibbs shall be Woodford Model 24P polished chrome finish.

E. Provide hose bibb with vacuum breaker loose tee key feature and shut off valve in water supply in all toilets rooms with floor drains (see floor plans for locations).

2.08 CLEANOUTS

A. Cleanouts for soil and waste pipes shall be provided at the bottom of each stack and at each change of direction. In interior horizontal runs install cleanouts at intervals not exceeding 50 feet on pipes up to four inches (4") in size and at intervals not exceeding 100 feet on larger size pipes.

B. Interior cleanouts shall be Zurn No. Z-1450-7 caulked into the lines and, where they occur in walls or finished areas, shall be provided with nickel-bronze tops or access plates; Zurn No. Z-1460-9. Provide Zurn No. Z-1415-2 with nickel bronze tops in all finished floors.

C. All interior cleanouts shall be the same size as the pipe served up to four inches (4") size and four inches (4") for all larger lines.

D. Refer to drawings for detail(s).

2.09 OIL SAND INTERCEPTOR (OIL/WATER SEPARATOR)

A. Provide where shown on Contract Document oil interceptor(s) of the size and capacity as scheduled.

B. Interceptor to be cast iron or 316 stainless steel constructions with acid resisting rubber base coating inside and outside. Provide adjustable gravity draw-off, removable baffle(s) and sediment bucket, and flow control fitting, all sized for the indicated peak flow rate. Provide retention tank of the indicated capacity connected to gravity draw-off line with vent piping and suction connection to ground surface per manufacturer's recommendation.

C. Below grade piping for tank vents and gravity draw-off line shall be Schedule 80 PVC with threaded connections and sized to match interceptor connections.

2.10 WATER COOLERS/DRINKING FOUNTAINS

A. Fixtures used for the dispensing of potable water shall be provided at the locations shown on drawings and as scheduled.

B. Fixtures shall meet current accessibility standards.

C. Wall hung fixtures shall be provided with floor carriers anchored to the floor.

D. Coordinate with Division 26 installer the electrical requirements of the equipment.

PART 3 - EXECUTION

3.01 EQUIPMENT AND PLUMBING FIXTURES

A. Install all the equipment and plumbing fixtures in compliance with manufacturer's recommendations and as required to meet applicable codes.

B. Set all equipment properly leveled. Do not use the flanged joints as a method of correcting misalignments.

C. All pipes, etc. shall be tightly secured to and anchored to walls. Provide additional stiffening members on stud walls as required. Insulated pipes, hangers and supports shall have allowance for the continued, uninterrupted installation of insulation.

D. All wall-hung fixtures shall be provided with floor carriers anchored to floors. Lavatory carriers shall include concealed arms.

E. For all ADA compliant fixtures, mounting heights shall comply with Code requirements.

F. Coordinate with Division 26 installer the location of power supply outlets for hands free flush valves and faucets.

3.02 WATER COOLERS/DRINKING FOUNTAINS

A. Fixtures used for the dispensing of potable water shall be certified and labeled to indicate they are lead free. All labels shall be permanent and visible.

B. Wall hung units shall be installed free of movement and/or vibration. Provide floor carriers.

3.03 EQUIPMENT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacturer used as the basis of design. For all other listed manufacturers, shop drawing data shall indicate equal or better performance characteristics as the specified equipment.

3.04 HOSE BIBBS

A. Provide a shut off valve in the water supply line to each hose bibb. Valve shall be accessible. Refer Specifications Section 22 00 00 for access door / panel requirements.

3.05 TRAP PRIMERS

A. Trap primers shall be accessible for service. Refer to Specifications Section 22 00 00 for access door / panel requirements.

END OF SECTION – 22 10 00

SECTION 22 20 00 - PIPING GENERAL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions Division 01 and Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Section of the specifications.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure the steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE OF WORK

A. This Section provides the general requirements and specifications for the piping materials and system components required for complete and fully operational plumbing systems.

B. Plumbing installer shall provide for each indicated piping system all the required labor, materials, transportation, permits, certifications, shop drawings, equipment, apparatus, tools, temporary construction and all other items needed for complete systems which are safe and ready for operation.

C. Provide all required excavation and backfill. Include cutting of concrete slabs.

D. Plumbing Piping Systems:

1. Sanitary waste and vent.

2. Domestic hot and cold water.

3. Grease, sand and oil collection systems, including traps, as shown on the contract documents.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included as part of this Section. Installer shall review them for coordination with additional items of work related to the work under this Section.

22 00 00 Plumbing General Requirements
22 02 00 Operations and Maintenance Manuals
22 08 00 Painting and Identification
22 10 00 Plumbing – General
22 21 00 Piping
22 51 00 Insulation

1.04 QUALITY ASSURANCE

A. For Quality Assurance requirements refer to Specifications Division 01 and Section 22 00 00.

1.05 SHOP DRAWINGS

A. Submit shop drawings for the following items as specified in this Section and shown on

the contract documents.

Piping materials.
Insulation protection shields.
Dielectric fittings (unions – flanges).
Inserts.
Pipe hangers and supports.
Air vents.
Pressure gages.
Thermometers.
Thermometer wells.

B. For additional submission requirements refer to Specifications Division 01 and Section 22 00 00.

PART 2 - PRODUCTS

2.00 PIPING MATERIALS

A. Brass pipes shall be seamless drawn semi-annealed pipe containing not less than 85% copper and shall conform to ASA H27. 1.

B. Galvanized steel pipes shall be Schedule 40 black steel with galvanized malleable iron threaded fittings.

C. Copper pipes:

1. Copper pipes above ground shall be type 'L' hard drawn tubing.

2. Copper pipes below ground shall be type 'K' hard drawn tubing.

3. Copper piping 3/8 inch outside diameter and smaller, may be soft drawn.

D. PVC pipes shall be high impact Schedule 40 polyvinyl chloride Type I, ASTM E1785. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications.

E. CPVC pipe: (when approved by owner submit for preapproval)

1. All CPVC Schedule 80 pipe shall be manufactured from a Type IV, Grade 1 Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D 1784.

2. The pipe shall be manufactured in strict compliance to ASTM F441, consistently meeting the Quality Assurance test requirements of this standard with regard to material, workmanship, burst pressure, flattening and extrusion quality. The pipe shall be produced in the USA using domestic materials, by an ISO 9001 certified manufacturer and shall be stored indoors after production, at the manufacturing site, until shipped from factory.

3. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications.

4. Acceptable manufacturers are: Flowguard Gold and Harvel Plastics, Inc.

2.01 VALVES

A. Furnish and install valves specified herein; shown on drawings and necessary for the control and service of all piping systems and equipment. All valves shall be top quality, of approved manufacturer.

B. Each valve shall have the manufacturer's name or brand, the figure or list number and the guaranteed working pressure cast on the body and cast or stamped on the bonnet.

C. Except for special applications, all valves shall be the product of one manufacturer.

D. Acceptable valves manufacturers are: Jenkins, Walworth, Crane or Centerline. Where figure numbers of one manufacturer are indicated equivalent figure numbers of acceptable manufacturers can be substituted. Provide table of equivalence with shop drawings submittal.

E. All valves installed in insulated pipe systems shall have shaft extensions to facilitate insulation installation.

F. Valves shall be accessible and installed with proper clearances for service and operation and shall be tight at the specified test pressure. Provide service access to valves located in concealed spaces. Refer to Specifications Section 22 00 00 – Access Doors and Panels.

2.02 PIPING AND VALVE IDENTIFICATION

A. Refer to Specifications Section 22 08 00.

2.03 PIPE HANGERS AND SUPPORTS

A. Support piping inside the building directly from the building structure by means of adjustable wrought iron clevis type hangers. (Generally, we prefer 316ss hardware). Hangers similar to Grinnell Company Fig. 65 shall be used for pipe sizes 1-1/2 inches and smaller. Use Grinnell Fig. 260 for pipe sizes 2 inches and larger. For copper tube use Grinnell Fig. No. CT-269.

B. Hangers, supports, anchor and clips for copper piping shall be copper clad. When copper piping is carried on a steel trapeze hanger(s) with other piping, permanent isolation material such as Armaflex insulation shall be used to protect the copper from contact with those metals.

C. Hangers for insulated pipes shall be oversized to accommodate the insulation thickness.

D. When using threaded rods, double nuts shall be installed at each rod.

E. Maximum spacing between pipe supports shall be as follows:

NOMINAL PIPE SIZE (INCH)	ROD SIZE (INCH)	MAX SPAN (FEET)	MAX LOAD PER HANGER (LBS)
3/4 & UNDER	3/8	5	150
1	3/8	7	250
1-1/4	3/8	7	250
1-1/2	3/8	9	250
2	3/8	10	610
2-1/2	½	11	1130
3	½	12	1130
4	5/8	14	1430

NOMINAL PIPE SIZE (INCH)	ROD SIZE (INCH)	MAX SPAN (FEET)	MAX LOAD PER HANGER (LBS)

F. Additional hanger supports shall be provided at each valve, fitting, change of direction, connections to equipment and dead ends of pipes longer than two feet.

G. Horizontal runs of PVC and CPVC pipes shall be provided with supports every four (4) feet.

2.04 INSULATION PROTECTION SHIELDS

A. Provide shields for all pipe hangers supporting insulated pipe. Shields shall be galvanized steel with flared ends.

B. Shields shall cover not less than the bottom 180º of the insulation and meet the minimum requirements listed below:

1/4 to 3-inch pipe 18-gauge x 12 inches' long

2.05 DIELECTRIC FITTINGS

A. Provide dielectric unions or isolation flanges at all connections between copper and ferrous pipe and equipment.

B. Dielectric threaded union shall be as manufactured by EPCO Sales Company and Capitol.

C. When using flanged connections, a dielectric gasket shall be provided between flanges and plastic sleeves between bolts and flanges.

2.06 THERMOMETERS

A. Thermometers shall be of the separable socket, adjustable angle type, and minimum nine (9) inches long.

B. Thermometers shall be cast aluminum construction with metallic enamel finish and clear acrylic plastic window lens. Stem shall be brass and all fitting sand wells shall be brass. Wells shall have extension neck to extend through pipe insulation when installed on insulated piping system.

C. Filling fluid shall be red appearing mercury easily readable against a white background and temperatures shall be noted in black embossed figures.

D. Stem length shall be in accordance with companion thermometer well but not less than 3-1/2" long.

E. Install so that at least 75% of stem length is in the moving fluid stream. This may require increased length over the 3-1/2" specified above.

F. Range of thermometer shall be selected so that normal operating temperature is at approximate center of scale and highest possible temperature does not exceed full scale.

G. Acceptable manufacturers are: Dwyer, Trerice and Weiss.

2.07 PRESSURE GAGES

A. Pressure gages shall be minimum 4-1/2" diameter, cast aluminum structure with black finish. Clean glass window shall be mounted on a chrome plated closed type ring.

B. Gages shall be easily readable and have a white dial with black embossed figures, micrometer-type pointer with black finish.

C. Sensing element shall be a Bourdon type tube, silver brazed to tip, 1/4" brass unit. Movement shall be rotary-type, stainless steel with Delrin sector and phosphor bronze bushing. Accuracy shall be 1/2 of one percent of scale range.

D. Scale range upper limit shall be not less than 150%, and not greater than 200% of system operating pressure.

E. Acceptable manufacturers are: Weiss, Trerice, Dwyer, and Winters 300 series.

2.08 PVC-DWV PIPE AND FITTINGS

A. Pipe shall be Schedule 80 PVC, extruded from Type 1, Grade 1; Polyvinyl chlorine compound shall meet ASTM D-2665-68 Specifications.

B. Fittings shall be PVC Type 1, Grade 1.

C. Each section of pipe shall be continuously and permanently marked with the manufacturer's name or trademark, nominal pipe size, material, schedule or pressure rating at 73.4 degrees F. and quality control number. National Sanitation Foundation Symbol (NSF) must appear on all pipe and fittings.

D. All fittings shall be of molded type. All fittings for Schedule 80 pipe shall be Schedule 80.

E. Solvent cement used must be manufactured by the manufacturer of the fittings and consist of at least 15% by weight of the same PVC compound used in making the fitting.

F. All joints and connections shall be prepared, assembled and installed in complete conformance with the pipe manufacturer's recommendations. Joints or connections that can be twisted or parted by hand shall be cause for rejection of the complete PVC piping system or section thereof.

PART 3 - EXECUTION

3.00 PIPE AND VALVE IDENTIFICATION

A. Refer to Specifications Section 22 08 00 Painting and Identification.

3.01 EXCAVATION AND BACKFILL

A. Refer to specifications Section 22 00 00

3.02 PIPE DISTRIBUTION

A. Run all pipe parallel with and as close as possible to the nearest structural member. Run piping straight, plumb and grade in direction indicated on drawings. Set all piping true to line and grade.

B. Piping shall be laid out and installed with sufficient clearances to permit proper application of insulation. Relocate piping if a neat insulation job cannot be obtained.

C. In laying out the work, consult the Architect where there may be any question concerning routing of pipe where it may affect the final appearance of the work. Coordinate work with other trades working in the area.

D. Coordinate work with other trades working in the area. Failure to coordinate routing and elevation of pipes with ductwork installer and other trades may require the relocation of piping installed under this Section at no cost to the contract.

E. Pipes shall not be hung from other pipes, ducts or ceiling grid. They shall be supported directly from the building structure. In laying out the work, the contractor shall provide for proper access to valves, control devices and any other items at a later date. Pipes shall be so routed as to make access possible.

F. Copper pipes concealed in masonry partitions or supported against masonry shall be protected from contact with masonry by providing continuous cover of either two coats of asphalt-based paint, closed cell rubber insulation or a plastic sleeve with a minimum 0.032 inches wall thickness. Same care shall be exercised to prevent any contact of copper pipe with steel reinforcing, metal studs and other dissimilar metals.

G. Provide additional hangers as necessary for the proper support of valves, strainers, in-line pumps and any related equipment.

H. The equipment installed under this Section shall not be used to support the weight of pipes and accessories. Provide additional supports to the floor or building structure to relieve such weight.

I. Plumbing systems installer shall be familiar with building structure and provide additional steel members when necessary for the proper support of piping or any related equipment.

J. No welding or cutting of building framing and support members shall be permitted without the written approval of the Structural Engineer.

K. All supports shall be from the building structure. On concrete structures, drill and set in place expansion anchors for pipe hangers. The use of gunpowder driven impact anchors is prohibited.

L. Set all equipment properly leveled and aligned with associated piping. Do not use the flexible joint connectors as a method of correcting misalignments.

M. Provide sway control hangers on pipe runs when there is a change of direction larger than 45º on the horizontal plane.

3.03 VALVE CONTROL

A. Valves shall be installed where shown on plans, where necessary to facilitate service of sections of the piping system(s) and at the inlet and outlet connections to all fixtures and equipment.

B. Water lines to rooms with multiple plumbing fixtures, such as restrooms, kitchens, janitor's rooms shall be provided with isolation valves. Locate valves above corridors with accessible ceilings, otherwise hinged ceiling access panels shall be provided as per Specifications Section 22 00 00.

C. These valves are in addition to standard shut off service valves located at each fixture.

D. Water lines for hose bibbs shall have dedicated shut off valves.

E. All domestic water shut off valves shall be full port ball valve type.

3.04 SLEEVES

A. Provide pipe sleeves where pipes pass through masonry walls, roofs and floors. Sleeves shall be schedule 40 PVC, except penetrations of fire rated walls or partitions where schedule 40 steel sleeves shall be used. Sleeves installed in floors shall extend 1/2 inch above finished floors. Exceptions are sleeves in mechanical rooms and rooms with waterproof membrane, which shall extend 2 inches above finished floor.

B. Sleeves shall be sized to allow a minimum of clearance between pipe or pipe insulation and sleeve. Sleeve installed for piping subject to movement shall not restrict movement.

C. The space between sleeves and pipe shall be packed with oakum and sealed with a UL

listed waterproof sealant. Also refer to the Architectural Section of the Contract Documents for other approved materials and methods.

D. Plastic sleeves shall be installed at all copper piping penetrations of metal studs. Sleeves shall be Greenlee type # 712C or approved equal.

E. Where piping must penetrate existing slab, beams or masonry wall, contractor shall core bore a hole of the minimum size required to allow the pipe sleeve to be installed. The area between the hole and pipe sleeve shall be sealed with a UL listed, non-hardening, caulk. All core drilling shall be done under the direction of the structural engineer at indicated locations.

F. Pipe penetrations of fire or smoke rated walls and floors shall be sealed to maintain the integrity of construction. Refer to Paragraph "Fire stopping" in Section 22 00 00 Plumbing – General. When applicable, requirements of the fire assembly UL listing shown on the Architectural plans must be followed and supersede any other requirements of this Section.

G. Steel pipe sleeves in contact with concrete or masonry shall be protected with two (2) coats of asphalt-based paint, evenly applied over the pipes before they are set in place.

3.05 PIPE JOINTS

A. Clean all pipe and fittings before jointing. Ream the ends of pipe having screwed, welded or soldered joints to remove all burrs after cutting.

B. After threading and/or cutting, swab out the pipe to remove all foreign matter.

C. SCREWED PIPE: All threads must be clean and sharp. Pull joints up tight using an approved joint compound applied to male threads only, except as otherwise specified. Make screwed joints in piping containing hydrocarbons with litharge and glycerin in lieu of red lead joint compound.

D. SOLDERED JOINTS: Make joints as recommended by the solder manufacturer, using solder as indicated.

E. FLARED JOINTS: Make joints as recommended by the fitting manufacturer.

3.06 CONNECTIONS TO EQUIPMENT

A. On screwed and soldered piping systems provide unions at each service valve and at each pipe connection to equipment.

3.07 PENETRATION OF WALLS, PARTITIONS AND DECKS

A. Work under this section includes thorough and complete caulking on both sides of all penetrations through walls, partitions and roof decks whether such penetration occurs above or below ceiling lines.

B. Coordinate penetrations of precast concrete elements with the manufacturer. The installer of the precast work shall do penetrations and patching.

C. Penetration of masonry work shall be done by and patched by skilled masons.

D. All penetrations shall be cut in a manner that the hole is uniformly 1/8 inch clear all around the item penetrating it (including insulation).

E. All caulking work shall be done in strict compliance with requirements of Section Caulking and Sealants.

F. Any pipe penetration of a wall, partition, floor or roof deck, which vibrates, shall be treated so no vibration is transmitted at point of penetration.

3.08 TEST OF PIPING SYSTEMS

A. The objective of these tests is to prove the adequacy, quality, and safety of all piping systems and assure that operating pressures can be safely maintained.

B. All leaks detected during these tests shall be promptly corrected and piping systems shall then be retested.

C. Furnish necessary instruments, test equipment, water, power, fuel and personnel required for tests, and make provisions for removal of test equipment and draining of pipes after tests have been completed.

D. Contractor shall notify the Architect at least 72 hours in advance of any test that will be ready for observation by the Architect or his designated representative. Failure to comply with this request will not allow the Architect or his representative to properly schedule his visit to the site and the test must remain on until the field observation can be accomplished.

E. In the event the Architect or his designated representative is unable to observe the piping under test, the contractor shall proceed as follows:

Observe all tests and furnish a letter for each test to the Architect within 5 days of the test completion certifying that the test was performed. Include the following information.

1. Type of system tested

2. Date of test

3. Test pressure

4. Medium used for test (water, air, etc.)

5. Exact location and extent of system tested.

6. Duration of test.

F. Tests may be performed on partial sections of the system only if the section must be concealed to permit normal progress of the project. The installer shall overlap test sections by one joint for partial tests to insure that all joints are subjected to test. Upon completion of the system, the entire system shall be given a final test and be certified by the contractor.

G. All tests shall be performed and certified by the contractor prior to any painting, insulating or concealment of the piping.

H. Systems shall be tested as described herein except where a local or other applicable code has more stringent requirements, which shall then be followed. Other systems shall be tested as indicated on applicable sections of these specifications.

END OF SECTION – 22 20 00

SECTION 22 21 00 – PIPING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions Division 01 and Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Section of the specifications.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure the steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE

A. Plumbing installer shall provide for each indicated piping system all necessary and required labor, transportation, permits, certifications, shop drawings, etc.

1. Domestic hot and cold water piping

2. Sanitary waste, drain and vent piping. When indicated provide air admittance valves.

3. Grease, sand and oil contaminated waste piping.

B. Furnish and install all necessary required materials, equipment, apparatus, tools, temporary construction and all other items needed for a complete system, which is safe and ready for operation.

C. Do all required excavation and backfill.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 00 00 Plumbing General Requirements
22 02 00 Operations and Maintenance Manuals
22 08 00 Painting and Identification
22 10 00 Plumbing – General
22 20 00 Piping General – Plumbing
22 51 00 Insulation

1.04 QUALITY ASSURANCE

A. All materials used for potable domestic water systems shall have National Safety Foundation (NSF) seal.

B. For additional Quality Assurance requirements refer to Specifications Division 01 and Section 22 00 00.

1.05 SHOP DRAWINGS

A. Submit shop drawings for the following items as specified in this Section and shown on the contract documents.

Gate valves.

Globe valves.
Check valves.
Butterfly valves.
Ball valves.
Pressure reducing valves.
Balancing valves.
Premolded pipe covers.
Water hammer arrestors.
Vent caps.
Air vents.
Escutcheons.
Cocks.

B. For additional submission requirements refer to Section 22 00 00.

PART 2 - MATERIALS

2.01 DOMESTIC WATER PIPING (HOT-COLD) (HEAT RECLAIM)

A. Temperature: Up to 200°F.

B. Operating pressure: 125 psig maximum.

C. Underground pipe:

1. 2-1/2 inches and smaller-type "K" hard temper copper tube.

D. Aboveground pipe:

1. Type "L" hard temper copper tubes.

2. Type 316/316L, plain ends.

E. CPVC pipe: (when approved by City; submit request)

1. All CPVC Schedule 80 pipe shall be manufactured from a Type IV, Grade 1 Chlorinated Polyvinyl Chloride (CPVC) compound.

2. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications.

F. Fittings:

1. Fittings: 150 lbs. wrought copper with socket ends.
2. PVC and CPVC: Fittings shall be product of the pipe manufacturer and match pipe schedule.

G. Unions: 2-1/2 inches and smaller. 125 lbs. cast copper. Socket ends, copper-to-copper seat.

H. Solder

1. Copper pipe: 95% tin/5% antimony. The use of acid is prohibited. The use of lead containing solder is prohibited. Use of lead free solders with a tin/copper/silver composition such as Silvabrite 100 is acceptable.

I. Valves:

1. Gate Valves-Underground:

a. 2-1/2 inches and smaller-125 lbs. screwed, iron body, bronze trim-non-rising stem with solid wedge disc. Acceptable products are: Crane No. 490, Nibco No. T-619 and Jenkins 40BJ. (The 490 gate is a U-bolt style and preferred for underground because of ease of repair.)

2. Gate Valves Aboveground

a. 2 inches and smaller-125 lbs. soldered, bronze, solid wedge disc, non-rising stem screwed bonnet. Acceptable products are: Crane No. 1320, Nibco No. S-113 and Jenkins 313J.

b. 2-1/2 inches and larger-125 lbs. flanged iron body, bronze trim solid wedge disc. Acceptable products are: Crane No. 465- 1/2, Nibco No. F-617-0 and Jenkins 525J.

3. Globe Valves:

a. 2 inches and smaller-125 lbs. solder joints bronze screwed bonnets, composition disc. Acceptable products are: Crane No. 1310, Nibco No. S-211-Y and Jenkins 106BPJ.

b. 2-1/2 inches and larger-125 lbs. flanged iron body-bronze trim. Acceptable products are: Crane No. 351, Nibco No. F-718-B and Jenkins 2342J.

4. Check Valves:

a. 2 inches and smaller-125 lbs. soldered bronze Y-pattern swing check composition disc. Acceptable products are: Crane No. 1342, Nibco No. S-433 and Jenkins 4093J.

b. 2-1/2 inches and larger – 125 lbs flanged iron body-bronze trim swing check valve. Acceptable products are: Crane 373, Nibco F918 and Jenkins 587J.

5. Ball Valve:

a. 1/2 through 1 1/2 inches: Forged brass body, full port valve, chrome plated brass ball, brass stem, PTFE seats, with Push-to-Connect ends. Victaulic Series 300.

b. Brass ball valves shall be full port. One-quarter (1/4) turn lever handle operated, hot forged brass. 100% full port. Valves shall have blowout proof stem and 2-piece body design. Gland follower and single O-ring stem design Teflon seats and stem packing.

6. Pressure Reducing Valves:

a. 2 inches and smaller-300 lbs. screwed bronze. Acceptable product is: Watts No. U5.

J. The use of PVC or CPVC pipes in return air plenums or exposed to air-conditioned spaces is prohibited. Cast iron, steel and copper pipe only shall be used in those areas. Refer to the Mechanical Section of the contract documents for the type of air conditioning system being installed in this project.

2.02 SANITARY PIPING (SOIL, WASTE, VENT)

A. Pipe-Exterior Underground

All exterior underground sanitary piping shall be high impact Schedule 80 PVC-DWV with socket ends. Coordinate with piping materials specified in the Civil Engineering documents.

B. Pipe-Under Building and Aboveground

All soil, waste, and vent piping shall be Schedule 80 PVC-DWV ASTM D2665-68.

C. Fittings-Under Building and Aboveground

Soil, waste and vent pipe fitting shall be Schedule 80 PVC joints ASTM D2665-68, solvent welded.

D. The use of PVC in return air plenums or exposed to air-conditioned spaces is prohibited. Cast iron pipe only shall be used in those areas. Refer to the Mechanical Section of the contract documents for the type of air conditioning system being installed in this project.

2.03 PREMOLDED PIPE COVERS UNDER LAVATORIES

A. Provide premolded insulation covers over P-trap and water supplies under lavatories/sinks designated for handicap applications.

B. Premolded covers shall be as follows:

1. Covers shall meet Federal, ANSI and local code requirements.

2. Covers shall be molded closed cell vinyl, minimum 3/16" thick. Fasteners shall be nylon and be supplied with kit. Insulation "k" value shall be 1.17 or higher.

3. Covers shall be suitable for field painting. For field painting requirements refer to another section of the Specifications.

4. Covers shall be self-extinguished, tested in accordance with ASTM D63J.

C. Covers shall be Handi Lav-Guard Insulation as manufactured by TRUEBRO or ProWrap-McGuire Products.

2.04 WATER HAMMER ARRESTORS

A. Provide water hammer arrestors with nesting type bellows. Casing to have sufficient displacement volume to dissipate the kinetic energy generated in the piping system.

B. Both casing and bellows to be constructed of stabilized 18-8 stainless steel.

C. Stainless-Steel Bellows may not take a permanent set even if expanded by static line pressure for prolonged periods. Bellows shall not split or tear under stress.

D. Bellows shall be fusion-welded under argon-gas shield with controlled constant provisions.

E. Bellows shall be unaffected by hot water temperatures up to 300ºF and be rated for 125 PSI working pressure or 250 PSI static pressure.

F. Arrestors shall meet Standard No. PDI-WH201 of the Plumbing and Drainage Institute.

G. Hammer arrestors shall be Zurn Shoktrols. Other acceptable manufacturers are Josam and Wade. Refer to Project Manual for required documentation when requesting acceptance of other non-listed products.

PART 3 - EXECUTION

3.01 PIPING

A. Installation of piping shall comply with the requirements of Specifications Section 22 20 00 and as herein specified.

B. Installer shall promptly install all sewer, drains, and piping after chases or cutting for same has been done, so as to keep the openings for such piping open as short a time as possible. No piping shall be permanently closed up, furred in or covered before examination by the authorities having jurisdiction.

C. All piping shall be run in the most direct manner. Horizontal storm, soil and waste pipe shall have a grade of one-quarter inch (1/4") per foot wherever possible and not less in any case than one-eighth (1/8") per foot. All offsets shall be 45º or less. At offsets greater than 45º, cleanouts and additional supports must be provided.

D. All water piping shall be run free from traps and arranged so that all parts of the system can be drained. Provide accessible one-half inch (1/2") gate valves with hose end where required for this purpose.

E. Reducing fittings shall be used where any change in the pipe sizes occur. No bushings of any nature are allowed.

F. Provide dielectric couplings when ferrous and non-ferrous metals are jointed. Dielectric couplings shall be as manufactured by EPCO or approved equal.

G. Vent branches shall be kept above the fixtures in such a manner as to preclude the use of the vents, as waste pipes should the latter become obstructed. All branches shall be so graded as to prevent accumulation of water or scale therein. All vent pipes shall be properly graded without drops or sags and so connected as to drip back to waste pipes by gravity. Wherever practicable, two or more vents shall be connected together and extended as one vent through the roof.

H. Exposed waste and vents pipes shall be chrome-plated brass (iron pipe size).

I. Provide swing connections throughout the piping systems to allow for horizontal and vertical expansion and contraction.

J. Unions or companion flanges shall be provided for easy removal of all equipment.

3.02 AIR CONTROL / AIR VENTS

A. At the high point of water supply system, furnish and install automatic air vent valve. Vent valves shall be TACO No. 426 or approved equal. Discharge room air vent valve shall be piped to an appropriate drain.

3.03 PIPE SUPPORTS

A. Vertical piping shall be supported at each stack base and at each floor. Freestanding vertical pipes should be adequately staked or braced during construction to maintain alignment.

B. Horizontal piping shall be supported within 24 inches of any elbows and hangers shall be properly placed to maintain alignment and grade with provision made to prevent shear. Large diameter pipes should be braced at changes of direction to prevent horizontal movement. For hanger specifications and spacing refer to Specifications Section 22 20 00.

C. PVC and CPVC horizontal lines shall have supports every four feet (4’).

3.03 EXCAVATION AND BACKFILL

A. Refer to Specifications Section 22 00 00.

3.04 FLASHING CONNECTIONS

A. Where the vents pass through the roof, the openings shall be provided with sheet lead flashing weighing not less than four (4) pounds per square foot. The flashing shall be made watertight at the roofline and be extended up, over and down at least two inches (2") into the pipe. Each flange shield shall extend not less than fourteen inches (14") in all directions from the respective vent, underneath the roofing material.

3.05 VALVE CONTROL

A. Valves shall be installed where shown on plans and/or where necessary to facilitate the servicing of sections of the domestic water system.

B. Valves shall be provided on all inlet and outlet connections to all fixtures, apparatus, all risers and all groups of fixtures or kitchen equipment.

C. Groups of fixtures shall be arranged to have their group valves in one location.

D. Access to all concealed valves shall be provided by means of access doors. Refer to Specification Section 22 00 00 paragraph Access Doors and Panels.

E. All domestic water shut off valves shall be full port ball valve type.

3.06 INSULATION

A. Insulation of rain leaders and domestic hot water pipes shall comply with the requirements of Specifications Section 22 51 00.

3.07 PREMOLDED PIPE COVERS FOR LAVATORIES

A. Insulate P-trap and water supplies under lavatories/sinks for handicap applications using fully molded, pre-insulated covers as specified in Specifications Section 22 10 00.

3.08 SLEEVES

A. Refer to Specifications Section 22 20 00 – Piping General.

3.09 ESCUTCHEONS

A. Install escutcheons at all exposed wall, ceiling and floor pipes penetrations. Pipe penetrations inside cabinets shall also be covered. Escutcheons shall match piping materials or as herein indicated.

B. Escutcheons shall completely cover the opening around the pipe penetration. Coordinate with contractor for general construction when this is not feasible so other means may be used to seal opening(s).

3.10 TESTS

A. Perform all required tests in accordance with the requirements of Specifications Section 22 20 00 and as herein specified. Where more stringent Codes apply, they shall then be followed.

B. Soil, waste, vent, and storm piping. Test the system with a 10-foot hydrostatic pressure for a minimum of 2 hours.

C. Domestic hot and cold water copper pipes. Test the system at 100 psi hydrostatic pressure

for 2 hours.

D. PVC and CPVC pipes. Test at system operating pressure plus 10% and held for 24 hours.

3.11 DISINFECTION AND STERILIZATION

A. Provide for the disinfection and sterilization of all piping systems used for the storage, heating, supply, distribution and dispensing of potable fluids. Include all wetted parts and accessories thereof. Work shall comply with the requirements of Florida Building Code, 2017 – Plumbing, local Water Utility, local Health Department and other Agencies having jurisdiction.

B. Plumbing installer shall arrange and pay all costs for testing of water samples as required by the governing authority. Provide required sample testing and injection connections. After acceptance of piping installation by the authorities having jurisdiction, remove and cap connections.

C. Submit three (3) copies of test reports to the Architect / Engineer and the Owner's authorized representative. Additional copies to be included in the Operations and Maintenance Manuals. Refer to Specifications Section 22 01 00.

D. Projects involving multiple buildings or phasing of construction may have each building or phase tested independently to facilitate occupancy. However, once construction is completed, a final test of the entire installation must be done.

3.12 WATER HAMMER ARRESTORS

A. Provide manufactured water hammer arrestors on all hot and cold domestic water supplies at each faucet, control valve or flush valve, except lawn faucets, wall hydrants and hose bibbs.

B. Arrestors shall be concealed and arranged so as to protect all plumbing fixtures. When a unit of equipment is located at the remote end of a long run of piping, the arrestor should be placed as close to the point of valve closure as possible.

C. Submit shop drawing of layout and location of arrestors before installation, for review by Architect / Engineer.

D. Water hammer arrestors and air chambers shall be installed at accessible locations. Provide access doors / panels as required for such access. Access Doors / Panels shall meet requirements of Specifications Section 22 00 00.

END OF SECTION – 22 21 00

SECTION 23 00 00 – MECHANICAL GENERAL REQUIREMENTS

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Division 23. When in conflict the requirements of the Contract and Division 01 supersede those listed on Division 23.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. Provide the labor, materials and equipment for the installation and testing of the mechanical equipment and systems shown on the drawings and herein specified.

B. All systems shall be complete, tested and ready for operation at time of Substantial Completion. Refer to Specification Division 01 and Sections 23 01 00.

C. Refer to each Section of this Division 23 for the specific scope of work under that Section.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 08 00 Painting and Identification
23 41 00 Corrosion Protection
23 70 00 Fans and Vents
23 95 00 Test and Balance

1.04 RELATED WORK NOT INCLUDED IN THIS DIVISION

A. Refer to related Sections of the Contract Documents for work to be provided by others such as but not limited to:

Electrical Work - Refer to Division 26

1.05 DEFINITIONS

A. Specific items of terminology, as used herein, shall have the following meanings:

1. BY OTHER TRADES: Shall mean work that is to be provided by persons or parties responsible for work at the project other than the party or parties who have been awarded a contract for work under this Division15. In the event that this document is used to acquire work as part of a general construction contract, the words "by other trades" shall mean by persons or parties who are not anticipated to be the installers for the work shown under this Division 23. In this context, the words "by other trades" shall not be interpreted to mean, “not included” in the overall contract.

2. DEMOLITION: Shall mean the removal of any existing equipment, piping, ducts, etc. and the temporary or permanent capping or plugging of indicated existing services

3. DUCTWORK: Shall mean ducts, fittings, dampers, controls, hangers, insulation, and any other items customarily required in connection with the installation of systems for the movement and or distribution of air. Include all tests and the test and balance of such systems.

4. EXPOSED: Shall mean work that is not concealed.

5. FURNISH: Shall mean purchase and deliver to the project site indicated equipment and/or materials complete with necessary rigging, appurtenance and supports.

6. PROVIDE: Shall mean FURNISH and INSTALL.

7. WORK: Shall mean to include all materials, labor, equipment, tests and test and balance required for a complete and operable installation.

B. Except where modified by specific notation to the contrary, it shall be understood that the indication and/or description of any item, in drawings or specifications or both, carries with it the instruction to furnish and install item, regardless of whether or not this instruction is explicitly stated as part of indication or description.

1.06 QUALITY ASSURANCE

A. General

1. Refer to requirements of Division 01. It is the intent of the drawings and specifications to obtain a complete and operable installation.

2. All materials shall be new, properly labeled and/or identified, and in full compliance with the contract documents and applicable Codes and Standards.

3. All work shall comply with applicable Codes and Standards at the time the project is bid.

4. Manufacturer's model names and numbers used in this Division 23 are subject to change per manufacturer's action. Contractor shall therefore verify applicable information with manufacturer's representative before ordering any product or equipment. Notify Engineer of any changes and promptly furnish, for their review, information on new or replacement product. Changes shall be at no cost to the contract.

B. Installer's Qualifications

1. Installers performing work under this Division 23 shall be both a State and local licensed firms regularly engaged in providing the work specified under each Section of these Specifications. Provide copy of license upon request.

2. Each installer shall provide, upon request, a list of at least five similar jobs he has completed in the last two (2) years. Also refer to requirements of Division 01.

C. Drawings and Specifications

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

2. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Notes or details on drawings which refer to an individual element of work and that may conflict with the specifications shall be brought up to the attention of the Engineer for clarification before any equipment or materials are purchased or work is installed. Failure to follow these guidelines may cause the contractor to replace / correct the work at no cost to the contract.

3. The separate divisional drawings and specifications do not relieve the contractor from the responsibility to provide the work, which is indicated on any of the drawings or division of the specifications.

4. The drawings of necessity utilize notes, details, symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of such notes, details, symbols and diagrams that any elements of work necessary for a complete installation are excluded. Any discrepancies shall be brought to the attention of the Engineer for clarification before bid time and the purchasing and installation of any equipment or materials. No work shall proceed until issues are resolved. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract.

5. Details, sections and enlarged plans that appear on the drawings are intended only for the purpose of establishing general feasibility. They do not supersede field coordination of the indicated work among the various trades working in that area.

6. Examine and coordinate site conditions, electrical, drawings and specifications prior to submitting bid. Any discrepancies shall be brought up to the attention of the Engineer.

7. The Engineers shall be notified of any discrepancies, omissions, conflicts or interferences, which occur between drawings and specifications. If such notification is received in adequate time prior to bid time additional data or clarifications will be issued by addendum to all bidders. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract. See note 4 above.

8. When extra work involving Division 23 trades is authorized, the work as shown on drawings, sketches, described by Addendum or Change Order is subject to this Specification in all respects.

D. Standards

1. Certain materials and installation procedures are described by reference to industry standards published by nationally recognized organizations such as, but not limited to, those listed below:

American Society for Testing Materials (ASTM)
National Fire Protection Association (NFPA)
National Electrical Manufacturers Association (NEMA)
Underwriter's Laboratories (UL)
American National Standards Institute (ANSI)
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
Air Movement and Control Association (AMCA)

2. Additional standards may be listed in other Sections of the Specifications and in the 2017 Florida Building Code.

3. Whenever a reference is made to a standard, installation and materials shall comply with the **latest adopted and published edition of the Standard at the time project is bid**.

E. Requirements of Government Agencies

1. The work under this contract shall comply with the standards and requirements of the City of Tampa Wastewater Department.

2. The contractor, at no cost to the contract, shall correct any work found to be in noncompliance with those Standards.

1.07 PERMITS, FEES AND INSPECTIONS

A. Contractor shall give the necessary notices, obtain all permits and pay all government fees, sales taxes and other costs in connection with this work.
B. Obtain all required certificates of inspection for work and deliver them to the Engineer before requesting acceptance and final payment for the work.

1.08 CODES AND RULES

A. All work specified and installed under Division 23 shall comply with the Florida Building Code, 2017.

B. Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

C. Installer's of work specified under Division 23 shall include in the work, without extra cost to the contract the labor, materials, services, apparatus and drawings required to comply with applicable laws, ordinances, rules and regulations before submitting his bid.

D. Installer shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.09 FIELD CHANGES DURING CONSTRUCTION

A. Occasionally during construction changes that deviate from the approved permit documents may occur.

B. Local authorities may require that the changes be submitted for their review via signed and sealed documents indicating the design professional concurrence with said changes. Contractor shall therefore notify the design professional of any changes before proceeding with the work and provide justification for the change including supporting sketches detailing the extent and nature of the change.

C. Failure to follow this procedure may delay the design professional response until he / she is satisfied with the need for the change.

D. When changes are made for the contractor's sole convenience, contractor assumes full responsibility for reimbursing the design professionals for his / her time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

Part 2 - EXECUTION

2.01 ORGANIZATION OF THE WORK

A. At all times a competent superintendent shall be on site in charge of the work. Replace if performance is unsatisfactory to the Owner and/or Engineer.

B. Maintain a complete file of all contract and shop drawings at the site available for review by Owner's representatives and Engineer. A set of drawings shall be dedicated as the "As Built Record Set" where all changes and / or deviations from the contract documents are noted as they occur. Refer to Specifications Division 01.

C. Upon installation of equipment, shop drawings shall be initialed and dated. This procedure will ensure proper scheduling and allow Owner's representatives and Engineer to check the work in progress.

D. A set of the ductwork shop drawings shall be kept on site for use by the Test and Balance Agency and the contractor. They shall highlight the sections of duct being pressure tested and note date of the test. Names of individuals conducting the test shall be listed next to the date.

2.02 COORDINATION WITH OTHER TRADES

A. Coordinate work to be installed under Division 23 with other trades and existing field conditions to avoid interferences and delays. Assist in working out space requirements to make a satisfactory installation. Notify the Engineer of any major conflicts that cannot be resolved through normal field coordination with other trades.

B. When work by others is installed before it is coordinated with the work of Division 23 trades, and as a result interferes with the Division 23 trades work, the installer responsible for causing the conflict shall make the necessary changes in his work to correct the condition at no cost to the contract. Notify Engineer of such conflicts. Contractor is responsible for reimbursing the Engineer for his time and cost in assisting in the resolution of such issues.

C. Furnish to other trades all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. Local authorities may require that field changes that deviate from the contract documents be submitted for their review via signed and sealed documents that indicate design professional concurrence with said changes. **Contractor shall notify the design professional of such changes before proceeding with work and provide justification for the change.** Failure to follow this procedure will make the contractor responsible for all costs associated with the change including design professional's time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

2.03 CUTTING AND PATCHING

A. When openings in walls/roofs are provided under the work of other sections, this installer shall furnish exact dimensions and locations of those openings.

B. No structural members shall be cut without the previous written approval of a Structural Engineer. This contractor is responsible for providing such engineering services. Provide copies of information to Design Professional.

2.04 EXAMINATION OF EXISTING CONDITIONS

A. This project includes work in an existing facility; therefore, contractors shall visit the site and examine those areas of the existing buildings affected by this work. Contractor shall become familiar with existing conditions and difficulties that may affect the execution of the work before submitting proposals.

B. Submission of a proposal shall therefore be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

C. Upon completion of his site visit contractor may submit a list of questions requesting the clarification of items noted during his visit. Submit request within the time frame shown on the General Conditions of the contract and Division 01. Late requests will not be accepted.

2.05 DEMOLITION

A. Demolition shall be as shown on drawings and/or herein specified.

B. Schedule all demolition work to cause minimum downtime of any building service or function. No extra cost to the contract will be allowed for overtime work unless authorized in writing by the Owner / Engineer.

C. At each location where work is to be performed, the Contractor shall examine the existing conditions to determine the nature and extend to which the existing systems must be removed, modified or rearranged to accomplish the work of this contract. In addition, the Contractor shall determine the extent to which portions of the existing building must be cut, altered and restored to accommodate the project modifications. In every instance, the Contractor shall be responsible for the correctness, adequacy, fit and alignment of new work with existing conditions, and for the satisfactory restoration of affected building work as approved by the Owner.

D. The Contractor shall protect existing building contents, equipment, fixtures, the building structure and its finishes from damage due to dust, falling debris, or any other work operations. Repair or replace any damage to existing facilities at no extra cost to the contract.

E. Equipment or other items to be modified or relocated shall be carefully dismantled or disconnected in a manner to avoid damage. Items damaged by the contractor's operations shall be replaced or repaired in a manner satisfactory to the Owner. Items not to be re-used shall be removed from the site by the Contractor. Those items that are identified to be turned over to the Owner shall be stored on the site at a designated location.

F. In each area where work is performed, the work area shall be kept in a neat, clean condition. Rubbish and debris shall not be allowed to accumulate and shall be removed daily if necessary to maintain clean conditions satisfactory to the Owner.

2.06 SEQUENCING AND SCHEDULING OF WORK

A. All work to be performed under this contract shall be carried out in accordance with an approved construction sequence and schedule. Upon award of the contract, and prior to commencing work at the building, the Contractor shall prepare and submit a detailed schedule of his proposed sequence of work and the dates of completion of the various portions of the work.

B. Where existing active building systems and services must be disrupted to permit modification, relocation or connection of new work, the work shall be carefully planned to minimize downtime. In each instance, preparatory work shall be completed to the maximum extent possible, and required tests completed where feasible, before the particular system or service is shut down to permit final connection or switch over.

2.07 STORAGE OF EQUIPMENT AND MATERIALS

A. All equipment and materials shall be stored on site in a dry location where they are properly protected from the weather, injury or deterioration. Materials shall <u>not</u> be stored in contact with the ground or floor.

B. Do not remove manufacturer's packing materials until ready to install.

C. Materials showing signs of corrosion or damage due to improper handling or storage shall be replaced at no cost to the contract.

D. Provide continuous protection for all equipment and materials already installed.

2.08 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Engineer before 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.

2.09 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code, owner standards and equipment manufacturer for the proper maintenance or removal of equipment. The most stringent requirements shall apply.

B. Coordinate with other trades so no conduit or other equipment interferes with the required clearances.

C. Notify project superintendent when work by other trades needs to be relocated in order to maintain required clearances. Notify Engineer if conditions persist and are not corrected by the responsible trade.

END OF SECTION – 23 00 00

SECTION 23 01 00 - PROJECT CLOSE OUT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 08 00 Painting and Identification
23 42 00 Direct Expansion (DX) Mechanical HVAC Equipment
23 70 00 Fans and Vents

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 TOOLS

A. All special tools for proper operation and maintenance of the equipment provided under this specification shall be delivered to the Owner's representative and a receipt requested.

3.02 SUBSTANTIAL COMPLETION

A. Refer to the General and Supplementary Conditions of the Contract and Division 01 of the Specifications for additional requirements applicable to this Section. When in conflict, those requirements take precedence over this Section.

B. Representatives of the installers responsible for work under this Division 23 shall be present at the time of the Substantial Completion. They shall have tools and ladders available to assist the Architect / Engineer and to promptly correct any deficiencies that may be identified.

C. Division 23 installers shall be in compliance with the following:

1. All work shown on the contract documents shall be completed and fully

operational.

2. The contractor shall perform his own review of the work prior to requesting the Substantial Completion visit. The contractor shall provide a hard copy of his punch list to the Architect / Engineer when submitting his request.

3. Systems and equipment shall be tested and balanced to assure compliance with contract documents. Provide the Architect / Engineer with copies of Test and Balance Report at least one week prior to the scheduled Substantial Completion visit.

4. Furnish a letter from the Building Automation System (BAS) manufacturer and/or installer certifying that the controls for the air conditioning system have been tested and calibrated and that systems perform as intended. Testing shall include controls software and all Sequence of Operations.

6. Replace temporary filters with the specified clean final filters.

7. Clean coils, equipment and ducts that may have accumulated dust during construction. Refer to requirements of Section 23 00 00, Paragraph, Operation of Air Conditioning Equipment during construction.

D. Architect / Engineer shall furnish contractor with a list of items noted during the Substantial Completion visit that need to be corrected. Contractor shall notify the Architect / Engineer in writing of any items appearing on that list that are disputed by Installer.

E. When listed items have been corrected and/or completed, Contractor shall request in writing another review of the work. Request shall include a copy of the original punch list with the initials of the contractor's representative who has verified that the items on the punch list have been completed.

F. Contractor shall be responsible for the costs associated with additional site visits by the Architect / Engineer beyond the substantial and final visits due to the contractor’s failure to complete all listed deficiencies. Contractor will pay these additional visits to the Architect / Engineer whose time is involved at the rate of $75.00 per hour. This amount may be deducted from the project's final payment.

3.03 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks, damage or defects. Any defective equipment, materials or workmanship shall be replaced or repaired at any time during the duration of the guarantee period.

B. Unless otherwise noted, all work shall be guaranteed for one year. Refer to other sections of the specifications for extended warranty requirements in items such as air conditioning compressors, water heaters, and others. The listed warranty time limits do not relieve the contractor’s or equipment supplier responsibility for any hidden latent installation or manufacturing defects that may appear at a later date.

C. The date of acceptance and start of all warranties and guaranties shall be established by the Owner and Architect through a formal notice to the Contractor. That date supersedes any date or term limits that may be listed on any of the manufacturer’s standard warranties. Also refer to Division 01 of the Specifications.

3.04 RECORD DRAWINGS

A. During the course of construction, the contractor shall keep at the site a set of mark-up prints indicating all deviations and changes from the work indicated on the contract drawings. Set shall be clearly labeled “RECORD DRAWINGS” and be available for review by Architect / Engineer.

B. Above information shall be used by the contractor to prepare one set of as-built reproducible drawings as a record of all construction revisions and changes from the contract drawings. Include all revisions to equipment schedules.

C. As indicated in Specifications Section 23 00 00, contractor shall keep a separate set of ductwork shop drawings indicating the duct sections, as they are pressure tested. Test and Balance technician shall initial and date drawings as duct sections are satisfactorily tested.

D. Upon completion of the work, and unless otherwise noted on the General and Supplementary Conditions of the Contract; and Division 01 of the Specifications, contractor shall furnish the Architect / Engineer a revised and final set of reproducible or electronic media CAD documents and a set of prints of the work as installed.

3.05 OPERATIONS AND MAINTENANCE MANUALS

A. Refer to Specifications Division 01 and Section 23 01 00.

3.06 OPERATING INSTRUCTIONS

A. Instruct representatives of Owner in operation and maintenance of all installed systems and equipment. Provide a minimum of two (2) working days of such instruction, more if required. Instruction period shall be video taped with copy of tape provided to the Owner.

B. Provide Maintenance Manual, see Specifications Division 01 and Section 23 02 00 and acquaint Owner's representative with its contents during instruction.

C. Furnish letter naming Owner's personnel receiving instruction and dates when instructions was given.

D. Provide, for each piece of equipment, the name, address and telephone number of the manufacturer’s representative and Service Company, so that service or spare parts can be readily obtained.

END OF SECTION – 23 01 00

SECTION 23 08 00 – PAINTING AND IDENTIFICATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. All ductwork provided under Division 23, which is exposed to view, to the weather and/or as indicated on the drawings and specifications shall be painted unless otherwise noted.

B. All galvanized metals that are to be field painted shall be properly prepared to accept specified paint. If paint peels, repeat treatment and repaint at no cost to the contract.

C. Fans shall have factory standard finish. Field painting of equipment over standard finish shall be as directed by Engineer.

D. Apply primer ready to field painting, where required.

E. All unfinished ironwork installed under Division 23, which is exposed to view within the building or exposed to the weather, shall be painted as herein specified.

F. Provide permanent identification on equipment and piping systems. Coordinate with City of Tampa Wastewater Department the numbering sequence of equipment. City Standards take precedence over these specifications.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 70 00 Fans And Vents

1.04 SHOP DRAWINGS

A. Submit catalog data, color samples, and other requested data for following.

1. Paints

2. Treatment of galvanized metals

3. Markers

4. Labels

PART 2 - PRODUCTS

2.01 PAINT

A. Rust inhibitor paint shall be red chromate base made up in a synthetic resin vehicle.

B. Finish paint where specified shall meet the requirements of the City of Tampa Wastewater standards.

2.02 PAINT SCHEDULE

A. Painting schedule for equipment and piping:

Equipment and system components	Manufacturer's standard color and finish

B. Colors shall meet ANSI A13.1 Standard recommendations:

As selected by City of Tampa Wastewater Department

C. Color of letters applied to above colors shall be black on a yellow background.

PART 3 - EXECUTION

3.01 PAINTING GENERAL

A. Ironwork installed under this Division 23 of the Specifications exposed to view within the building, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as duct hangers, structural supports, supports for equipment, etc., shall be painted with one (1) coat of rust inhibiting paint. Finish paint, color as selected by City of Tampa Waste Water Department.

B. Ironwork installed under this Division 23 of the Specifications which is exposed to the weather, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as duct supports, etc., shall be painted with two (2) coats of rust inhibiting paint and one (1) coat of an acrylic base UV and mold resistant white paint. The Owner may select a different color of the finish paint.

C. Painted galvanized metals from which paint peels shall be stripped, retreated and repainted at no cost to the contract.

3.02 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include but not limited to: exhaust fans, control cabinets, starters and power disconnects, and others as directed by Engineer.

B. Identification numbers and names shown on the Contract Documents are for reference only. They shall be changed to meet Owner's numbering sequence and standards. Contractor shall request a copy of such standards.

C. Contractor shall mark record construction documents to reflect the labeling and numbering sequences when different from contract documents.

END OF SECTION – 23 08 00

SECTION 23 41 00 – CORROSION PROTECTION

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Section. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Section.

1.02 SCOPE

A. The work under this section includes furnishing the labor, materials and equipment, and performing all operations necessary for the field application of coatings formulated for the protection against corrosion of the following equipment specified in this Section:

- Fans

B. Coatings shall completely cover and protect equipment components exposed to the weather.

C. For field applications, the applications contractor shall verify with the equipment manufacturer that the corrosion protection products he plans to use are compatible with the equipment. Include verification documentation with both equipment and corrosion protection materials shop drawing submittal.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 70 00 Fans and Vents

1.04 SHOP DRAWINGS

A. Provide for each product the following information:

Corrosion protection materials data sheets
Application procedures
Warranties

B. For additional Shop Drawing submission requirements refer to Specifications Division 01 and Section 23 00 00.

1.05 QUALITY ASSURANCE / WARRANTIES

A. Applicator Company shall be regularly and specifically engaged in the corrosion protection coatings business on a full-time basis. Company shall demonstrate

technical capability and business longevity. Application staff shall be fulltime employees of the Company.

B. The applicator staff shall be certified and trained in the application of the products they use and have a minimum of two (2)-years' full-time experiences doing this work.

C. Protective coatings shall carry five (5)-year unconditional warranties. Start of warranty is date of acceptance of project by the Owner. Include copy of Warranty in the Operations and Maintenance Manuals as per Specifications Division 01.

D. Product submittal shall include a list of local references of work completed within the last five (5) years. Provide contact names and phone numbers.

E. Application shall be done in strict accordance with the instructions provided with the product(s). Copy of the instructions shall be provided with the shop drawings and one kept at the site.

F. For additional Quality Assurance requirements refer to Specifications Division 01.

1.06 ACCEPTABLE FIELD APPLICATORS

A. Corrosion Solutions, Inc. and Blygold Florida Thermoguard.

B. Applicator's offices shall be located within a day's drive (maximum) from the job site.

C. Other applicators shall submit their qualifications, products and experience for review as per requirements of the General Conditions, Specifications Section 23 00 00 and this Section. City does not pre-approve substitutions before bid.

1.07 ACCEPTABLE PRODUCTS

A. Products shall be formulated for the Florida weather. Provide test data upon request.

B. Polyurethane based, Heresite, Electrofin or Blygold.

C. Other products shall be submitted for review as per requirements of the General Conditions, Specifications Sections 01, 23 00 00 and this Section.

D. Manufacturer's products used in this Section of the Specifications and application procedures are subject to change per manufacturer's action. Contractor shall therefore verify applicable information with manufacturer's representative before ordering any product or equipment. Notify Engineer of any changes and submit for their review information on new or replacement product. Changes shall be at no cost to the contract.

Part 2 - MATERIALS

2.01 GENERAL

A. Coatings to be applied under this Section of the Specifications shall be specifically formulated for finished products constructed with galvanized steel and aluminum.

B. The selected coating shall provide excellent resistance and durability against the corrosive effects of alkaloids, acids, alcohols, petroleum hydrocarbons, seawater, salt air and similar corrosive environments. Testing shall meet: ASTM G85-3000 hour's industrial environment; ASTM B117-10,000 hour's marine environment and Kesternich test-80 cycles fuel combustion (sulfuric environment).

2.02 APPLICATIONS OF CORROSION PROTECTION FOR AIR HANDLING EQUIPMENT (FANS) – FIELD APPLIED

A. Coatings shall be applied at the job site after all rigging and equipment handling has ended.

B. Fan(s) surfaces and other components shall be degreased cleaned and prepared for coating application. All rust shall be removed. Fan cabinets shall be brushed, rolled or sprayed with a corrosion and moisture resistant film for all surfaces (interior and exterior) to accomplish 4 - 8 mils of thickness. All exposed surfaces shall be coated. Coating shall be clear or gray and may not impede the natural coloration of the equipment manufacturer's finished product. All written information applied to the fans by the manufacturer shall remain legible and original. Fans shall then be left untouched for approximately 12-24 hours to permit curing of the product.

C. Acceptable Products and Manufacturers:

1. Cabinet coating process shall be similar and equal to Blygold Refamac, "OxiBloc II" process as supplied by OxiGuard, Inc., or Corrosion Solutions PC-2000.
2. Thermoguard-Polyurethane-based.

2.03 COATINGS

A. The coating shall be applicator standard product and provide a complete envelope protection against chemical and ultraviolet corrosion. All products shall contain anti-microbial additives.

B. Coating shall be effective on ferrous and non-ferrous metals, galvanized, anodized and painted surfaces.

C. Coating shall consist of an aluminum-impregnated polyurethane topcoat or an air dried phenolic material with corrosion resistant properties including ASTM Certification, tensile strength and flexibility to prevent fissures, stress cracks, peeling or flaking. Coating must achieve thickness as required.

2.04 PRIMER

A. Provide a combination primer/finish coat material similar to Blygold Florida "Rfamac" or Corrosion Solutions, Perfect-Coat PC-2000 Series.

2.05 THINNER

A. For all spray applications use a thinner similar to Blygold Florida or Corrosion Solutions' PC-2000-S.

2.06 CURING SCHEDULE

A. Specify curing time that reflects product mixture, ambient air temperature, as well as overall environmental conditions.

Part 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Remove all manufacturing machine oil, grease, corrosion and/or dirt from surfaces with an appropriate solvent and/or detergent cleaner.

3.02 APPLICATION

A. Do not apply product if temperature is less than 5ºF (-15ºC) above dew point, or if temperature is below 45ºF (7ºC).

B. All spray equipment must be thoroughly cleaned and hosed, in particular, shall be free of old products and contaminants.

C. Standard manufacturer spray equipment may be used with proprietary accessories to achieve the performance of the spray application process.

D. Compressed air supplies must be uncontaminated. Air pressures must be adjusted relative to the gun manufacturer, unique accessories and variable nozzles.

E. Apply a trial application of mist for bonding and pattern features.

F. Apply several cross passes. Finished product should be 3 to 4 mils as a wet film thickness.

3.03 DAMAGE TO EQUIPMENT

A. Applicator is responsible for any damage to the equipment.

END OF SECTION – 23 41 00

SECTION 234200 – DIRECT EXPANSION (DX) MECHANICAL HVAC EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions, Supplementary General Conditions Division 01 and Specifications Section 23 00 00 are part of this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. Work under this section includes furnishing the labor, materials, equipment, and performing all operations necessary for the installation of DX heating, ventilating and air conditioning systems shown, detailed, and/or scheduled on the drawings, and/or specified in this section of the specifications.

B. Each DX split air conditioning system shall consist of one air handling unit and listed condensing unit(s), fully charged refrigerant piping and controls. When indicated and scheduled on the contract documents, air-handling units shall be provided with multiple condensing units. When multiple condensing units and/or compressors are provided, the evaporator coils shall be interlaced circuit construction.

C. Coordinate with contractor for general construction the concrete or precast pads required for the equipment specified under this Section. For equipment on the roof, coordinate the installation of roof curbs or other indicated support frames with roofing contractor.

D. All equipment exposed to the weather shall be anchored as required by the 2017 Florida Building Code.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 08 00 Painting and Identification
23 41 00 Corrosion Protection
23 70 00 Fans and Vents
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. Each piece of equipment shall have manufacturer's name, address, serial and model numbers engraved on a metal plate securely attached to it. PIastic labels glued to the unit are not acceptable unless a matching label is installed inside the access door to the electric panel section of the unit.

B. Capacities shall be not less than those indicated on plans.

C. Provide certified sound and/or fan data as hereinafter specified and upon request from the Architect / Engineer.

D. Each condensing unit and matching air-handling unit shall be the product of the same manufacturer and be ARI Certified.

E. All insulation used on equipment shall meet NFPA-90A flame spread and smoke generation requirements. Insulation exposed to the unit airflow shall have a coating applied at the factory or integral to the insulation. Double wall construction units are preferred and shall be provided when specified.

F. In each air-handling unit, the coil and filter sections shall be completely sealed to prevent air bypass around coil and filters.

G. The use of R-22 refrigerant is prohibited; provide information on refrigerant being used. Refrigerant must meet EPA and ASHRAE standards for ozone depletion and global warming.

H. For additional Quality Assurance requirements refer to Specifications Division 01 and Section 23 00 00.

1.05 SHOP DRAWINGS

A. Prepare and submit shop drawings for the following items whenever they are shown on the contract documents or herein specified.

Split System Air Handling Unit and Condensing Unit

B. For additional Shop Drawing submission requirements refer to Specifications Division 01 and Section 23 00 00.

PART 2 PRODUCTS

2.01 SPLIT SYSTEM AIR HANDLING UNITS

A. Provide draw-thru air handling unit(s) of size and capacities as shown on plans and as herein specified. Unit(s) to be UL listed.

B. The unit cabinet shall be constructed of galvanized steel. Finish paint shall be manufacturer standard color.

Cabinet shall have hinged access doors with locks for access to filters, electrical

fan section and as required for the proper service of the equipment. Casing shall be reinforced, and braced steel supported on galvanized steel angles. Provide minimum two (2) handles and locks per door, additional handles and locks shall be provided for doors over 24” high. If, due to unit size, hinged access door is not feasible, tool – less removal access panel shall be provided for those sections.

Cabinet removable panels shall provide access to filters, coil and fan section and as required for the proper service of the equipment. Casing shall be reinforced, and braced steel supported on galvanized steel angles.

C. Unit panels and doors shall be double wall construction. If, due to unit size, double wall construction is not feasible, and insulation must be exposed to airflow, it shall have a factory applied neoprene coating or be foil faced to prevent erosion. Construction shall be noted on shop drawings. Information shall be clearly noted in the shop drawings for the equipment.

D. Unit shall include a fan section, coil section, electric heater section and filter section. Provide sloped, insulated stainless steel condensate drain pan under the complete fan and coil section, including plenums. Drain pans shall meet current IAQ criteria and be sloped to retain minimum or no condensate during operation. If, due to unit size, stainless steel pan is not available, a composite drain pan shall be provided. Galvanized steel drain pans are not acceptable. Information shall be clearly noted in the shop drawings for the equipment.

E. Provide double width, double inlet centrifugal fans, statically and dynamically balanced and factory tested. Fan shall not pass through first critical speed before reaching RPM. Bearings shall be grease lubricated. Internal bearings shall have extended grease lines. The blower shall be equipped with a solid steel shaft. Fan wheels over 12 inches in diameter shall be keyed to the shaft.

F. Belt driven fans shall be provided with adjustable sheave on the motor to allow changes in the fan speed and an increase of up to 30% in the RPM's. Once unit performance is achieved, replace adjustable sheave with a fixed sheave as selected by the Test and Balance Agency.

G. Evaporator Coils

1. Evaporator coil(s) shall be removable and have continuous aluminum fins having collars, and seamless copper tubes mechanically expanded into the fins. Casing shall be stainless steel.

2. Refrigerant coils shall be circuited to meet capacities and provide full cold face area to air flow; split face coils are not acceptable. Coils shall be tested with dry air at 300-psig under water, be cleaned, dehydrated and charged with dry nitrogen before shipment.

H. Electric Heaters

1. Refer to equipment schedule for units to be furnished with factory installed electric heaters.

2. Provide low watt density (25W/SQ. IN. MAXIMUM) electric heaters of capacities as scheduled on plans and herein specified. Heater(s) shall meet NFPA 70.

3. Coil(s) elements shall be 80% nickel, 20% chromium, insulated by floating ceramic bushings and supported in aluminized steel frames. Bushings shall be recessed into embossed openings and staked into supporting brackets. Stainless steel terminals shall be insulated with high temperature phenolic bushings.

4. All heaters shall be furnished with one, disc type, pilot duty and automatic reset thermal cutout for primary over temperature protection. Heaters shall be furnished with a disc type, load-carrying manual reset thermal cutout, factory wired in series with each heater stage for secondary protection. Heat limiters or other fusible over temperature protection devices are not acceptable.

5. Heaters shall be rated for the voltage, phase and number of heating stages indicated on the schedule. Three phase heaters shall have equal, balanced three phase stages. All internal wiring shall be suitable for 150^{o}C.

6. Heaters shall be supplied with their own controls including but not limited to thermal cutouts, de-energized magnetic contactors, built-in fuses, control circuit transformer with fused primary, and built-in type FRS or FRN fuses.

7. One set of thermal cutouts, de-energizing switch contactors and built-in fuses per stage shall be supplied if the heater load exceeds 48 amps. Fuse blocks shall include supplemental wire tension springs.

8. Heaters shall be supplied with the following factory built-in features:

   Airflow Switch
   Inlet Perforated Metal Pressure Plate

9. Heaters line terminal blocks shall be sized to handle 125% of the total heater load.

10. Heaters are to be listed by Underwriter's Laboratories (UL) and meet the requirements of the National Electrical Code. UL listing shall allow installation with zero clearance to combustible surfaces. UL labels shall be of the metal type installed in a visible location and permanently attached to heater frame.

11. When heaters are to be installed at the fan discharge, external to the unit cabinet, they shall be specifically designed for that application.

I. Provide filter box containing indicated filters. Boxes shall have hinged access doors on both sides and inlet flanges. Filters shall fit together to prevent air

bypass, provide filler sections if required. Provide metal frames for 2" and 4” thick pleated filters, MERV 8 and MERV 11 efficiency.

1. Refer to equipment schedule for units to be furnished with higher efficiency filters in addition to the 2” pleated filters.

J. Small units, 5 tons and under when installed in the vertical position shall be provided with a support frame minimum 2 ft high. Frame shall be hot dipped galvanized steel.

K. Provide, for each system, a programmable thermostat with capabilities such as seven (7) day time schedule, night set back, cool/off/heat selection fan/off/auto selection, and other features as may be required by the building use. Refer to sequence of operations on drawings. When indicated, provide a remote sensor to be installed in the return air duct.

L. Acceptable manufacturers are: Carrier, York-Johnson Controls, Trane and McQuay-Daikin. For basis of design refer to schedule on the contract documents.

2.02 AIR COOLED CONDENSING UNIT

A. Furnish and install air cooled condensing unit(s) of size and capacity as shown on plans and as herein specified. Unit(s) shall be by the same manufacturer as the air-handling unit. Mixing of manufacturers is prohibited.

B. Unit shall have as its main components, condenser coils with integral sub cooling, condenser fan(s) and motor(s) and manufacturer’s standard compressor for the specified unit size, unit controls, and a holding charge of refrigerant all designed for outdoor installation. Provide standard manufacturer low ambient protection and controls for outdoor temperature operation down to 0ºF.

C. Casings shall be galvanized steel. Interior surface phosphatized, painted with epoxy primer and finished with baked-on enamel manufacturers standard finish. Supporting legs, fan and motor base and motor mount shall be hot deep galvanized steel.

D. Condenser fans and drives: Axial flow fans with permanently lubricated ball bearings direct or V-belt drives powered by weatherproof, permanently lubricated ball bearing high efficiency heavy duty motors with built-in thermal overload protection. Zinc plated fans with manufacturer’s standard finish. Fans shall be protected with removable wire guard. Wire guard shall have manufacturer’s standard corrosion protection.

E. Condensing coils for systems 7.5 Ton and larger shall be seamless copper tubing with heavy-duty aluminum fins mechanically bonded to the tubes. Coil frame shall be galvanized steel. Provide removable access panels.

1. All aluminum coils can only be used when a request for approval has been submitted prior to bid and a written Addendum has been issued.

F. Coils shall be pressure tested at the factory with 320-psig air pressure under water; cleaned, vacuum, dehydrated and leak tested at 150 psig. Units shall have a sub-cooling circuit.

G. Compressor(s) shall be manufacturer's standard type for the specified unit model and size, 1750 rpm designed for refrigerant 410a. Blended, EPA approved replacement refrigerants are acceptable and are preferred provided proper information is submitted with equipment shop drawings. Complete compressor unit shall be mounted on galvanized steel base.

1. Foam breaker, spring-loaded cylinder heads and non-flexing ring plate valves with large gas passages and minimum clearance volume.

2. Compressors to be enclosed in a sound attenuating compartment and mounted on rubber-in-shear pads or spring isolators.

3. Compressor motor shall be suitable for voltage fluctuations plus or minus 15 percent of nameplate voltage and have two thermostats located directly in the motor winding.

H. Provide a 24-volt electrical control system.

I. Provide expanded galvanized metal grilles to protect all exposed condenser coils.

J. Provide hot gas bypass for systems operating in the cooling mode during light loading conditions or low ambient temperatures.

K. All units to have manufacturer's five-year compressor parts warranty. Warranties to start on day of acceptance of project by the Owner. Units shall be ETL or UL approved and listed. Installation and maintenance manuals shall be supplied with each unit.

L. When indicated, unit(s) to be given a corrosion protection coating as per Specifications Section 23 41 00.

M. Acceptable manufacturers are: York-Johnson Controls, Carrier, McQuay-Daiken and Trane.

PART 3 EXECUTION

3.01 EXAMINATION OF FIELD CONDITIONS

A. Contractor shall verify that spaces are ready to receive work. Coordinate with other trades working in the same area.

B. Units shall be installed level, with trapping provided in accordance with manufacturer's requirements. Visually inspect to ensure proper drainage of condensate.

C. Verify that required utilities are available, in proper location accessible and ready for use.

D. Beginning of installation means installer accepts existing conditions.

3.02 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be delivered to the site in manufacturer's original packaging each clearly marked with the proper identification number.

B. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

C. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags on each section to indicate location and orientation in direction of airflow. Each section shall have lifting lugs to allow for field rigging and final placement of section.

D. Delivered units shall have fan motors, sheaves and belts completely assembled and mounted in units. If these components are not completely assembled, contractor shall coordinate with the equipment supplier the installation, testing and vibration balancing of fan(s).

E. Store units in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish. Store in accordance with the requirements of Specifications Division 01 and Section 23 00 00.

3.03 INSTALLATION

A. Each piece of equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents.

B. Each piece of equipment shall be installed to be free of noise and vibration. Provide isolators as per manufacturer's recommendations and/or as herein specified.

C. Provide factory approved/trained supervision during start-up of equipment.

D. Provide extended four-year guarantee for all compressors (total 5 years).

E. Provide extended lubrication tubes and fittings for service of bearings located in concealed or difficult to reach sections of apparatus. Provide additional extensions as directed by Architect / Engineer.

F. Duct turns located near a fan discharge shall always be in the direction of fan rotation. Equipment installer shall coordinate arrangement of fan section to assure this condition is met.

G. For condensing units installed at ground level, provide a poured in place or precast reinforced concrete pad. Top of pad(s) shall be not less than 6" above

surrounding grade and shall extend a minimum of two feet beyond the equipment in all directions, more if necessary to provide for equipment service as recommended by the equipment manufacturer. Secure equipment to pad(s) as required by code to meet wind loads. Install a minimum 1" thick neoprene or rubber pad at each condensing unit weight support point.

H. Condensing units shall be installed free of enclosures that prevent air circulation. When enclosures are provided, installer shall verify that the clearances for airflow and service access around the equipment meet those recommended by the equipment manufacturer. Notify Architect / Engineer of any conflicts.

I. Air handling units shall be installed on a six-inch (6") concrete pad. Pad shall extend a minimum of one foot (1 Ft.) beyond the equipment in all directions.

3.04 EQUIPMENT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacturer used as the basis of design. For all other acceptable manufacturers, shop drawing data shall indicate equal or better performance characteristics than the specified equipment.

B. Once unit airside performance is achieved, replace adjustable sheave with a fixed sheave as selected by the Test and Balance Agency. Replacement shall be done at no cost to the contract. Include information in the Test and Balance Report and the Operations and Maintenance Manual.

3.05 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code and the equipment manufacturer for the proper maintenance or removal of equipment.

B. Coordinate with other trades so no conduit, pipes; ceiling hangers, etc. interfere with the required clearances.

C. Notify contractor for general construction when uncoordinated work installed by other trades needs to be relocated.

3.06 CORROSION PROTECTION

A. Condensing units shall have field applied corrosion protection coating as indicated in Specifications Section 23 41 00.

END OF SECTION – 23 42 00

SECTION 23 70 00 – FANS AND VENTS

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. The work under this section includes furnishing the labor, materials, tools, appliances, equipment, and performing all operations necessary for the complete installation of fans shown and scheduled on the Contract Documents.

B. The following fan types are part of this project:

1. In-line cabinet fans

2. Utility fans

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00	Mechanical General Requirements
23 41 00	Corrosion Protection
23 95 00	Test and Balance

1.04 QUALITY ASSURANCE

A. Each fan shall have manufacturer's name, address, serial and model numbers engraved on a metal plate securely attached to the equipment.

B. Capacities shall be not less than those indicated on the Contract Documents.

C. Provide certified sound and/or fan data as hereinafter specified and upon request from the Engineer.

1. Wall mounted equipment shall be provided with supports suitable for wall construction. When fan or its accessories installation requires penetration of outside wall, it shall include necessary caulking, etc. to prevent water intrusion. Coordination location of wall openings with project superintendent.

D. For additional Quality Assurance requirements refer to Specifications Division 01.

1.05 SHOP DRAWINGS

A. Prepare and submit shop drawings for the following items whenever they are

shown on the Contract Documents or herein specified.

In-Line Fans
Utility Fans
Power Roof Exhaust Fans

B. For additional Shop Drawing submission requirements refer to Specifications Division 01 and Section 23 00 00.

Part 2 - PRODUCTS

2.01 IN-LINE FANS

A. Furnish and install duct mounted, belt driven centrifugal inline fans as herein specified and shown on contract documents.

B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18-gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gaskets. Pivoting motor plate shall utilize threaded L-bolt design for positive belt tensioning. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

D. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, *Balance Quality and Vibration Levels for Fans.*

E. Motor shall be NEMA design B with class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure.

F. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty greasable ball type in a pillow block cast iron housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

G. Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

H. Basis of design fan is a model SQN-B as manufactured by Loren Cook Company of Springfield, Missouri. Acceptable similar fan as manufactured by Greenheck.

2.02 UTILITY FANS

A. Furnish and install belt driven utility fans as specified herein and scheduled on the Contract Documents. Utility fans shall be single width, single inlet.

B. The housing shall be constructed of heavy gauge galvanized steel with lock formed seams permitting no air leakage. The housing construction shall allow for the fan to be rotated in the field to any of the eight standard discharge positions. Housing and bearing supports shall be constructed of welded heavy gauge galvanized steel members to prevent vibration and rigidly support the motor and wheel assemblies.

C. The fan wheel of direct drive fans shall be of the forward curved type and shall be constructed of heavy gauge aluminum with uniform stamped blades. The fan wheel of belt drive fans shall be of the non-overloading backward inclined, centrifugal fan type and constructed of heavy gauge steel. Wheels shall be statically and dynamically balanced at the factory. The wheel cone and fan inlet cone shall be matched for maximum performance and operating efficiency.

D. Motors shall be permanently lubricated, heavy-duty high efficiency ball bearing type matched to the fan load and furnished at the voltage, phase and enclosure shown on the fan schedule.

E. The fan shaft shall be ground, and polished solid steel mounted in heavy duty, permanently sealed, pillow block ball bearings. Bearings shall be selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulley shall be adjustable for final system balancing.

F. Fan performance shall be based on tests conducted in accordance with AMCA Standard 210 test code for air moving devices, and fans shall be licensed to bear the AMCA Certified Ratings Seal for air performance.

G. Fans shall be provided with provided with weather protection covers for exposed outdoor installation.

H. Belt Drive utility fans shall be Model SFB with forward curved wheels as manufactured by Greenheck and Cook.

2.03 POWER ROOF EXHAUST FAN

A. Furnish and install power roof exhaust fan of size and capacity as shown on plans and as herein specified.

B. Fan type shall be centrifugal wheel, belt or direct drive as scheduled, statically and dynamically balanced. Fan shall have AMCA certified rating seal.

C. Fan housings shall be weatherproof of heavy gauge aluminum construction.

D. Fan motor shall be supported on vibration isolating mounts. Belt driven fans shall be provided with adjustable sheave on the motor to allow changes in the fan speed and an increase of up to 30% in the RPM's.

E. Direct driven fan(s) shall be provided with unit mounted adjustable solid-state speed control. Fan(s) shall be selected to deliver specified CFM with the solid-state speed control set at 70% of its operating range.

F. Each fan shall be equipped with the following accessories:

1. A back-draft damper installed in the curb of the fan.

2. A minimum 12 inches high pre-fabricated roof curb shall be furnished with the fan and match unit furnished. Installer shall verify requirements based on roof construction to assure top of curb is at least 10 inches above finished roof surface. Refer to Architectural and Structural Roof Plans.

3. Provide bird screen and disconnect switch.

4. For additional accessories and controls refer to schedule on the Contract Documents.

G. Acceptable manufacturers are: Greenheck and Cook.

Part 3 - EXECUTION

3.01 INSTALLATION

A. Each fan shall be installed in accordance with the approved recommendations of the manufacturer and conform to the requirements of the Contract Documents.

B. Fans shall be installed free of noise and vibration. Provide isolators as per manufacturer's recommendations.

C. Fans suspended from the building structure shall be provided with the required restraints to prevent swaying or lateral movement during start up and normal operation. Submit installation details with fans shop drawings.

D. Deliver equipment to the site in manufacturer's original packaging. Clearly mark each piece of equipment with the proper identification number. Storage shall be done in accordance with the requirements of Specifications Division 01 and Section 23 00 00.

E. Provide extended lubrication tubes and fittings for service of bearings located in difficult to reach sections of the equipment. Provide additional extensions as directed by Engineer or the Owner.

F. Duct elbows located near the fan discharge shall always be in the direction of fan rotation. Equipment installer shall coordinate arrangement of fan section to assure this condition is met. Inlet duct connections shall be free of turbulence.

G. Air moving equipment shall be joined to duct sections with a 30 oz. neoprene coated, glass fiber flexible connector.

3.03 EQUIPMENT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacturer used as the basis of design. For all other acceptable manufacturers, shop drawing data shall indicate equal or better performance characteristics than the basis of design equipment.

B. Once unit airside performance is achieved, replace adjustable sheave with a fixed sheave as selected by the Test and Balance Agency. Replacement shall be done at no cost to the contract. Include information in the Test and Balance Report and the Operations and Maintenance Manual.

3.04 TEST AND BALANCE

A. Test and Balance Agency shall adjust fan belts and test and record equipment performance. Refer to Specifications Section 23 95 00.

B. Test and Balance Agency shall select replacement fixed sheave for belt driven fans once unit airside performance is achieved.

3.05 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code and equipment manufacturer for the proper maintenance or removal of equipment.

B. Coordinate with other trades so no conduit interfere with the required clearances.

C. Notify contractor for general construction when in order to install this equipment work by other trades needs to be relocated.

3.06 IDENTIFICATION

A. Each piece of equipment shall be identified as per Specifications Section 23 08 00 with a permanently engraved plastic plate securely attached to equipment. Identification numbers shall be as directed by the City of Tampa Wastewater Department Project Manager.

3.07 CORROSION PROTECTION

A. All fans specified under this section of the specifications shall have a corrosion protection coating applied as per Specifications Section 23 41 00.

END OF SECTION – 23 70 00

SECTION 23 95 00 – TEST AND BALANCE

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Division 01 and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. The contractor shall procure the services of a local, independent Test and Balance Agency, hereinafter referred to as the Agency, approved by the Engineer, which specializes in the testing and balancing of heating, ventilating, and air conditioning systems.

B. The Agency shall test, balance and adjust all air systems and temperature control equipment specified in this Division 23 of the Specifications.

C. The Contractor shall award the test and balance contract to the Agency as soon as possible to allow them to schedule their work in cooperation with other trades and meet the completion date.

D. The Agency shall test each Sequence of Operation for all systems to verify proper operation. Include description of operation in report, verify that all controls are installed and operating in accordance with the control Sequence of Operation on plans or on equipment submittals.

E. Submit a certified Test and Balance Report to the Engineer at least one week prior to the scheduled Substantial Completion. Refer to Specifications Division 01. If the report is not available, the Substantial Completion may be re-scheduled.

1.03 RELATED DOCUMENTS

A. Work covered under other sections of the specifications related to testing and balancing includes but is not limited to the following:

23 00 00	Mechanical General Requirements
23 70 00	Fans and Vents

B. Work performed under the above sections is herein referred to as the Installer. Refer to specific items of work provided by each Installer. Installers shall cooperate with test and balance agency as required during execution of the work under this Section.

C. Prior to commencing the work under this Section, The Agency staff shall visit the construction site to review the work specified under the above listed Sections as it relates to work under this Section. Any deviations from plans and specifications that may affect the performance of the system(s) shall be reported to the

Engineer and Contractor.

1.04 QUALITY ASSURANCE

A. Contractor shall list in his bid the name of the local Agency he proposes to use for the project. Agency is subject to acceptance by Engineer. Submit qualifications of Test and Balance Agency to Engineer for review and approval. Submission shall be forwarded as soon as contractor is selected. Once accepted, contractor, without good cause, cannot replace Test and Balance Agency.

B. All instruments used for test and balance shall be accurately calibrated within six months of commencing work on this project and maintained in good working order. Provide proof of calibration upon request.

C. Submit qualifications of Test and Balance Agency to Engineer for review and approval. Submit proposed test and balance procedures, list of equipment to be used and any other information that will allow the Engineer to properly evaluate Agency's capabilities as related to the Project.

D. All readings shall be within +10% / -5% of the values shown on the plans and specifications, shop drawings and manufacturer's literature. Readings for outside airflow shall be within –5% - 0% of the values shown on the plans. These allowances do not relieve the Agency from adjusting speed controllers, belts and other control devices to achieve design conditions.

E. Prior to commencing its work, the Test and Balance Agency shall meet with the contractor and installers to review and obtain copies of the **latest** construction documents, addenda, shop drawings, change orders, field changes and any other information necessary for their thorough and complete understanding of the scope of the project. If required information is not readily available from the Contractor, Agency may request that information directly from the Engineer. Contractor shall be responsible for all reproduction costs.

F. The Agency shall be represented at the time of substantial completion for a random check of the values contained in the test and balance report. If report values cannot be verified, Agency shall re-test the entire system, prepare a new report and submit to the Engineer.

G. Project will not be considered substantially complete until Test and Balance Report can be reviewed and verified.

H. For additional Quality Assurance requirements refer to Specifications Division 01 and Section 23 00 00.

1.05 WARRANTY

A. During the first year after completion of test and balance work, the owner may request a recheck or resetting of any outlet, supply fan, or exhaust fan listed in the test and balance report.

1.06 REPORTS

A. At the end of each workday, the Agency technician shall furnish the Contractor with a list of items that must be repaired or adjusted. Provide a copy to the Engineer.

B. Test and Balance information shall be compiled in a neat, orderly, itemized format on standard AABC or NEBB Forms. Test data shall be submitted to the Engineer

for review. Provide minimum of three (3) hard copies of the report for Engineer's review. When electronic copies are submitted, they shall be in PDF format. For large reports, a readable CD or DVD will be required.

C. After review comments are satisfied furnish the Engineer three (3) final sets of the complete final report. A report is deemed to be final when all outstanding items listed on previous reports have been corrected and are no longer listed on the report.

D. Included in the report shall be the following minimum information. Identify each piece of equipment with project tag number, model number and serial number. Serial number on exhaust fans may be omitted.

1. Air quantities at each exhaust air device tabulated against CFM shown on the Drawings.

2. Static pressure readings entering and leaving each exhaust fan. These readings shall be related to fan curves for CFM handled.

3. Motor current readings at each fan. The voltage at the time of readings shall be listed.

4. Test controls and Sequence of Operations of equipment.

5. Provide calculations and recommended fixed sheave selection for each fan where adjustable sheaves were used for test and balance. Contractor shall install fixed sheaves.

E. Submit three (3) bound copies of the final complete Test and Balance Report one week prior to substantial completion. Electronic copies are <u>not</u> acceptable other than for progress review of data. Failure to comply with this request may result in a postponement of the Substantial Completion Inspection.

1.07 COORDINATION WITH CONTRACTOR AND INSTALLERS

A. The Agency staff shall visit the construction site to review and become familiar with the installation of pipe systems, sheet metal work, temperature controls and other components and parts of the heating, air conditioning, and ventilating systems. Verify that adequate provisions have been made for the testing and balancing of the systems and equipment.

B. The Agency will not instruct or direct the Contractor in any work but will provide him with daily reports of his findings with copy to the Engineer.

C. The Contract Documents indicate dampers and miscellaneous flow adjustment devices for the purpose of obtaining optimum operating conditions. When additional dampers are required by the Agency to achieve design airflows, the contractor, at no additional cost to the contract, shall provide them. It will be the responsibility of the Contractor to install these devices in a manner that leaves them accessible and adjustable. The Agency should be consulted if there are any questions concerning the arrangement and access to any control devices.

D. The controls installer shall initially set, adjust, relocate (if necessary), and calibrate all controls. The Agency shall verify proper operation of controls. Include in the report one week prior to the Substantial Completion a statement that all controls have been tested for proper operation in accordance with the Sequence of Operation and design intent.

E. Contractor to install fixed sheaves on air handling equipment as recommended by Test and Balance Agency.

Part 2 - PRODUCTS

NOT APPLICABLE

Part 3 - EXECUTION

3.01 GENERAL

A. Installer of mechanical systems shall make all preliminary tests and adjustments, place all systems and equipment in full operation and promptly notify the Test and Balance Agency to start their work. Installer shall maintain all systems in operation during each working day of testing and balancing.

B. Installer shall promptly correct all deficiencies noted by the Agency so as not to delay the completion of the test and balance work.

C. It shall be the responsibility of the Contractor to replace fan drives, sheaves, belts and/or motors as recommended by the Agency (without cost to the contract) to attain the specified air volumes.

END OF SECTION – 23 95 00

SECTION 25 31 00

GENERAL INSTRUMENTATION AND CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes requirements for furnishing and installing instrumentation and control systems including all work and materials necessary to perform control and monitoring functions as illustrated on drawings, and as specified in the following sections:

1. Section 25 31 01 - Field Instruments
2. Section 25 31 02 - Panel Devices and Enclosure Construction
3. Section 13451 - PLC Systems

1.2 REFERENCES

A. Codes and Standards referred to in this Section are:

1. IEEE 802.3 10/100/1000 Mbps baseband networks
2. ISA-S5.4 Instrument Loop Diagrams.
3. NFPA 70 National Electrical Code
4. UL Underwriter's Laboratory
5. NEMA National Electrical Manufacturers Association

1.3 DEFINITIONS

A. Terminologies

1. Systems Integrator: Firms regularly engaged in providing instrumentation, control, and Supervisory Control and Data Acquisition (SCADA) systems.
2. PLC: Programmable Logic Controller system, including power supply, central processing unit (CPU), communication controller, interconnect cables, and input and output interface.
3. OIT: Graphical local Operator Interface Terminal at PLC enclosures.
4. SCADA (Supervisory Control and Data Acquisition): SCADA is an integrated network of PLCs, OITs, HMIs, servers, PCs, printers and network switches. It serves as the computer based system-wide monitoring and control system.

1.4 SYSTEM DESCRIPTION

A. General Description of Work

1. Provide new magnetic flow meter on the pump station discharge force main.
2. Provide new bubbler level monitoring of the two halves of the wet well including new bubbler transmitters, pneumatic circuits and bubbler downtubes.
3. Provide a new Pump Control PLC and PLC Panel for monitoring and control for the new station pumps as shown.
4. There is an existing SCADA PLC and Motorola MOSCAD radio telemetry system. The MOSCAD unit shall be removed and provided to the City of Tampa. A new Motorola ACE3600 Remote Terminal Unit shall be provided and installed by the CONTRACTOR.
5. Most of the existing I/O signals connected to the existing SCADA PLC associated with pump control will be eliminated and replaced with new I/O signals at the new Pump Control PLC.

Only certain existing I/O signals are to be retained and transferred to the new Pump Control PLC.

B. Programming and Software Configuration

1. Provide all programming and software configuration for the new Pump Control PLC as part of this contract work.
2. All programming modifications and/or additions for the new Motorola ACE3600 RTU will be performed by the CONTRACTOR.

C. Provide all materials and work necessary for complete and fully functional system.

1. Provide instrumentation and control components as well as system integration. Provide all mounting hardware and supports. Work shall include panel mounting and the completion of all wiring terminations within control panels.
2. Coordinate work with all electrical, mechanical, and structural work furnished in this contract.
3. Ensure proper interface between PLC, OIT and network systems and equipment furnished in this contract.
4. Install, make final connections, adjust, test, start-up systems per manufacturer's instructions and recommendations.

D. Design Requirements

1. General: Provide instrumentation and control system for the pumping station as indicated herein and as shown on drawings.
2. Provide the new PLC System to monitor all PLC controlled systems, which include all work performed in this contract.
3. The pumping station will remain linked to the H. F. Curren Wastewater Treatment Plant via an existing SCADA communications link. The remote SCADA link is the responsibility of the City. Any connections to and/or modifications to the SCADA link will be performed by the City.

E. Source Code Ownership

1. Any developed ladder logic (along w/ source code) shall become property of the City of Tampa. This applies to any logic associated with any package control systems as well.

1.5 SUBMITTALS

A. General: Provide submittals as specified in the Specific Provisions and as required below. Submit documents as follows:

1. Provide cover sheet on each submittal with the following information:
   a. Project Title, Location and Owner
   b. Submittal Title
   c. Submittal Order (First Submittal, Re-submittal Number, etc.)
2. Organize and divide documents, using tagged dividers, into logical divisions.
3. Provide index sheets.
4. Minimum drawing size: 8-1/2 by 11 inches. Put drawings, larger than 11 by 17 inches, in three-hole plastic pockets.
5. Type all text.
6. Do not submit faxed documents.

B. Action Submittals

1. Product Data: Submit manufacturer's official and published product data, specifications, and installation recommendations for each item.

2. Shop Drawings: Submit shop drawings as per the Specific Provisions, and as required below. Include the following information in each submittal:

a. Instrument index, including tag number, description, location, and calibrated range for each instrument.

b. Individual instrument specification sheet, including manufacturer's name and complete catalog number.

c. PLC Input and Output drawings, containing, but not limited to, the following information:

(1) Instrument tag numbers

(2) Individual component locations

(3) Actual equipment wiring terminal designations, point to point wiring, and cable shield terminations

(4) Wire type, size and identification number

(5) Signal types (e.g., 120 Volt ac, 4-20 mAdc, pulse frequency, etc.)

(6) Contact orientations (e.g., normally open, normally closed, etc.)

(7) Equipment grounding requirements

(8) Signal boosters, interposing relays, optical isolators, and shunt resistors.

C. Information Submittals (for owner information, not for approval)

1. Test Reports: Submit all loop field calibration reports.

2. Manufacturer's Instructions: Submit manufacturer published installation manuals for each instrument.

D. Contract Closeout Information Submittals (for owner information, not for approval): Provide submittals as required below.

1. Project Record Documents: In addition to requirements described in the Specific Provisions, provide the following:

a. PLC program documentation: Provide paper copies of all PLC software development and configuration including listing of all PLC register tables.

b. Include functional narrative description of the developed ladder logic to describe each control system. Ladder logic is to be annotated as specified in Section 13451 to include functional alphanumeric description of logic elements to assist Owner in understanding the ladder logic for troubleshooting and future modification.

c. PLC program copies: Provide two digital copies of fully configured PLC systems. Digital copies shall be in CD-ROM format.

d. Operator interface program copies: Provide hard copy printouts and digital copies of new OIT screens and database listings. Digital copies shall be in CD-ROM format.

2. Operation and Maintenance Data: Provide operation and maintenance manuals as specified in the Specific Provisions. Include the following information:

a. Recommended spare parts list.

b. Manufacturer approved repair and service centers list.

c. Replacements part sources.

d. Recommended maintenance procedures and frequencies.

3. Warranty: Provide warranty certificate as described in the Specific Provisions.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements

1. Code Compliance: Comply with National Electrical Code (NFPA 70) 2014 edition, the Florida Building Code (FBC) 6th edition 2017 and Chapter 5 of the City of Tampa Code and any and all local codes, applicable to construction and installation of electrical wiring, devices, material and equipment.

2. NECA Standards: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation".

3. UL Labels: Provide control panel components, power supplies, controllers, relays, etc., which have been listed and labeled by Underwriter's Laboratories.

B. The purpose of contract drawings and specifications is to convey information required for complete and functioning systems. Systems Integrator is responsible for all details necessary to properly install, adjust, and place in operation, intended systems. "Instrument Schedules" and "PLC I/O Summaries" are provided for convenience; their accuracy is not guaranteed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store, and handle all products and materials as specified in the Specific Provisions.

B. Packing and Shipping

C. Acceptance at Site: Inspect all materials and equipment against approved shop drawings at time of delivery. Immediately return for replacement or repair any equipment or materials damaged or not meeting requirements of approved shop drawings.

D. Storage and Protection: Label all equipment and materials after they have been inspected. Store all equipment and materials in dry, covered, ventilated location. Protect from harm in accordance with manufacturer's recommendations.

1.8 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Protect all equipment and instruments specified herein from moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Allowable hardware manufacturers are listed in the respective specification sections.

2.2 MONITORING AND CONTROL – GENERAL

A. These sections contains functional descriptions of the pump station equipment and processes to be monitored and controlled by (or through) the new PLC system.

B. Configure the PLC system to meet the functional requirements specified herein.

C. Make all register and I/O data available to the PLC system for monitoring via the existing remote Treatment Plant SCADA system.

D. PLC shall examine status of operating mode input from each equipment item/group. PLC control logic and outputs shall only be activated if the equipment is in the proper operating mode (auto, computer or remote, as applicable). Computer Mode and Remote Mode inputs to the PLC generally refer to the same thing, i.e. that control is now handed off to the PLC.

E. In general, all PLC control discrete outputs for starting and stopping equipment are to be configured as maintained “Run” signal commands which are maintained during a power failure.

2.3 TYPICAL MONITORING AND CONTROL STRATEGIES

A. Continuous Process Signal Monitoring

1. Indicate each continuous process signal monitored on Operator Interface Terminal in direct engineering units.
2. Include operator adjustable alarm points for each process signal for Low-Low, Low, High, High-High and rate of change.
3. Generate an alarm when the process signal is out-of-range.
4. Totalize flow signal in PLC to obtain the following information:
   a. Cumulative running total (dedicated reset from OIT that is password protected)
   b. Total flow since midnight today

B. Typical Setpoint Control Adjustment

1. Provide each operator adjustable timer and process variable setpoint with minimum and maximum limits.
2. Provide numerical fields for setpoint entry. Setpoint entries should be in direct engineering units.
3. Provide out of range warning message if attempts are made to set setpoints less than the minimum limit, or greater than the maximum limit.

2.4 ALARM PROCEDURES

A. Program the PLC and local OIT to annunciate the alarms:

1. When an alarm occurs, program associated PLC to function as follows:
   a. Display alarm event in annunciator table format on the OIT at the new PLC Panel.

B. Program the PLC to permit user to acknowledge the alarm from the OIT or from a remote SCADA HMI workstation.

2.5 CONTROL STRATEGY – PUMPING

A. Flow meters:

1. Provide a new magnetic flowmeter on the discharge pipeline of the pumps as shown. Connect the flowmeter output to the new PLC.

B. Configure the new PLC to monitor and control the pumps. Develop OIT screens to display the running and alarm status of the pumps. Include display of station flow and pump speed. Include totalized flow values on the display. Configure the OIT with a reset function, password protected, to allow the operator to reset the cumulative flow totalizer value from the OIT.

C. Each pump has a HAND-OFF-AUTO mode selector at the AFD. In HAND mode, the operator starts and stops the pumps manually at the drive.

D. When the HAND-OFF-AUTO selector at the AFD is in AUTO, configure the PLC to control the pump.

E. General Background:

1. There will be three, equal 250-hp pumps at the pump station. Normal control strategy is to operate with one lead and one lag pump. Pumps in excess of the lead and lag should only be placed on line manually, after the pump station headers have been opened up to both discharge lines.
2. Use 80% of full speed as the typical maximum speed under automatic conditions. This allows the pumps to operate at a good point on their pump curves. Provide ability to manually input the maximum allowable pump speed, as described below.
3. Allow the operator to select the lead-lag1 pump sequence from any of the three pumps from the OIT. Also, provide the capability of making any pump the lag2 pump, which will only come on upon failure of the lead or 1st lag pump. Configure pump start-stop controls and speed ramps based on adjustable level settings in the wet well.

F. The signals from the two new bubbler wet well level transmitters are to be used for the pump control and alarm settings. Allow the operator to select the active wet well bubbler level signal at the OIT.

G. Develop OIT screen showing pump mode and running status, alarms and pump speed. Each pump has a Local/Off/Remote mode switch at the AFD control panel. PLC control is active when the local mode selector is in Remote mode.

H. Configure the OIT screen to include wet well levels, discharge flow and totalization values. Provide a reset function to allow the operator to reset the flow totalizer value for “Total flow to Date” from the OIT.

PART 3 EXECUTION

3.1 ERECTION, INSTALLATION AND APPLICATION

A. General

1. Install all instruments and equipment in strict compliance with manufacturer's instructions.
2. Mount all gages and indicators in upright position.
3. Provide sufficient space around equipment for maintenance and removal of equipment.
4. Cover front panels, gages and indicators during construction for protection from dust, weld and paint splatter.
5. Unless otherwise impractical, mount all indicating instruments at eye level (5 feet).
6. Unless otherwise impractical, support instruments independent of process piping.

B. Installation Hardware

1. Provide 316 stainless steel nuts and bolts.
2. Provide aluminum or stainless steel support channels.
3. Provide 1/4-inch thick minimum, clear anodized aluminum equipment mounting plates.

4. Provide EPDM gaskets to prevent galvanic reaction between dissimilar metal surfaces.

C. Equipment Identification and Instrument Tags

1. Provide embossed stainless steel tags as specified in Section 13420.
2. Provide an engraved laminated plastic plate at each wall-mounted instrument panel, indicating panel and instrument function and tag.
3. Engraved laminated tag colors: Provide black lettering on white background. Mount tags at eye level.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspection: Provide tests as required in the Specific Provisions.

B. Inspection: Demonstrate that instruments, panels, and PLC equipment,

1. Has not been damaged by transportation or installation,
2. Has been properly installed,
3. Has no mechanical defects,
4. Is in proper alignment, and
5. Has been properly connected.

C. Tests: Perform the following tests:

1. Field-calibrate all field instruments. Test all analog input loop zeroes and spans by disconnecting wiring at each transmitter and by connecting a 4-20 mA generator. PLC Panel OIT shall display correct value based on simulated 4-20 mA signal.
2. Test all external alarm contacts by placing jumpers across normally open contact inputs, or by physically disconnecting wiring on normally closed contact inputs. These procedures shall be done at location of field contacts.
3. Test digital inputs and outputs by actual starting and stopping of equipment when possible, or with jumpers at field equipment terminals.
4. Conduct all tests in presence of Owner personnel or Engineer.

D. Manufacturers Field Service: Provide manufacturer field service for calibration, initial setup, programming and commissioning of each instrument.

END OF SECTION

SECTION 25 31 01

FIELD INSTRUMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Scope:

1. Provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation all primary sensors and field instruments furnished under this Section.

2. Install all in-line flow elements and provide taps in the process piping systems for installation of other flow, pressure, level and temperature sensing instrumentation.

3. Drawings and Specifications illustrate and specify functional and general construction requirements of the sensors and field instruments and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. Provide all components, piping, wiring, accessories and labor required for a complete, workable and integrated system.

B. Instruments furnished under other Sections

1. Certain field instruments are specified to be included with the equipment furnished by the vendor under other specification sections. These instruments shall generally meet the requirements specified in this section where applicable.

2. Instruments furnished by other equipment vendors/manufacturers are not included in the schedule at the end of this section but are generally shown on the P&IDs.

C. Coordination: Coordinate the installation of all items specified herein and required to ensure the complete and proper interfacing of all the components and systems.

D. Related Sections:

1. Section 25 31 00 - General Instrumentation and Control
2. Section 25 31 02 - Panel Devices and Enclosure Construction
3. Section 25 31 03 - PLC Systems

1.02 QUALITY ASSURANCE

A. Comply with the requirements of Section 25 31 00, General Instrumentation and Control.

B. Acceptable Manufacturers:

1. Furnish primary sensors and field instruments by the named manufacturers or equal equipment by other manufacturers.

2. The named manufacturers have been specified to establish the standard of quality and performance of the equipment to be supplied.

3. Obtain all sensors and field instruments of a given type from the same manufacturer.

4. The primary sensors and field devices shall be interchangeable with similar function existing primary sensors and field devices to minimize spare parts inventory.

C. Manufacturer's Responsibilities and Services:

1. Design and manufacture the primary sensors and field instruments in accordance with the applicable general design requirements specified in Section 25 31 00, General Requirements, and the detailed specifications herein.

2. Field supervision, inspection, start-up and training in accordance with the requirements of the Specific Provisions.

1.03 SUBMITTALS

A. Comply with the requirements specified in the Specific Provisions and Section 25 31 00, General Instrumentation and Control.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements specified in Section 25 31 00, General Instrumentation and Control.

B. Primary sensors and field instruments shall not be delivered to the site until all product information and system Shop Drawings for the sensors and instruments have been approved.

1.05 IDENTIFICATION TAGS

A. All sensors and field instruments shall have an identification tag meeting the following requirements:

1. Tag numbers for sensors and field instruments shall be as listed on the Drawings as the equipment number.

2. The identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self tapping screws of appropriate size.

3. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.

4. All sensors and field instruments mounted on or within panels shall have the stainless steel identification tag installed so that the numbers are easily visible to service personnel.

1.06 SPARE PARTS:

A. Provide the following spare parts:

1. One complete bubbler level transmitter system package including spare air filter, air flow regulator, purgemeter and transmitter.

2. One spare magmeter flow converter.

PART 2 PRODUCTS

2.01 GENERAL:

A. Provide components to operate on 115-volt ac, single phase, 60 hertz electrical service unless otherwise specified.

B. Provide two-wire transmitter power supplies as required. Loop power supplies are to be installed in the PLC cabinets complete with a separate fuse and blown fuse indicator for each analog circuit.

C. Provide fuses or switches for equipment as recommended by the instrument manufacturer.

D. Provide contacts for control of motor operated or electrically operated equipment rated minimum 10 amps at 115 volts' ac, 60 hertz. Provide contacts for low level analog signal switching of the gold bifurcated, cross bar type.

E. Provide 4-20 mA dc analog output signals from all process transmitters.

F. Where interposing relays are required to provide proper contact rating from devices interfacing to the PLCs, install the relays in the PLC cabinets. See Section 25 31 02.

G. Furnish all necessary accessories for installation, including mounting brackets, floor stands, hardware and like items.

H. Provide tool kits and test equipment, as recommended by the manufacturer, necessary for assembling, calibrating and maintaining equipment.

2.02 BUBBLER LEVEL TRANSMITTER

A. Provide air bubbler-type level transmitter components assembled in a separate bubbler control panel, complete with air pressure regulators, constant differential relays, pneumatic tubing, valves and pressure transmitter as shown.

B. Air Filter: Provide coalescing air filter for moisture and particulate removal. Provide ½" NPT air connections, Grade 6 filter element, auto drain and DPI indicator. Provide Parker model HN2S-6QUW or equal.

C. Pressure Regulator: Provide air supply filter-regulator with 0-120 psi output range adjustment, 3-micron filter with self-relieving design. Provide Siemens Model 91-HF or equal.

D. Constant Differential Relays: Provide a constant differential relay for each bubbler to maintain a constant volumetric flow rate of bubbler air to the liquid level bubbler downtube. Provide integral needle valve to adjust the air flow rate. Design the differential relay to ensure a constant volumetric rate of flow, regardless of variations in the process or supply pressure. Provide integral purgemeter (rotameter) to indicate the air flow. Indicator to have a scale suitable for 0-2.5 scfh air flow. Provide Siemens Model 62-VA or equal.

E. Level Gauges:

1. Provide bronze bourdon tube actuated, 4 ½ -inch size, phenolic case with glass or clear plastic window.

2. Scale: 0-15 psi / 0-34 feet combination gauge

3. Accuracy: 0.5 percent of range (Grade 2A per ANSI B40.1)

4. Manufacturer: Ashcroft, Weksler, US Gauge or equal.

F. Stainless Steel Tubing: Fully annealed, type 304 seamless meeting ASTM A269 with stainless steel compression type fittings.

G. Tubing Valves: instrument grade, ball type shutoff. Stainless steel construction.

H. Level Transmitter:

1. Differential capacitance cell type. Two-wire, 4-20 mAdc output signal. Loop powered from 24 volts dc nominal. Output load impedance of at least 550 ohms.

2. Microprocessor based "smart" electronics. HART protocol compatible.

3. Accuracy: +\- 0.10 percent of calibrated span.

4. Span and zero continuously adjustable, either locally or via hand-held digital interface.

5. NEMA 4 housing. Suitable for operation over ambient temperature range of 20-120 degrees F.

6. Ceramic or stainless steel wetted parts. Stainless steel bleed and drain fittings. All metal external parts.

7. Integral 4-digit LCD output indicator graduated 0-100 percent. Provide integral mounting bracket suitable for wall or pipestand mounting.

8. ½-inch NPT process connections.

9. Manufacturer: Yokogawa EJA430 or equal

2.03 INFRARED HYDROCARBON GAS ANALYZER

A. The hydrocarbon gas detector shall be a diffusion-based point-type infrared gas detector type approved to provide continuous monitoring of methanol gas concentrations in the range of 0 to 100% LEL.

B. The detector shall provide a 4-20 mA output signal, corresponding to the detected gas concentration.

C. The detector shall operate at 24VDC with an operating range of 18-30VDC.

D. The detector shall be suitable for use in outdoor applications.

E. The detector shall be globally certified for use in Class 1, Divisions 1 and 2, and Zones 1 and 2 hazardous areas.

F. The detector shall comply to ANSI/ISA 12.13.01-2000 performance standards.

G. The detector shall not require routine calibration to ensure proper operation.

H. The detector shall provide fail-safe operation.

I. The detector shall automatically provide a continuous self-test to indicate a fault or fouled optics condition.

J. The detector shall provide a multi-layered filtering system to protect optics from dirt and water ingress.

K. The detector shall provide an internal heating system to minimize condensation, allowing reliable operation through temperature extremes.

L. The detector shall produce a 4-20mA output to indicate a calibration or fault condition.

M. The detector shall provide a 0 to 100% LEL detection range.

N. Acceptable manufactures.

1. Det-Tronics Model PIR9400S3P2AW with stainless steel detector.

PART 3 EXECUTION

3.01 ERECTION, INSTALLATION AND APPLICATION

A. General

1. Strictly follow manufacturer recommendation for installation of the field instruments. The Contractor shall be responsible for any problems

resulting from any deviation from manufacturer installation instructions.

2. Mount all transmitters vertically, with the integral indicators facing front or sides. For pipe mounted instruments, provide sufficient clearance to permit 360° access to the units.

3. Seal all conduit and wiring entries into all instruments installed below ground or in vaults with non-setting transparent potting material. Seals shall be water tight, suitable for submergence in 30 feet of water.

3.02 FIELD QUALITY CONTROL

A. Manufacturers Field Service

1. Secure the services of factory personnel for instrument start-up and calibration. Calibrate each instrument, including its complete instrument loop. Indication at remote receiving instruments, including any SCADA system operator interface screens, shall be equal to readings at local transmitter indicators.

2. Provide written loop-calibration report for each instrument loop, which shall include, but not limited to the following:

a. Date and time the final calibration was completed.

b. Weather conditions at the time the final calibration was performed.

c. Comparison of readings at the local transmitters with readings at the remote receiving instruments.

d. Verification of operation of all contact outputs, including those at the receiving instruments.

e. Description of method of calibration.

f. Provide a table showing calculated and measured values at 0%, 25%, 50%, 75%, and 100%.

g. Names and signatures of factory personnel performing calibration.

h. Names and signatures of Owner representative witnessing calibration process.

END OF SECTION

SECTION 25 31 02

PANEL DEVICES AND ENCLOSURE CONSTRUCTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes technical requirements for fabrication, engineering, wiring and installation of instrument panels and enclosures and providing the panel mounted instruments and equipment. These include, but are not limited to the following:

1. Panel Construction
2. Panel Wiring
3. Panel Mounted Equipment

B. Related Sections:

1. Section 25 31 00 - General Instrumentation and Control
2. Section 25 31 01 - Field Instruments
3. Section 25 31 03 - PLC Systems

1.2 SUBMITTALS

A. General: Provide submittals as specified in the Specific Provisions and as required in section 25 31 00.

B. Pre-Construction Submittals

1. Product Data: Submit manufacturer's official and published product data, specifications, and installation recommendations for each item. Product data shall include terminal wiring details, and manufacturing and calibration data.
2. Shop Drawings: Include the following information:
   a. Bill of materials
   b. Front panel layout
   c. Internal panel layout
   d. Internal wiring diagrams, including wire type, size and identification number
   e. Terminal block layout
   f. Nameplate lists
   g. Color schedules
   h. Elementary control diagrams
3. Provide loop diagrams conforming to ISA-S5.4 "Instrument Loop Diagrams".

1.3 QUALITY ASSURANCE

A. Comply with the applicable provision of the following codes and standards:

1. Underwriters Laboratory (UL)
2. Electrical Testing Laboratory (ETL)
3. National Electrical Code (NEC)
4. National Fire Protection Association (NFPA) 79, Electrical Standard for Industrial Machinery
5. Instrumentation Society of America (ISA)

B. All electrical materials and equipment shall be new and shall bear the label of the Underwriters' Laboratory (UL), Inc., Factory Mutual (FM) or equivalent where standards have been established and label service regularly applies. All control panels to be UL508 certified.

C. All PLC/SCADA/I&C control panels, when required by Code(s), shall comply with the requirements of UL-508A, and NEC 409, Industrial Control Panels, as specified in Section 16055, Electrical Requirements for Shop-Assembled Equipment.

D. Provide integrated instrumentation systems. Assign complete responsibility for furnishing, coordination, assembly, and installation supervision of all equipment to one Systems Integrator regularly engaged in the manufacture, assembly and production of systems of type specified. Provide complete, satisfactory, and trouble-free operating installation.

E. Furnish like instruments from the same manufacturer. Minimize number of different manufacturers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers include the following:

1. Enclosure: Hoffman, Hammond or equal
2. Terminal Blocks: Phoenix Contact, Weidmuller
3. Power Supplies: Phoenix Contact, Action Instruments
4. Signal Isolators: Action Instrument, Moore Industries, Phoenix Contact
5. Pushbuttons, selector switches and pilot lights: Allen Bradley, Square D
6. Digital Panel Indicators: Precision Digital PD765-6X2-00.
7. Electronic bar graph indicators: Omega BG-18-1-P7.
8. UPS: Powerware, APC or equal.

2.2 GENERAL REQUIREMENTS

A. Panels and enclosures shall meet the NEMA requirements for the type specified.

B. Sizes shown are estimates. Furnish panels and enclosures amply sized to house all equipment, instruments, front panel mounted devices, power supplies, power distribution panels, wiring, tubing and other components installed within.

C. Panels located inside control or electrical room areas shall be NEMA 12 rated unless specified otherwise.

D. Panels located in process areas or outdoors (except areas classified as hazardous locations) shall be NEMA 4X stainless steel unless specified otherwise.

E. Provide lifting rings on panels in excess of 100 pounds.

F. Panels are to be sized by the integrator based on the equipment furnished. Intended panel sizes are shown on the drawings. Panels may be increased in size only upon prior approval by the Engineer.

G. Provide panel fabrication such that all internal installed devices are located on a back plate of the panel. Devices mounted on the sides of the panel will not be allowed.

H. Panel Mounted Equipment

1. Unless otherwise specified, provide components to operate on 120 Volts AC single phase 60-Hertz power.
2. Provide 24Vdc two-wire transmitter power supplies as required.
3. Provide interposing relays and signal isolators to protect panel mounted equipment from electrical surges induced in field wiring.
4. Provide engraved laminated nameplates to identify each panel mounted component. The nameplates shall have black lettering on white background. Lettering height shall be 3/16-inch minimum.

I. Panel Accessories

1. Provide panel heaters, corrosion inhibitors and breather drains for condensation and corrosion control inside panel. Panel heaters shall be of forced air types, provided with integral thermostatic control.
2. One UPS supply receptacle 120 VAC, 20A duplex type.
3. One “service receptacle”, 120 VAC, 20A duplex, grounding type receptacle.
4. One 24V LED light fixture with lamp and protective plastic shield.
5. Provide a UPS inside the PLC panel to provide surge protection and backup power to the PLC equipment and network equipment. Size the UPS for the PLC and communication components furnished, designed to give 15-minute operation under full load. Provide rating of 500-VA minimum. Provide unit with hot-swappable batteries.
    a. Connect UPS to UPS supply receptacle via plug and cable.
    b. Wire PLC enclosure via plug and cable into UPS output receptacle so that PLC equipment and network adapter are powered by the UPS. (When UPS fails, enable user to power PLC enclosure directly from duplex UPS supply receptacle.)

2.3 PANEL CONSTRUCTION

A. NEMA 12 Panels

1. Fabricate enclosures using minimum 14 gage steel for wall or frame mounted enclosures and minimum 12 gage for free standing enclosures. Steel shall be free of pitting and surface blemishes.
2. Continuously weld all exterior seams and grind smooth.
3. Provide stiffening members for strength and stiffness as required.
4. Panel shall be flat within 1/16-inch over a 24-inch by 24-inch area.
5. Use pan type construction for doors. Door widths shall not exceed 36-inches.
6. Mount doors with full length heavy duty piano hinge with stainless steel pin.
7. Provide oil resistant gasket completely around each door or opening.
8. Provide handle-operated, oil-tight, key-lockable three-point stainless steel latches.
9. Use stainless steel fasteners throughout.
10. Provide interior mounting panels and shelves constructed of minimum 12 gage steel.
11. Provide steel print pocket with white enamel finish.
12. Provide enclosure mounting supports as required for floor, frame, or wall mount.
13. Provide all holes and cutouts for installation of conduit and equipment. Provide water tight conduit hubs. (Double locknuts are not acceptable.)
14. Completely clean all interior and exterior surfaces so they are free of dirt and corrosion.
15. One coat of primer shall be applied to all interior and exterior surfaces
16. All interior surfaces shall be painted with two coats of semi-gloss white
17. All exterior surfaces shall be painted with a minimum of three finish coats, ANSI 61 grey.
18. Provide one extra quart of touch-up paint for each exterior finish color.
19. Install a 12 AWG bonding jumper between doors and internal grounding lug.

B. NEMA 4X Panels

1. Fabricate NEMA 4X enclosures from 14 gauge (minimum) stainless steel.
2. Provide stainless steel hardware including hinge and cover clamps.
3. Do not paint stainless steel enclosure exterior surface.
4. Sandblast, roughen, or chemically etch stainless steel enclosures to reduce gloss, reflections and glare.
5. Provide conduit knock-outs prior to installation of equipment inside enclosure. Provide water tight conduit hubs. (Double locknuts are not acceptable.)
6. Provide door clamps on three sides of enclosure door. Clamps shall be quarter-turn or similar tool-less means.

7. Rolled lip around three sides of door and along top of enclosure opening.
8. Hasp and staple for padlocking.
9. Provide a clear plastic, gasketed lockable hinged door to encompass all non-NEMA 4 front of panel instruments.
10. Install a 12 AWG bonding jumper between doors and internal grounding lug.

2.4 PANEL GROUNDING

A. Provide ground busbars, which shall be directly wired and connected to facility grounding system.

B. Provide dc ground bus (for analog cable shield termination) bonded to chassis ground.

C. Provide nickel-plated copper busbars, with current rating of 100 amperes.

D. Provide each busbar with at least twenty (20) screw clamp terminal blocks, each capable of accepting #10 AWG conductors.

E. Terminal, control, relay, and instrumentation panels. Use a 12 AWG bonding jumper between doors and internal grounding lug.

2.5 PANEL WIRING

A. Terminate all wiring, to and from field devices, at panel terminal blocks, not on equipment terminals.

B. Do not terminate more than two wires at the same terminal. Wiring splices and wire nuts will not be permitted within the enclosure.

C. Provide wire identification at each wire end. Utilize computer-generated, heat-shrink type wire markers.

D. Install all wiring in plastic wiring ducts, provided with snap-on covers. Size ducts to include at least 100% spare capacity. Restrain all wiring outside of ducts with plastic ties.

E. Group and wrap all wires passing a door hinge in protective wire harness. Provide abrasion protection for wire bundles passing through holes or across sheet metal edges.

F. Provide panel wiring of stranded copper with 600-volt rated thermoplastic insulation.

1. Power wiring: No. 14 AWG minimum
2. Control wiring: No. 18 AWG minimum
3. Electronic signal wiring: No. 18 twisted shielded pair minimum
4. Ethernet network wiring: Category 5e minimum
5. Other serial communication cables: As recommended by equipment manufacturer.

G. Wire color convention shall comply with NFPA 79 (1994), part 16:

1. Line, load, and control conductors: black.
2. Neutral: white.
3. Equipment safety ground: green.
4. AC control circuit: red
5. DC control circuit: blue
6. Foreign voltage control wire: orange

H. Physically separate AC wiring from DC wiring.

1. Where AC and DC wiring runs in parallel, provide at least 2-inch separation.
2. Where AC and DC wiring cross, they shall cross at 90°.

I. Do not daisy-chain neutral wiring and grounding conductors at equipment terminals. Provide terminal blocks that accept jumper bridges.

2.6 TERMINAL BLOCKS

A. Provide terminal blocks for field wiring and equipment wiring terminations. Provide unique identification at each terminal block.

1. Arrange terminal blocks in consecutively, based on standard alphanumeric order.
2. Group terminal blocks based on voltage level and function.
3. Color code foreign voltage terminal block identification to match wire insulation.

B. Provide at least 25% spare terminal blocks for each type used in each enclosure.

C. Provide high-density modular type terminal blocks suitable for mounting on standard DIN rails.

1. Material: Nylon
2. Termination type: tubular screw with serrated pressure plate.
3. Current carrying parts (metal bodies): nickel or tin-plated copper.
4. Ground terminal blocks shall be dual color type: Green and Yellow.
5. Maximum conductor size: No. 8 AWG stranded.
6. Current rating: Up to 15 amperes at 250 volts AC.
7. Supply manufacturer jumper bridges, designed to fit on terminal blocks. Do not daisy-chain wiring.

D. Provide fused terminal blocks for panel power distribution.

1. Provide disconnect lever and fuse-puller mechanism.
2. Provide illuminated indication to indicate status of load-side power.
3. Fuses shall be standard 1/4" by 1-1/4", and sized to protect load.

E. Provide two-level type terminal blocks for PLC discrete input and outputs. Both levels shall be of the feed through types.

F. Provide three-level type terminal blocks for analog signal wiring. Top and center terminations shall be feed through types. Bottom termination shall be grounded to isolated mounting railing, connected to the dc ground bus.

2.7 PANEL MOUNTED EQUIPMENT

A. DIN Rails: Provide all DIN rails of aluminum construction.

B. Interposing Relays

1. Provide interposing relays to interface all PLC discrete outputs with field-mounted equipment.
2. Provide high density, DIN rail mounted type relays, with coils, contacts, and voltage ratings as required. Contacts shall be rated 10 Amperes at 120 volts minimum. Relays shall have LED indicator to indicate coil status.
3. Relays for control of motor starters larger than NEMA size 1 shall be DPDT, rated 15 Amperes at 250 VAC.

C. Regulated Power Supplies

1. Provide regulated DC power supply as required for PLC discrete inputs, 2-wire analog loops and instrument power. Size power supplies to include 100% spare capacity.
2. Power supplies shall be as follows:
   a. Input power: 110 Volts AC, 60 Hz.
   b. Output power: 24 Volts DC at 200 mA or 500 mA
   c. Output regulation: <1%
   d. Operating temperature: 0 to 50° C
   e. DIN Rail mountable.

D. Control Devices and Pilot Lights

1. General: Pushbuttons, selector switches, and indicating lights shall be 30mm diameter heavy-duty types, oiltight, watertight and corrosion resistant. Provide a legend plat at each device.
2. Contact block current rating: 10 amperes at 240 volts AC.
3. Pilot lights shall be super-bright LED type with 120V lamps, color cap, and push-to-test feature. Provide flashing types where indicated.

E. Signal Isolators

1. Provide 4-wire type for use as a signal isolator, converter and/or repeater.
2. Input Signal: 4-20 mA dc, field configurable for other signal ranges.
3. Input Impedance: No greater than 50 ohms.
4. Isolation: 1000-volt RMS output from input, power and ground; fully floating

5. Output Signal: 4-20 mA dc into 800 ohms minimum. Where dual signal isolator is shown, provide isolator that "splits" a 4-20 mAdc process signal input and delivers two identical, completely isolated outputs to two separate control devices.
6. Accuracy: +/- 0.1% of span
7. Power Supply: 120-volt ac, 60 hertz or 24-volts dc
8. Enclosure: designed for high density DIN rail mount
9. Isolators are not scheduled.
    a. Provide as shown and as necessary to eliminate ground loop problems when connecting instruments to other instrument loops.

F. Digital Panel Indicators

1. Type: Electronic, 3-1/2 Digit LED, 0.56-inch high display
2. Input Impedance: no greater than 250 ohms.
3. Power Source: 110-volt ac, 60 hertz
4. Input Signal: 4-20 mAdc
5. Input Dampening: Adjustable
6. Enclosure: 1/8 DIN, general purpose for indoor flush panel mount. Indicators for outdoor panels shall have a NEMA 4 bezel rating or be mounted behind a weatherproof gasketed door assembly.
7. Accuracy: +/- 0.05 percent of span +/- 1 count
8. Decimal Point: Selectable via DIP switches or keypad.
9. Input Connections: Compression type screw terminals
10. Range Selection: DIP switches, multiturn potentiometers, or keypad.
11. Power: 115 Vac or 24 Vdc.

G. Electronic Bargraph-type Panel Indicators

1. LED light bar with 41 individual LEDs, vertical panel mounted.
2. Measureing range adjustable via DIP switches.
3. Red LED with dot or bar display selectable.
4. 1" x 4" nominal size indicator with 0-100% scale calibration.
5. Power: 24 Vdc.

2.8 SOURCE QUALITY CONTROL

A. Tests and Inspection

1. Test each panel in conjunction with factory acceptance test as described in Section 13400.

PART 3 EXECUTION

3.1 PREPARATION

A. Sequence enclosure installation as follows:

1. Install enclosures and conduits, and pull field wiring into enclosures.
2. Seal all wire entries with non-setting silicon compound to prevent moisture from entering enclosure.
3. Cover enclosure installation thoroughly with heavy-duty plastic sheet to protect against moisture, paint splatter and dirt. Cover until 120-volt power is available, and enclosure is ready to receive internal panel.
4. Terminate field wiring on terminal blocks.
5. Energize panel heater and keep enclosure door closed when no work is being performed in enclosure. (Do not energize any other equipment prior to field wiring termination check.)
6. Check accuracy of field wiring termination. Thoroughly test for continuity.
7. Energize panel mounted equipment only after all wiring has been thoroughly checked and tested.
8. Energize panel heater to prevent condensation inside the panel.

3.2 ERECTION, INSTALLATION AND APPLICATION

A. Do not install control panels or enclosures directly against concrete walls. Provide stainless steel channels between wall and enclosure. Mount enclosure to stainless steel channels.

B. Install enclosures and panels level and plumb. Touch up all nicks, scratches, etc. with materials recommended by enclosure manufacturer.

C. Vacuum and clean all panel interior surfaces prior to system commissioning.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspection

1. Demonstrate that each enclosure and each panel mounted equipment:
   a. Has not been damaged during transportation or installation.
   b. Has been properly installed.
   c. Has no mechanical defects.
   d. Is in proper alignment.
   e. Has been properly wired and connected.

3.4 DEMONSTRATION

A. Test all control function as described in the Specific Provisions and Section 13400. In addition, perform the following:

1. Calibrate all process variable indications.
2. Adjust all alarm setpoints.
3. Tune all control function to achieve optimum and stable control.

3.5 SCHEDULES

A. Provide the following panels and enclosures:

Panel	Quant	NEMA Rating	Comment
Pump Control PLC Panel CP-L01	1	NEMA 4X	New PLC Panel
Bubbler Panel BP-L01	1	NEMA 4X	New bubbler panel

B. Provide other control panels for equipment package control systems which meet the general requirements of this section.

C. See drawings and specification Section 13400 for enclosure function and enclosure mounted equipment.

END OF SECTION

SECTION 25 31 03

PROGRAMMABLE LOGIC CONTROL (PLC) SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This section includes requirements for providing a Programmable Logic Control (PLC) system, local operator interface systems and all appurtenances required for monitoring and control of equipment and unit processes. The PLC will serve as the digital SCADA system interface to field devices and signals. The SCADA shall be remotely connected to a SCADA HMI workstation located remotely at the H. F. Curren Wastewater Treatment Plant.

B. Programming and Software Configuration

1. All programming and software configuration for the Motorola ACE 3600 RTU shall be included as part of this contract work.

2. All programming and software configuration for the PLC and HMI will be included as part of this contract.

C. Provide all submittal documents within 90 days of Notice to Proceed.

D. Work includes all elements of the systems specified. Provide all control hardware complete with power supplies, enclosures, accessories, and other appurtenances. Provide installation of new equipment, and testing necessary for the proper operation of the control system.

E. Related Sections

1. Section 25 31 00 - General Instrumentation and Control
2. Section 25 31 01 - Field Instruments
3. Section 25 31 02 - Panel Devices and Enclosure Construction

1.02 SYSTEM DESCRIPTION

A. Existing System

1. The existing Pump Control in the Pump Station is to be removed and turned over to the City of Tampa for inventory purposes.

2. There is an existing Motorola MOSCAD™ radio telemetry system connected to the existing SCADA PLC via serial data link. This telemetry system provides a backup communication link to the treatment plant SCADA system. This system will be replaced by a Motorola ACE3600 unit. Refer to specification section 25 31 04. The existing Motorola MOSCAD™ unit may be utilized to provide temporary communications during construction. Refer to contract drawings.

B. Design Requirements

1. Program the PLC to achieve pump station control and monitoring described in Section 25 31 00.

2. Fully configure PLC system and appurtenances to form a complete working system.

C. Provide complete systems, which shall include, but not be limited to I/O racks or chassis, power supplies, input and output modules, special communication modules, local operator interface systems, and power and communication cables.

D. Provide one copy of PLC programming software and one copy of operator interface system programming software as specified herein. Software licensing to be for the City of Tampa. Turn all software and manuals over to Owner personnel at job completion.

1.03 SUBMITTALS

A. Submit product data as required in Section 25 31 00.

1. Submit data sheets and catalog literature on each type of equipment.

2. Submit programming and installation manuals for each type of equipment.

B. Documentation:

1. Provide all documentation related to PLC configuration.

2. Furnish all manuals, PLC logic documentation and application programmer's notes.

3. Furnish listing of PLC register tables.

4. Furnish hard copy printout of all PLC logic at project closeout.

C. Operation and Maintenance Manuals: Submit operation and maintenance manuals.

1.04 SPARE PARTS

A. Provide the following spare parts:

1. One PLC processor

2. One digital input module of each type utilized

3. One digital output module of each type utilized

4. One analog input module of each type utilized

5. One analog output module of each type utilized

6. One power supply assembly of each size utilized

7. One communications module of each type utilized

8. One dozen fuses of each size furnished

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General

1. The PLC system shall comprise the following categories of components: Baseplates, Power Supplies, CPUs, I/O Modules, Option Modules, and Cables.

B. Manufacturer

To ensure compatibility with other Wastewater Department control systems, and to limit the City's inventory of spare parts, the Programmable Logic Controller components shall be a GE RX3I series. Do not substitute.

C. Baseplates

1. Provide a new 12 slot Universal baseplate and a new 12 slot expansion baseplate as required by the contract documents.

D. Power Supplies

1. Provide the power supplies indicated on the contract drawings. Provide power supply suitable for 120-VAC single phase input power.

E. Input and Output (I/O) Modules

1. Provide the required I/O modules to enable the PLC to interface with input and output field devices such as switches, sensors, relays, and solenoids. Provide both discrete and analog I/O types as required by the application. Provide 16 channel discrete and analog input modules. Provide a minimum of 25% spare I/O, or 2 spare I/O, (whichever is greater) for each type used. Provide I/O modules as specified on the contract drawings.

F. Option Modules

1. Provide Option Modules as required for this application. These modules shall extend the capability of the PLC beyond the basic functions providing such things as communications and networking options, motion control, high speed counting, temperature control, interfacing to operator interface stations, etc.

Provide modules which plug into the baseplate as part of the integrated PLC system; stand-alone converters, etc, are not acceptable.

G. Cables

1. Provide PLC manufacturer's standard prefabricated cables to connect the PLC components together or to other systems. For example, cables shall be provided to:

   a. interconnect baseplates

   b. connect a programmer to the CPU or to an option module

   c. connect option modules to field devices or other systems.

2. Provide cables of the proper length. No splices shall be allowed.

H. Software and Documentation

1. Program the PLC in ladder logic using IBM compatible software. Provide all configuration software and all necessary interface hardware and cables under this Contract to become the property of the City. The software is to be designed, developed, and documented by the Contractor. The Contractor shall be responsible for providing the details of the design and supplying the City with a set of reproducible as-built drawings. The Operation and Maintenance Manual shall include program documentation containing ample comments and a narrative of the actual working program with a symbol cross-reference legend for the system.

I. Operator Interface Terminals

1. Provide 15-inch diagonal color graphic Operator Interface Terminal (OIT).

2. Display: 1024x768 TFT color.

3. Touchscreen: analog resistive

4. Communications:

   a. Ethernet port

   b. 3 serial ports, RS-232/RS-485

   c. 2 USB ports

5. Multiple simultaneous protocols for multi-controller communications.

6. 256MB flash memory, 256MB SDRAM.

7. NEMA 4 enclosure suitable for 32-122 degrees F.

8. Power: 24VDC. Integrator to provide suitable DC power supply for the OIT or power from the PLC panel 24VDC loop power supply.

9. Provide complete with Windows based configuration software and cables for the OIT.

10. Manufacturer: Maple Systems model HMI5150P or equal.

11. Provide 7-inch diagonal color graphic Operator Interface Terminal (OIT).

12. Display: 800x480 TFT color.

13. Communications:

    a. Ethernet port

14. Multiple simultaneous protocols for multi-controller communications.

15. NEMA 4 enclosure suitable for 32-122 degrees F.

16. Power: 24VDC. Integrator to provide suitable DC power supply for the OIT or power from the PLC panel 24VDC loop power supply.

17. Manufacturer: Maple Systems model HMI5070B or equal.

2.02 ENCLOSURES

A. Provide the PLC in the enclosures as specified on the contract drawings.

Power supply

A. Provide a small UPS at PLC panel as specified on the contract drawings.

PART 3 EXECUTION

3.01 INSTALLATION AND APPLICATION

A. Inputs and Outputs Isolation

1. Design PLC discrete inputs to monitor dry contact closures, sourced from the PLC enclosure.

2. Design PLC discrete outputs to energize terminal block style interposing relays as specified in Section 25 31 02.

B. Provide all communication cables necessary for complete working systems. Provide surge protection on all communication ports as necessary.

C. Interface with Other Products

1. Provide all special interface modules necessary for complete working systems. These shall include all necessary cables and connectors as required.

D. Testing

1. Test all control function as described in Section 25 31 00.

3.02 INPUT/OUTPUT SIGNAL SUMMARY SCHEDULE

A. Input and output signals for the Pump Control PLC are shown on the drawings. The I/O is summarized by location in the table below.

B. The I/O summary represents the SCADA PLC hard-wired inputs and outputs for the Pump Control PLC specified in this Section.

C. In addition to the 12 spare discrete inputs shown on the drawings, provide minimum 25 percent installed spare I/O of each type, or 2 I/O, whichever is greater. Round up to the nearest whole signal number.

1. Spare I/O shall be installed, wired and interfaced to the terminal strips.

2. Expandability. Allow any or all prewired spare points to become active points. Include related documentation changes. Spares utilization will be subject to following limitations.

a. Change will not be made subsequent to Submittal approval of PLC panel or process area loop drawings.

b. Treat changing of active points to spare points in same manner as incorporation of spares.

D. Signal types are as follows:

1. DI Digital (discrete) Input

2. DO Digital (discrete) Output

3. AI Analog Input

4. AO Analog Output

TABLE 25 31 03-1
Input/Output Point List for CP-L01

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSAI101	Analog In	Pump No. 1 Motor Vibr	(1)	(1)	AI1	1	(1)	(1)

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSAI102	Analog In	Pump No. 1 Motor Temp	(1)	(1)	AI1	2	(1)	(1)
LOUSAI103	Analog In	Pump No. 1 Pump Vibr	(1)	(1)	AI1	3	(1)	(1)
LOUSAI104	Analog In	Pump No. 1 Pump Temp	(1)	(1)	AI1	4	(1)	(1)
LOUSAI105	Analog In	Pump No. 2 Motor Vibr	(1)	(1)	AI1	5	(1)	(1)
LOUSAI106	Analog In	Pump No. 2 Motor Temp	(1)	(1)	AI1	6	(1)	(1)
LOUSAI107	Analog In	Pump No. 2 Pump Vibr	(1)	(1)	AI1	7	(1)	(1)
LOUSAI108	Analog In	Pump No. 2 Pump Temp	(1)	(1)	AI1	8	(1)	(1)
LOUSAI109	Analog In	Pump No. 3 Motor Vibr	(1)	(1)	AI1	9	(1)	(1)
LOUSAI110	Analog In	Pump No. 3 Motor Temp	(1)	(1)	AI1	10	(1)	(1)
LOUSAI111	Analog In	Pump No. 3 Pump Vibr	(1)	(1)	AI1	11	(1)	(1)
LOUSAI112	Analog In	Pump No. 3 Pump Temp	(1)	(1)	AI1	12	(1)	(1)
LOUSAI113	Analog In	Spare	(1)	(1)	AI1	13	(1)	(1)
LOUSAI114	Analog In	Spare	(1)	(1)	AI1	14	(1)	(1)
LOUSAI115	Analog In	Spare	(1)	(1)	AI1	15	(1)	(1)
LOUSAI116	Analog In	Spare	(1)	(1)	AI1	16	(1)	(1)
LOUSAI201	Analog In	Flow Meter	(1)	(1)	AI2	1	(1)	(1)
LOUSAI202	Analog In	Down Stream Level	(1)	(1)	AI2	2	(1)	(1)
LOUSAI203	Analog In	Up Stream Level	(1)	(1)	AI2	3	(1)	(1)
LOUSAI204	Analog In	Generator Fuel Tank Level	(1)	(1)	AI2	4	(1)	(1)
LOUSAI205	Analog In	LEL Level	(1)	(1)	AI2	5	(1)	(1)
LOUSAI206	Analog In	Spare	(1)	(1)	AI2	6	(1)	(1)
LOUSAI207	Analog In	Spare	(1)	(1)	AI2	7	(1)	(1)
LOUSAI208	Analog In	Spare	(1)	(1)	AI2	8	(1)	(1)
LOUSAI209	Analog In	Spare	(1)	(1)	AI2	9	(1)	(1)
LOUSAI210	Analog In	Spare	(1)	(1)	AI2	10	(1)	(1)
LOUSAI211	Analog In	Spare	(1)	(1)	AI2	11	(1)	(1)

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSAI212	Analog In	Spare	(1)	(1)	AI2	12	(1)	(1)
LOUSAI213	Analog In	Spare	(1)	(1)	AI2	13	(1)	(1)
LOUSAI214	Analog In	Spare	(1)	(1)	AI2	14	(1)	(1)
LOUSAI215	Analog In	Spare	(1)	(1)	AI2	15	(1)	(1)
LOUSAI216	Analog In	Spare	(1)	(1)	AI2	16	(1)	(1)
LOUSAO301	Analog Out	AFD No. 1 Speed Command	(1)	(1)	AO3	1	(1)	(1)
LOUSAO302	Analog Out	AFD No. 2 Speed Command	(1)	(1)	AO3	2	(1)	(1)
LOUSAO303	Analog Out	AFD No. 3 Speed Command	(1)	(1)	AO3	3	(1)	(1)
LOUSAO304	Analog Out	CP-L01 LEL Indication	(1)	(1)	AO3	4	(1)	(1)
LOUSAO305	Analog Out	Spare	(1)	(1)	AO3	5	(1)	(1)
LOUSAO306	Analog Out	Spare	(1)	(1)	AO3	6	(1)	(1)
LOUSAO307	Analog Out	Spare	(1)	(1)	AO3	7	(1)	(1)
LOUSAO308	Analog Out	Spare	(1)	(1)	AO3	8	(1)	(1)
LOUSAO309	Analog Out	Spare	(1)	(1)	AO3	1	(1)	(1)
LOUSDO401	Digital Out	AFD No. 1 Run Command	(1)	(1)	DO4	1	0	1
LOUSDO402	Digital Out	AFD No. 2 Run Command	(1)	(1)	DO4	2	0	1
LOUSDO403	Digital Out	AFD No. 3 Run Command	(1)	(1)	DO4	3	0	1
LOUSDO404	Digital Out	LEL Alarm Light	(1)	(1)	DO4	4	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	5	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	6	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	7	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	8	0	1
LOUSDI501	Digital In	Pump 1 Auto Selected	(1)	(1)	DI5	1	0	1
LOUSDI502	Digital In	Pump 1 OFF Selected	(1)	(1)	DI5	2	0	1
LOUSDI503	Digital In	AFD 1 E-STOP	(1)	(1)	DI5	3	0	1
LOUSDI504	Digital In	AFD 1 Run Status	(1)	(1)	DI5	4	0	1

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSDI505	Digital In	AFD 1 Fault	(1)	(1)	DI5	5	0	1
LOUSDI506	Digital In	AFD 1 Control Power OK	(1)	(1)	DI5	6	0	1
LOUSDI507	Digital In	Pump 1 Not Ready	(1)	(1)	DI5	7	0	1
LOUSDI508	Digital In	Pump 1 Discharge Valve Fail	(1)	(1)	DI5	8	0	1
LOUSDI509	Digital In	Pump 1 Vibration Warning Alarm	(1)	(1)	DI5	9	0	1
LOUSDI510	Digital In	Motor 1 Vibration Warning Alarm	(1)	(1)	DI5	10	0	1
LOUSDI511	Digital In	Pump 1 CTC Temp Alarm	(1)	(1)	DI5	11	0	1
LOUSDI512	Digital In	Spare	(1)	(1)	DI5	12	0	1
LOUSDI513	Digital In	Spare	(1)	(1)	DI5	13	0	1
LOUSDI514	Digital In	Spare	(1)	(1)	DI5	14	0	1
LOUSDI515	Digital In	Spare	(1)	(1)	DI5	15	0	1
LOUSDI516	Digital In	Spare	(1)	(1)	DI5	16	0	1
LOUSDI601	Digital In	Pump 2 Auto Selected	(1)	(1)	DI6	1	0	1
LOUSDI602	Digital In	Pump 2 OFF Selected	(1)	(1)	DI6	2	0	1
LOUSDI603	Digital In	AFD 2 E-STOP	(1)	(1)	DI6	3	0	1
LOUSDI604	Digital In	AFD 2 Run Status	(1)	(1)	DI6	4	0	1
LOUSDI605	Digital In	AFD 2 Fault	(1)	(1)	DI6	5	0	1
LOUSDI606	Digital In	AFD 2 Control Power OK	(1)	(1)	DI6	6	0	1
LOUSDI607	Digital In	Pump 2 Not Ready	(1)	(1)	DI6	7	0	1
LOUSDI608	Digital In	Pump 2 Discharge Valve Fail	(1)	(1)	DI6	8	0	1
LOUSDI609	Digital In	Pump 2 Vibration Warning Alarm	(1)	(1)	DI6	9	0	1
LOUSDI610	Digital In	Motor 2 Vibration Warning Alarm	(1)	(1)	DI6	10	0	1
LOUSDI611	Digital In	Pump 2 CTC Temp Alarm	(1)	(1)	DI6	11	0	1
LOUSDI612	Digital In	Spare	(1)	(1)	DI6	12	0	1
LOUSDI613	Digital In	Spare	(1)	(1)	DI6	13	0	1
LOUSDI614	Digital In	Spare	(1)	(1)	DI6	14	0	1

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSDI615	Digital In	Spare	(1)	(1)	DI6	15	0	1
LOUSDI616	Digital In	Spare	(1)	(1)	DI6	16	0	1
LOUSDI701	Digital In	Pump 3 Auto Selected	(1)	(1)	DI7	1	0	1
LOUSDI702	Digital In	Pump 3 OFF Selected	(1)	(1)	DI7	2	0	1
LOUSDI703	Digital In	AFD 3 E-STOP	(1)	(1)	DI7	3	0	1
LOUSDI704	Digital In	AFD 3 Run Status	(1)	(1)	DI7	4	0	1
LOUSDI705	Digital In	AFD 3 Fault	(1)	(1)	DI7	5	0	1
LOUSDI706	Digital In	AFD 3 Control Power OK	(1)	(1)	DI7	6	0	1
LOUSDI707	Digital In	Pump 3 Not Ready	(1)	(1)	DI7	7	0	1
LOUSDI708	Digital In	Pump 3 Discharge Valve Fail	(1)	(1)	DI7	8	0	1
LOUSDI709	Digital In	Pump 3 Vibration Warning Alarm	(1)	(1)	DI7	9	0	1
LOUSDI710	Digital In	Motor 3 Vibration Warning Alarm	(1)	(1)	DI7	10	0	1
LOUSDI711	Digital In	Pump 3 CTC Temp Alarm	(1)	(1)	DI7	11	0	1
LOUSDI712	Digital In	Spare	(1)	(1)	DI7	12	0	1
LOUSDI713	Digital In	Spare	(1)	(1)	DI7	13	0	1
LOUSDI714	Digital In	Spare	(1)	(1)	DI7	14	0	1
LOUSDI715	Digital In	Spare	(1)	(1)	DI7	15	0	1
LOUSDI716	Digital In	Spare	(1)	(1)	DI7	16	0	1
LOUSDI801	Digital In	Future Pump 4	(1)	(1)	DI8	1	0	1
LOUSDI802	Digital In	Future Pump 4	(1)	(1)	DI8	2	0	1
LOUSDI803	Digital In	Future Pump 4	(1)	(1)	DI8	3	0	1
LOUSDI804	Digital In	Future Pump 4	(1)	(1)	DI8	4	0	1
LOUSDI805	Digital In	Future Pump 4	(1)	(1)	DI8	5	0	1
LOUSDI806	Digital In	Future Pump 4	(1)	(1)	DI8	6	0	1
LOUSDI807	Digital In	Future Pump 4	(1)	(1)	DI8	7	0	1

LOUSDI808	Digital In	Future Pump 4	(1)	(1)	DI8	8	0	1

LOUSDI809	Digital In	Future Pump 4	(1)	(1)	DI8	9	0	1
LOUSDI810	Digital In	Future Pump 4	(1)	(1)	DI8	10	0	1
LOUSDI811	Digital In	Future Pump 4	(1)	(1)	DI8	11	0	1
LOUSDI812	Digital In	EF-1 No Air Flow	(1)	(1)	DI8	12	0	1
LOUSDI813	Digital In	EF-2 No Air Flow	(1)	(1)	DI8	13	0	1
LOUSDI814	Digital In	EF-1 Running	(1)	(1)	DI8	14	0	1
LOUSDI815	Digital In	EF-2 Running	(1)	(1)	DI8	15	0	1
LOUSDI816	Digital In	Spare	(1)	(1)	DI8	16	0	1
LOUSDI901	Digital In	SF-1 50% Speed	(1)	(1)	DI9	1	0	1
LOUSDI902	Digital In	SF-1 100% Speed	(1)	(1)	DI9	2	0	1
LOUSDI903	Digital In	SF-1 No Air Flow	(1)	(1)	DI9	3	0	1
LOUSDI904	Digital In	SF-1 AFD Fault	(1)	(1)	DI9	4	0	1
LOUSDI905	Digital In	SF-1 AFD Running	(1)	(1)	DI9	5	0	1
LOUSDI906	Digital In	SF-2 100% Speed	(1)	(1)	DI9	6	0	1
LOUSDI907	Digital In	SF-2 No Air Flow	(1)	(1)	DI9	7	0	1
LOUSDI908	Digital In	SF-2 AFD Fault	(1)	(1)	DI9	8	0	1
LOUSDI909	Digital In	SF-2 AFD Running	(1)	(1)	DI9	9	0	1
LOUSDI910	Digital In	Bar Screen Rake Running	(1)	(1)	DI9	10	0	1
LOUSDI911	Digital In	Bar Screen Compactor Running	(1)	(1)	DI9	11	0	1
LOUSDI912	Digital In	Bar Screen Common Alarm	(1)	(1)	DI9	12	0	1

LOUSDI913	Digital In	German Club MH Alarm	(1)	(1)	DI9	13	0	1
LOUSDI914	Digital In	German Club Common Alarm	(1)	(1)	DI9	14	0	1
LOUSDI915	Digital In	River Shore MH Alarm Pump 4	(1)	(1)	DI9	15	0	1
LOUSDI916	Digital In	River Shore Common Alarm	(1)	(1)	DI9	16	0	1

LOUSDI1001	Digital In	AC-1 Low Pressure	(1)	(1)	DI10	1	0	1
LOUSDI1002	Digital In	AC-1 Fault	(1)	(1)	DI9	2	0	1
LOUSDI1003	Digital In	AC-2 Low Pressure	(1)	(1)	DI9	3	0	1
LOUSDI1004	Digital In	AC-2 Fault	(1)	(1)	DI9	4	0	1
LOUSDI1005	Digital In	VP-1 Fault	(1)	(1)	DI10	5	0	1
LOUSDI1006	Digital In	VP-2 Fault	(1)	(1)	DI10	6	0	1
LOUSDI1007	Digital In	Generator Running	(1)	(1)	DI10	7	0	1
LOUSDI1008	Digital In	Generator Fault	(1)	(1)	DI10	8	0	1
LOUSDI1009	Digital In	Generator Diesel Tank Low Alarm	(1)	(1)	DI10	9	0	1
LOUSDI1010	Digital In	Generator Diesel Tank High Alarm	(1)	(1)	DI10	10	0	1
LOUSDI1011	Digital In	Generator Diesel Tank Leak Alarm	(1)	(1)	DI10	11	0	1
LOUSDI1012	Digital In	52-B1a Closed	(1)	(1)	DI10	12	0	1
LOUSDI1013	Digital In	86-B1 Tripped	(1)	(1)	DI10	13	0	1
LOUSDI1014	Digital In	52-B2a Closed	(1)	(1)	DI10	14	0	1
LOUSDI1015	Digital In	86-B2 Tripped	(1)	(1)	DI10	15	0	1
LOUSDI1016	Digital In	Spare	(1)	(1)	DI10	16	0	1

LOUSDI1101	Digital In	Pump 1 Vibration	(1)	(1)	DI11	1	0	1
LOUSDI1102	Digital In	Motor 1 Vibration	(1)	(1)	DI11	2	0	1
LOUSDI1103	Digital In	Pump 2 Vibration	(1)	(1)	DI11	3	0	1
LOUSDI1104	Digital In	Motor 2 Vibration	(1)	(1)	DI11	4	0	1
LOUSDI1105	Digital In	Pump 3 Vibration	(1)	(1)	DI11	5	0	1
LOUSDI1106	Digital In	Motor 3 Vibration	(1)	(1)	DI11	6	0	1
LOUSDI1107	Digital In	Spare	(1)	(1)	DI11	7	0	1
LOUSDI1108	Digital In	Spare	(1)	(1)	DI11	8	0	1
LOUSDI1109	Digital In	AFD 1 Running	(1)	(1)	DI11	9	0	1
LOUSDI1110	Digital In	AFD 1 Fault	(1)	(1)	DI11	10	0	1

LOUSDI1111	Digital In	AFD 2 Running	(1)	(1)	DI11	11	0	1
LOUSDI1112	Digital In	AFD 2 Fault	(1)	(1)	DI11	12	0	1
LOUSDI1113	Digital In	AFD 3 Running	(1)	(1)	DI11	13	0	1
LOUSDI1114	Digital In	AFD 3 Fault	(1)	(1)	DI11	14	0	1
LOUSDI1115	Digital In	52-B3a Closed	(1)	(1)	DI11	15	0	1
LOUSDI1116	Digital In	86-B3 Tripped	(1)	(1)	DI11	16	0	1
LOUSDI1201	Digital In	52-1a Closed	(1)	(1)	DI12	1	0	1
LOUSDI1202	Digital In	86-1 Tripped	(1)	(1)	DI12	2	0	1
LOUSDI1203	Digital In	52-2a Closed	(1)	(1)	DI12	3	0	1
LOUSDI1204	Digital In	86-2 Tripped	(1)	(1)	DI12	4	0	1

LOUSDI1205	Digital In	52-G1a Closed	(1)	(1)	DI12	5	0	1
LOUSDI1206	Digital In	86-G1 Tripped	(1)	(1)	DI12	6	0	1
LOUSDI1207	Digital In	52-G2a Closed	(1)	(1)	DI12	7	0	1
LOUSDI1208	Digital In	86-G2 Tripped	(1)	(1)	DI12	8	0	1
LOUSDI1209	Digital In	52-Ta Closed	(1)	(1)	DI12	9	0	1
LOUSDI1210	Digital In	86-T Tripped	(1)	(1)	DI12	10	0	1
LOUSDI1211	Digital In	52-A1a Closed	(1)	(1)	DI12	11	0	1
LOUSDI1212	Digital In	86-A1 Tripped	(1)	(1)	DI12	12	0	1
LOUSDI1213	Digital In	52-A2a Closed	(1)	(1)	DI12	13	0	1
LOUSDI1214	Digital In	86-A2 Tripped	(1)	(1)	DI12	14	0	1
LOUSDI1215	Digital In	52-A3a Closed	(1)	(1)	DI12	15	0	1
LOUSDI1216	Digital In	86-A3 Tripped	(1)	(1)	DI12	16	0	1

(1) To be provided as part of the contract document record drawings.

END OF SECTION

SECTION 26 00 00

ELECTRICAL – GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required for the City of Tampa's Louisiana Avenue Pump Station Improvements as hereinafter specified and shown on the Drawings. The work includes, but is not limited to, the following:

1. Submit pumping station bypass plans, including electrical service/controls details to the Engineer for review. An approved bypass system equipment must be in place and operable prior to starting demolition. Coordinate work with the City and TECO as required.

2. Submit pumping station temporary radio communications plan, including electrical service/controls details to the Engineer for review. An approved temporary radio communication plan must be in place prior to starting demolition. Coordinate work with the City as required.

3. Remove the existing 480V pump station electrical service feeders back to the base of the existing Tampa Electric Company (TECO) power distribution poles. All work shall be coordinated with TECO.

4. Provide and install new 480V pump station electrical service feeders from the base of the existing Tampa Electric Company (TECO) power distribution poles to the new service entrance switchgear to be provided. All work shall be coordinated with TECO.

5. Demolish and remove the existing Current Transformer (C.T.) Meter associated with the existing service.

6. Demolish and remove the existing 480V, 600A, service entrance disconnect switches located in the existing service entrance room.

7. The contractor shall carefully remove the existing Transfer Switches located in the existing service entrance room and turn over to the City of Tampa for maintenance inventory.

8. Demolish and remove the existing Motor Control Center (MCC). The contractor shall carefully remove the existing Adjustable Frequency Drive (AFD) for Pump #3 and all motor starters. The AFD and motor starters shall be turned over to the City of Tampa for maintenance inventory.

9. Demolish and remove the existing lighting fixtures and switches as indicated on the drawings.

10. Demolish and remove the existing 480V capacitor banks, located on the lower level of the pump station, as indicated on the drawings.

11. Demolish and remove the existing 480V motor starters and disconnects, located on the lower level of the pump station, as indicated on the drawings.

12. Provide and install the new service entrance switchgear, designated 'SWITCHGEAR LPS', as indicated on the drawings.

13. Provide and install the new Motor Control Center, designated 'MCC-LPS', as indicated on the drawings.

14. Provide and install the new Adjustable Frequency Drives, designated as 'AFD-P1', 'AFD-P2' and 'AFD-P3', as indicated on the drawings.

15. Provide and install the new standby generator set, designated as 'G-1' as indicated on the drawings.

16. The existing MOSCAD cabinet, located in the upper level equipment room, contains an existing MOSCAD-L unit, a Motorola Radius CM 200 radio, a Brighthouse cable modem, a Linksys RV042 VPN router, a UPS, a battery and a 24V DC power supply. The contractor shall carefully remove the components and turn them over to city for maintenance inventory. The MOSCAD-L unit may be utilized to provide temporary radio communications during construction.

17. The Contractor shall provide and install a new Pump Control Panel to be designated 'CP-L01'.

18. The Contractor shall provide and install a new Bubbler Control Cabinet to be designated 'BP-L01'.

19. The Contractor shall provide and install a new MOSCAD ACE3600 unit.

20. Provide and install new lighting fixtures, switches and lighting controls as indicated on the drawings.

21. Provide and install new 120V receptacles as indicated on the drawings.

22. Demolish and replace miscellaneous conductors/conduits as indicated on the drawings.

23. The contractor shall coordinate all site, electrical work, controls work, temporary construction power, temporary control systems, and all bypass systems required with City of Tampa staff and the mechanical contractor to allow for uninterrupted pump station operation during construction.

    a. The contractor shall provide all temporary power to the facilities required during construction. The contractor may rent the standby power engine/generator sets required or use equipment from his/her inventory. The contractor shall coordinate the temporary power requirements with the mechanical contractor, as diesel driven pump set(s) may also be utilized to accommodate a portion of the pumping requirements.

    b. The contractor shall also supply and install any and all circuit breaker panelboards, combination starters, Adjustable Frequency Drives, cabling, etc. that may be required to facilitate the temporary load connections.

c. The contractor shall submit shop drawings and cut sheets detailing his/her temporary power system proposal for engineer's approval. The contractor shall be fully responsible for maintaining power at all times to the said facilities, providing all diesel fuel required and performing all associated maintenance functions.

d. The Louisiana Avenue Pump Station telemetry system serves as a radio telemetry hub for the City's SCADA system. The operation of the radio telemetry system shall not be disrupted during the construction process.

e. The contractor shall submit shop drawings and cut sheets detailing his/her temporary control and radio telemetry system proposal for engineer's approval. The contractor shall be fully responsible for maintaining station control and radio communications at all times to the said facilities and performing all associated maintenance functions.

B. The work, apparatus and materials, which shall be furnished under these Specifications and accompanying Drawings, shall include all items listed hereinafter and/or shown on the Drawings. All materials necessary for the complete installation shall be furnished and installed by the CONTRACTOR to provide complete power, instrumentation, wiring and control systems as indicated on the Drawings and/or as specified herein.

C. The CONTRACTOR shall furnish and install the necessary cables, protective devices, conductors, supports, raceways, exterior electrical system, etc., to serve loads as indicated on the Drawings and/or as specified.

D. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; sub-standard work will be rejected.

E. It is the intent of these Specifications that the electrical system shall be suitable in every way for the service required. All material and all work, which may be reasonably implied as being incidental to the work of this Section, shall be furnished at no extra cost.

F. Furnish and install a complete system of conduit as herein specified and shown on the drawings.

G. Submit working drawings, parts schedules, cut-sheets, maintenance items to be performed and written testing protocol to the Engineer.

1.02 DEFINITIONS

A. Hazardous Areas: There are no classified areas in the pumping station except for the Wet Well and Screen Room, which is a Class 1, Division 1, Group D hazardous location.

B. Corrosive Areas: All areas outdoors and below grade with the exception of the Wet Well.

1.03 CODES, INSPECTION AND FEES

A. All material and installation shall be in accordance with the 2014 edition of the National Electrical Code and all applicable national, local and state codes, laws and ordinances.

1.04 TESTS

A. Test all systems and repair or replace all defective work. Make all necessary adjustments to the systems and instruct OWNER's personnel in the proper operation of the systems.

B. The minimum tests required shall be as indicated in Sections 25 31 00, 25 31 01, and 26 08 13 of the specifications.

C. The Engineer shall be notified forty-eight (48) hours before tests are made to enable the Owner to have designated personnel present.

1.05 CUTTING AND PATCHING

A. All cutting and patching shall be done in a thoroughly workmanlike manner.

1.06 INTERPRETATION OF DRAWINGS

A. The Drawings are not intended to show exact locations of conduit runs.

B. Each three-phase circuit shall be run independently, in a separate conduit. No conduit shall contain more than one (1) three-phase circuit.

C. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.

D. Where circuits are shown as "home-runs," all necessary fittings and boxes shall be provided for a complete raceway installation.

F. The locations of equipment, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

G. Circuit layouts shown are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.

H. The ratings of motors and other electrically operated devices together with the size shown for their branch circuit conductors and conduits are approximate only and are indicative of the probable power requirements insofar as they can be determined in advance of the purchase of equipment.

I. All connections to equipment shall be made as shown, specified and directed and in accordance with the approved shop drawings, regardless of the number of conductors shown on the Electrical Drawings.

1.07 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on a set of project Contract Drawings. When the project is complete, furnish a complete set of reproducible "As-built" drawings for the Project Record Documents.

1.08 COMPONENT INTERCONNECTIONS

A. Component equipment furnished under this Specification will not be furnished as integrated systems.

B. Analyze all systems components and their shop drawings; identify all terminals and prepare drawings or wiring tables necessary for component interconnection.

1.09 SHOP DRAWINGS

A. As specified under other Sections, shop drawings shall be submitted for approval for all materials, equipment, apparatus, and other items as required by the Engineer.

B. Prior to submittal by the CONTRACTOR, all shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list all discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.

C. The Engineer's check shall be only for conformance with the design concept of the project and compliance with the Specifications and Drawings. The responsibility of, or the necessity of, furnishing materials and workmanship required by the Specifications and Drawings, which may not be indicated on the shop drawings, is included under the work of this Section.

D. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this Section.

E. No material shall be ordered or shop work started until the Engineer's approval of shop drawings has been given.

1.10 PROJECT CONDITIONS

A. General: The Drawings indicate the extent and general arrangement of the principal electrical elements, outlets, devices and circuit layouts. Install and connect all electrical elements and devices to form a complete workable system as required by the Contract Documents, regardless of whether all system components are specifically stated in the Specifications or shown. Provide necessary materials and installation wherever required to conform to the specific requirements of the furnished equipment and for proper installation of the Work.

B. Schematics: In general the runs of feeders are shown schematically and are not intended to show exact routing and locations of raceways. Verify actual and final arrangement, equipment locations, and prepare circuit and raceway layouts before ordering materials and equipment. Equipment locations are approximate and are subject to modifications as determined by approved equipment dimensions.

C. Coordination of Work: Coordinate the Work so that the electrical equipment may be installed without altering building components, other equipment or installations.

D. Departure from Design: If departures are deemed necessary due to structural conditions, obstructions or other problems, provide details of such departures and the reasons for requesting approval as soon as practicable but not later than the submittal of the raceway layout drawings. Do not make any departures without written approval.

1.11 WARRANTY

A. Provide a warranty for all the electrical equipment in accordance with the requirements of other Sections. Under no circumstances shall the warranty be for less than one year starting from substantial completion.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 ROUGH-IN

A. Final Location: Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.02 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.

2. Verify all dimensions by making field measurements.

3. Arrange for chases, slots, and openings in other building components as construction progresses to provide for electrical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in cast-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum possible headroom.

7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide all required connections for each service.

8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the ENGINEER for resolution.

9. Where installed exposed in finished spaces, install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.

10. Provide electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

11. Provide access panels or doors where units are concealed behind finished surfaces.

12. Install systems, materials, and equipment providing right-of-way priority to systems required to be installed at a specified slope.

3.03 CUTTING AND PATCHING

A. General: Perform cutting and patching as specified in the General Provisions. In addition to the requirements specified in the General Provisions, the following requirements apply:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:

a. Uncover Work to provide for installation of ill-timed Work.

b. Remove and replace defective Work.

c. Remove and replace Work not conforming to requirements of the Contract Documents.

d. Remove samples of installed Work as specified for testing.

e. Install equipment and materials in existing structures.

f. Locate existing structural reinforcing with a pachometer where core drilled penetrations are required so as not to cut the steel reinforcing.

2. Cut, remove, and properly dispose of selected electrical equipment, components, and materials as indicated. Included are the removal of electrical items indicated to be removed and items made obsolete by the

new Work. Deliver all removed serviceable apparatus to the OWNER as directed.

3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

4. Provide and maintain adequate temporary partitions or dust barriers that prevent the spread of dust and dirt to adjacent areas.

5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

6. Patch finished surfaces and building components using new materials that are compatible with the original installation and applied by experienced installers.

END OF SECTION

SECTION 26 00 13

ELECTRICAL REQUIREMENTS FOR SHOP-ASSEMBLED EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing, installing and testing shop-assembled equipment as indicated, in accordance with the Contract Documents. Shop-assembled equipment panels and other items are specified under the driven equipment sections and may require external field connection to ancillary devices and other system components for interlocks and alarms. Provide all field wiring as required by the system and equipment specified under the driven equipment sections. This field wiring may not be specified or shown. This equipment includes but is not limited to the following:

1. Air compressors
2. Adjustable Frequency Drives (AFD's)
3. Standby Generator
4. Air monitoring equipment
5. Electric hoists and cranes
6. Miscellaneous control equipment
7. Odor control equipment
8. Pump and fan equipment
9. Sump pump equipment
10. Temperature control systems
11. Valve and gate operators

B. Related Work Specified in Other Sections, But is Not Limited to, the Following:

1. Section 4 - Concrete
2. Section 26 00 00 - Basic Electrical Materials and Methods
3. Section 26 05 19 – Wires and Cables
4. Section 26 05 33 – Electrical Raceway Systems
5. Section 26 27 19.19 - Electric Motors
6. Section 26 05 53 - Electrical Identification
7. Section 26 05 26 - Grounding
8. Section 26 27 19.13 – Control Components and Devices

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

2. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide the Shop Assembled equipment using the Components and Appurtenances meeting the requirements specified in Division 26.

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish manufacturer's data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities and other relevant data.

C. Shop Drawings: Furnish shop drawings for the shop-assembled equipment, including the following:

1. Layout drawings of the assembly showing accurately scaled basic equipment sections, auxiliary compartments and combination sections. Show special relationships of assemblies to associated equipment, including plan and front views of the equipment. Furnish a device summary.

2. Furnish wiring diagrams for assemblies that show connections to electrical power. Clearly differentiate between shop-installed portions of wiring and field installed portions.

3. Furnish construction drawings for equipment requiring field assembly. Clearly differentiate between shop-assembled portions and field assembled portions.

4. A manufacturer’s standard connection diagram or schematic showing more than one method of connection is not acceptable unless the intended method is clearly identified.

D. Quality Control: Furnish manufacturer's test reports and certified performance records of all equipment installed. Furnish field test reports after equipment is installed.

1.05 QUALITY ASSURANCE

A. Codes: Comply with local codes and all other applicable codes.

B. Regulatory Requirements: Comply with applicable Regulatory Agency requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

PART 2 PRODUCTS

2.01 FABRICATION

A. General: Provide shop-assembled equipment as standard products manufactured by companies regularly engaged in the manufacture of such equipment.

B. Factory Assembled Requirements: Provide control panels for shop-assembled equipment as complete factory assembled units that require only external

connections for installation including main disconnect and all electrical features necessary for the proper operation of the units.

C. Controls:

1. Motors 1/2 Hp and Larger:

a. Provide motors suitable for 480-volt, 3-phase, 60-hertz operation, with all controls at 115 volts or less.

b. Provide a combination circuit breaker along with all required control transformers, relays, timers, heaters and other necessary incidentals to form a complete functioning unit.

c. Provide NEMA Size 1 or larger starters.

2. Motors less than 1/2 Hp:

a. Provide motors suitable for 120-volt, single phase operation.

b. Provide manual motor starter with neon pilot light.

3. Provide all controls and equipment as specified in Section16491.

D. Control Components: Install principal control components in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Above grade indoor	NEMA 12 - Industrial
Outdoor and below grade elevation indoor	NEMA 4X - Watertight and corrosion-resistant (stainless steel) (fiberglass-reinforced thermal setting polyester formulation) with stainless steel external hardware. Provide all external operators made of the same materials as that of the enclosures
All areas listed Class I, Division 1 or 2, Group D as defined in Section 26 00 00 or as shown.	NEMA 7 - Explosion-proof

E. Miscellaneous Controls:

1. Provide float switches, pressure switches, limit switches, thermostats and other auxiliary control devices to satisfy the intended service.

2. Provide contacts rated at 10-amperes, 120 volts, 60-hertz ac, unless otherwise specified.

3. Provide limit switches that function in accordance with contact development charts.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install shop-assembled equipment as indicated, in accordance with manufacturer's written instructions.

B. Coordination: Coordinate cabling and wiring as necessary to interface installation of shop-assembled equipment.

C. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.

D. Grounding Connections: Make equipment grounding connections for the shop-assembled equipment as specified and shown. Tighten connections in accordance with UL Standard 486A to assure permanent and effective grounding.

E. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation upon completion of the Contract.

END OF SECTION

SECTION 26 00 16

ELECTRICAL UTILITY COORDINATION AND REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for arrangement and coordination with the Utility Company for the permanent electrical power service.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 4 - Concrete
2. Section 26 29 23 - Adjustable Frequency Drives
3. Section 26 05 73 - Short Circuit and Coordination Study

1.02 SYSTEM DESCRIPTION

A. Utility Company: Tampa Electric Company
702 N. Franklin Street
Tampa, FL 33602

B. Utility Company Contact: Brock Blackmore
Telephone: 813-228-1008
E-mail: btblackmore@tecoenergy.com

C. System Characteristics:

1. 480 Volts

2. 3 Phase

3. 4 Wire

4. Solidly Grounded Neutral

D. The electrical service work includes the de-commissioning of the existing 480V electrical services derived from the secondary of TECO pole-mounted transformers and replacing with new 480V electrical services derived from the secondary of TECO pad mount transformers located in the same or close proximity of the existing transformers. The new 480V electric services will terminate in a 480V switchgear configured in a main-tie-main arrangement with the tie normally open.

1.03 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in the Specific/General Provisions.

B. Correspondence: Furnish copies of all correspondence with the Utility Company including available short circuit currents and X/R ratings for each feeder.

C. Utility Company Drawings: Furnish Utility Company prepared drawings.

D. Layout Drawings: Furnish the following drawings:

1. Equipment pad details
2. Equipment mounting details.

1.04 QUALITY ASSURANCE

A. General: Perform Work in accordance with Utility Company's written requirements and standards.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify that field measurements are as indicated on Utility Company drawings.

PART 2 PRODUCTS

2.01 UTILITY METERING

A. Revenue Meters: Meters will be furnished by Utility Company.

B. Meter Base: Provide meter base in accordance with the requirements of the Utility Company.

C. Metering Transformers: Metering transformers furnished by the Utility Company at the pad mount transformers. Provide wiring to remote meter bases as directed by the Utility Company.

2.02 TRANSFORMERS

A. Utility Transformers: Pad mounted transformers will be provided by the Utility.

PART 3 EXECUTION

3.01 EXAMINATION

A. General: Verify that service equipment is ready to be connected and energized.

3.02 PREPARATION

A. Utility Company Arrangements: Make arrangements with Utility Company for any temporary electrical service requirements.

B. Utility Company Access: Coordinate location of Utility Company's facilities to provide proper access.

C. Coordination: Coordinate schedule of Utility Company's facilities with all other work.

D. Utility Company Metering: Arrange for the energy usage for each of the incoming electric services to be totaled for providing a single bill to the City.

E. Utility Company System Information: Obtain all information required to perform the Harmonic Analysis and the Short Circuit and Coordination Study specified in other sections.

3.03 INSTALLATION

A. General: Install Electrical Power Service in accordance with the Utility Company's recommendations and approved shop drawings.

B. Metering Transformer Cabinet and Meter Base: Install metering transformer cabinet and meter base in accordance with the Utility Company requirements and as shown.

C. Concrete Pads: Provide cast-in-place concrete pads for Utility Company transformers and other equipment.

END OF SECTION

SECTION 26 05 19

WIRES AND CABLES - 600 VOLTS AND BELOW

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing all wires and cables rated at 600 volts and below for complete electrical systems as shown.

B. Related Work Specified In Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 53 - Electrical Identification
3. Section 26 08 13 - Electrical Testing Requirements

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM B 3 - Standard Specifications for Soft or Annealed Copper Wire

2. ASTM B 8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

3. TIA/EIA 568-A- Commercial Building Telecommunications Cabling Standard

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 26 00 00.

B. Product Data and Information: Furnish manufacturer's catalog data for each type of wire and cable furnished.

1.04 QUALITY ASSURANCE

A. General: Furnish wire and cable in accordance with applicable IEEE and NEMA standards, meeting the requirements of the NEC and UL listed.

B. Tests: Furnish cables factory tested prior to shipment in accordance with ICEA standards for the insulation specified.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle wire and cable in accordance with the manufacturer's instructions and as specified in the Specific/General Provisions.

B. Storage: Store cable reels on concrete or other hard surface or on 2x4 wood laggings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Wire and Cable

   a. American Insulated Wire Corporation
   b. Southwire Company

2. Instrumentation Cable

   a. Belden
   b. Dekoron
   c. The Okonite Company

3. Data (Local Area Network) and Data Highway Cable

   a. Belden
   b. Alpha

4. Multiconductor Cable

   a. The Okonite Company
   b. Rome Cable Corporation
   c. Southwire Company

5. Wire Connectors

   a. Thomas & Betts
   b. 3 M/Electrical Products Division
   c. Ideal

6. Color Coding Marker

a. W. H. Brady Company
b. Thomas & Betts

2.02 MATERIALS

A. Conductors: Provide soft drawn or annealed copper conductors with 98 percent minimum conductivity, meeting requirements of ASTM B 3 (solid) or ASTM B 8 (stranded). Use stranded conductors except solid No. 12 and No. 10 AWG may be used in lighting fixture and convenience outlet wiring.

B. Insulation: Provide wires and cables with insulation as follows:

1. Power, control and lighting wiring

a. Single Conductor: Provide insulation as follows:

Conductor Size	NEC Type Letter	Insulation Material
Nos. 14AWG and larger	XHHW	Cross-linked Polyethylene

b. Multiconductor Cables: Insulate individual conductors with 15 mils of polyethylene or PVC and 4-mil nylon jacket. Wrap the conductors with type binder and an outer jacket not less than 45 mils of PVC. Use ICEA Method 1 for color coding wires.

2. Instrumentation Wiring: The manufacturers' name and catalog number shown below are for the purpose of establishing quality and general configuration.

a. Two conductor or single pair: Stranded No. 16 AWG wire, 600 volt polyethylene insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of PVC. Belden Cat. No. 8719.

b. Three Conductor: Stranded No. 16 wire, 600-volt polyethylene insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of PVC. Belden Cat. No. 8618.

c. Multiple Pairs or Triads: Provide individually shielded pairs or triad of stranded No. 16 AWG wire with overall shield. Insulate each wire for 600 volts with 15 mils of PVC and a 4-mil nylon jacket. Assemble pairs or triads with tinned copper drain wire and metalized tape shield providing 100

percent shield coverage. Cable pairs or triads together with tinned copper drain wire and overall metalized tape shield.

3. Data (Local Area Network) Cable: The manufacturers' name and catalog number shown below are for the purpose of establishing quality and general configuration.

   a. Category 5: Provide cable having third party verification to TIA/EIA 568-A Category 5 requirements and constructed of four pair of stranded No. 24 AWG solid copper wire, polyethylene or polypropylene insulation, stranded No. 24 AWG tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of gray PVC. Belden Cat. No. 1624R.

4. Data Highway Cable: The manufacturers' name and catalog number shown below are for the purpose of establishing quality and general configuration.

   a. Twinaxial: Provide stranded No. 20 AWG tinned copper wire (9.5 ohms/mile), 78 ohm nominal impedance, 300 volt polyethylene insulation, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and 55 percent tinned copper braid shield (4.1 ohms/mile) and outer jacket of blue PVC. Belden Cat. No. 9463.

C. Printed Data on Covering: Provide the following information printed on the surface of all wires and cables at regular intervals throughout the entire length.

1. Manufacturer or trade name.
2. Size of conductor.
3. Type of insulation.
4. Voltage classification.

2.03 WIRE CONNECTIONS AND CONNECTING DEVICES

A. Connectors for No. 10 AWG and Smaller: Provide insulated compression type butt connectors.

B. Connectors for No. 8 AWG and Larger: Provide UL, Inc. listed compression type tube connectors for parallel or butt splices. Provide companion preformed plastic insulating covers or tape to provide insulation equal to conductor insulation.

C. Miscellaneous Connectors: Provide preinsulated spring connectors for lighting and receptacle splices and pigtails.

D. Solderless Lugs: Provide solderless terminal lugs for stranded and multiple solid conductors at connection to terminals or use UL listed crimp tool compression style lugs.

E. Control Wire Terminations: Provide spade lug or pressure type control conductor connection terminations for control wiring terminations. Provide lug bolting at devices or bus bars with a flat washer, a Belleville washer and a locknut.

2.04 COLOR CODING

A. General: Use a vinyl impregnated cloth tape resistant to oil, dirt and heat for conductor color coding.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Swab new and existing conduits to be used to clear debris and remove moisture before conductor installation. Install conductors in raceways with no splices between boxes.

B. Pulling Equipment: Pull conductors using proper equipment without exceeding manufacturer's recommendation for maximum pulling tension. Protect conductor insulation jacket at all times from twists, kinks, scrapes, punctures and other damage. Replace damaged conductors. Pull wires and cables into ducts and conduit without the use of lubricants, except where such use is necessary and approved by the cable manufacturer and the ENGINEER. Use UL listed lubricating compound compatible with the conductor insulated jacket and with the raceway. Use lines of nylon or polypropylene, propelled by carbon dioxide, or compressed air, to snake or pull wire and cable into conduits. Do not use flat steel tapes or steel cables.

C. Conductor Support: Support conductors in vertical risers with woven grips to prevent loading on conductor connectors.

D. Seals: Provide a seal between the conductor and conduit for conduits entering buildings or from areas where the temperature change may cause condensation or moisture. Seal the conduits after the conductors are in place.

E. Identification: Identify all cables as specified in Section 16075.

F. Color Coded Tape: Apply color coding tape at all terminations and splices with overlapping turns for a minimum length of two inches, starting two inches back from the termination point. Provide color code tape in all boxes and manholes.

Provide color coding throughout the entire network for service, feeder, branch, control and low energy signal circuit conductors. Use the following color code for conductors.

	COLOR CODING				
SYSTEM	PHASE A	PHASE B	PHASE C	NEUTRAL	GROUND
208/120 three phase	Black	Red	Blue	White	Green
480/277 three phase	Brown	Orange	Yellow	White	Green
Control and low-energy signal	Red	---	---	White	Green
Gas and Fire De-tection Systems	Pink	---	---	---	---
Instru-mentation	Tan	---	---	---	---
dc circuits	Olive	---	---	---	---

G. Terminations: Leave a minimum of six inches of free conductor at each connected outlet and a minimum of nine inches at unconnected outlets.

H. NEC Requirements: Install wiring in accordance with applicable provisions of National Electrical Code, and as indicated.

I. Conductor Sizing: Size conductors in accordance with the NEC and the following:

1. Size for branch lighting circuits so that the greatest voltage drop between lighting panel and center of load does not exceed two percent at rated load.

2. Size conductors to limit the maximum conductor temperature to less than 75 degrees C, except where specifically stated otherwise.

3. Use minimum conductor sizes as follows:

a. Power and lighting branch circuits, No. 12 AWG.

b. 120-volt control circuits, No. 14 AWG.

c. Instrumentation and signal wiring, 2 or 3 conductors No. 16 AWG stranded shielded.

4. Size conductors as shown or as required by the actual load to be served, whichever is larger.

J. Splicing: Install continuous cables without splices in all duct systems.

K. Instrumentation wiring: Install instrumentation wiring as follows:

1. Wherever possible provide continuous instrumentation wiring without splices from field device to instrument. Where connections are required, make all connections in terminal boxes.

2. Terminate instrumentation wiring at terminal blocks only.

3. Where instrumentation wire is required to be connected in a terminal box, provide an isolated terminal for each shield.

4. Ground instrumentation shields and drain wires only at the panel end of loop.

5. Install clear, heat-shrink, seamless tubing over exposed shields and drain wires in all terminal boxes, junction boxes, panels and field devices.

L. Hazardous Areas: Seal all conduits in hazardous areas before admission of possible hazardous gases to the area.

M. Accuracy of Information: The number and sizes of wires and conduits indicated are for guidance only and are not necessarily the correct number and sizes necessary for actual equipment installed. Install as many wires and conduits of the required size as necessary for a complete electrical system, and provide adequately for the equipment actually installed.

3.02 CONDUCTOR IDENTIFICATION

A. Labeling: Label each wire at both termination points and at each splice point in junction boxes. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.

B. Identification: Where the total number of control and signal wires is three or more and no terminal board is provided, identify each wire in junction boxes and cabinets by means of plastic slip-on wire marker.

C. Plastic Tags: In manholes, identify each wire by laminated plastic tag located so it can be easily seen.

D. Color Coordination: Connect circuit conductors of the same color to the same phase throughout the installation.

3.03 WIRE AND CABLE CONNECTIONS TO EQUIPMENT

A. General: Provide electrical connections to all equipment in strict accordance with the manufacturer's approved wiring diagrams, the Plans, or as approved. Repair or replace any damaged equipment resulting from erroneous connections.

3.04 CONNECTOR AND TERMINAL LUG INSTALLATION

A. UL Requirements: Install all connectors and terminal lugs in accordance with UL requirements and manufacturer's recommendations.

3.05 QUALITY ASSURANCE

A. Field Tests: Test the following 600-volt wires and cables after installation but before final connections are made up:

1. All secondary feeders from the substation transformers.

2. All feeders between and from the low voltage switchgear assemblies.

3. All feeders from motor control centers to motors 30 hp and larger.
4. All feeders from variable speed drive units.

5. All feeders from motor control centers, to lighting panels and dry-type transformers.

6. For the above listed cables, apply a test voltage of 1,500 volts ac for a period of 1 minute between all conductors in the same conduit, and between each conductors and ground.

B. Test Results: Make all tests and submit certified test results. Replace any cables that fail the tests.

C. Continuity Test: Perform continuity test to demonstrate proper cable connection.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing a complete grounding system as specified and shown. Grounding includes but is not limited to: electric equipment enclosures, transformers, unit substations, switchgears, switchboards, motor control centers, ground grid systems, grounding rods, grounding conductors, bonding jumpers, water pipe connections, and structure metal frames as required.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 33 - Electrical Raceway Systems
3. Section 26 05 19 - Wires and Cables - 600 Volts and Below
4. Section 26 08 13 - Electrical Testing Requirements

1.02 REFERENCES

A. Codes and Standards: The following codes and standards are referred to in this Section:

1. NEC - National Electrical Code

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish manufacturer's catalog data for the following:

1. Grounding and grounded conductors
2. Grounding connectors, clamps and bushings
3. Grounding rods
4. Bonding jumpers

C. Shop Drawings: Furnish shop drawings showing the locations and length of grounding rods. Label the size and material used for grounding rods. Furnish details pertaining to grounding electrode conductors, grounding and grounded conductors, grounding connections and the ground grid for buildings, structures, lighting units, manholes and handholes.

D. Quality Control: Furnish a field report of the system ground impedance test results.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Construct a complete grounding system in accordance with applicable ANSI, IEEE Standards and the NEC and local codes.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Grounding and Grounded Conductors

a. American Insulated Wire Corporation
b. Southwire Company

2. Ground Plates

a. Burndy Corporation
b. OZ/Gedney Company
c. Erico Products
d. Thomas & Betts

3. Grounding Rods

a. Harger Lightning Protection, Inc.
b. Thomson Industries, Inc.
c. Carolina Galvanizing Utility Products Division
d. Erico Products
e. Superior Grounding Systems

4. Ground Rod Access Box

a. Hubbell Power Systems – Quazite
b. Hartford Concrete Products, Inc.

2.02 MATERIALS

A. General: Provide conductor sizes as shown or required. All conductors shall be stranded copper.

B. Materials: Provide conductors in accordance with the requirements specified in Section 26 05 19.

C. Bare conductors: Provide bare copper conductor where buried in earth, embedded in concrete or exposed.

D. Insulated Conductors: Provide copper conductor with green color insulation rated at 600 volts where installed in conduits or other enclosed raceways.

2.03 CONNECTORS

A. Grounding Clamps and Bolted Connectors: Provide grounding clamps and bolted connectors suitable for devices or cables being connected.

B. Ground Plates: Provide two-hole, cast, copper alloy, ground plates suitable for installation in concrete. Fabricate the ground plates with two ½-inch diameter threaded holes and a 4/0 stud for connection to the grounding system.

C. Welding: Provide the exothermic welding process for buried, concealed and accessible connections to structural members, ground rods, and case grounds. Clean and paint welds embedded in the ground or encased in concrete with asphalt base paint.

D. Bolted Connectors: Provide bolted connectors for grounding to ground buses and equipment.

E. Pipe Grounding: Provide copper, brass, or bronze grounding clamps for grounding pipes. Do not provide strap type clamps.

F. Grounding Bushings: Provide grounding bushings for conduits where conduits are not effectively grounded by firm contact to the grounded enclosure.

2.04 GROUNDING RODS

A. Length and Size: Provide grounding rods 3/4-inch in diameter and 20 feet long.

B. Grounding Rod Material: Stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. Install conductors to preclude exposure to physical damage.

2. Install connections firm and tight.

3. Arrange conductors and connectors without placing strain on the connections.

4. Bury equipment grounding conductors as shown, or at a minimum of 12 inches below grade.

5. Bring loops or taps up for connection to equipment or other items to be grounded.

6. Install an insulated grounding conductor in all conduits.

7. When raceways are used to contain and protect grounding conductors, install in accordance with Section 26 05 33 and NEC.

8. Where conductors are installed in nonmetallic raceway, provide the grounding conductor in addition to the neutral wire, sized in accordance with NEC or as scheduled.

9. Perform exothermic welding with properly sized molds.

B. Grounding Rod Installation:

1. Install grounding rods as shown with the top of the rod a minimum of 12 inches below grade.

2. Drive grounding rods into permanently moist soil.

3. Provide additional ground rod sections as required to reach permanently moist soil.

4. Provide cast iron junction box without bottom for access to grounding rod and conductor where shown.

C. Equipment Grounding: Ground each piece of electrical equipment using a conductor in the raceway feeding the equipment in accordance with NEC.

1. Unless specified otherwise, connect transformer enclosures and neutrals to the grounding system. Connect the neutral ground connection at the transformer terminal. Make the connection from the ground grid to the ground bus and enclosures of switchgears and motor control centers, lighting and distribution panelboards, and control, relay and instrumentation panels.

2. Provide two separate, independent, diagonally opposite connections for power transformers so removal of one connection will not impair continuity of the ground system. Provide ground plates that are imbedded in the concrete pad so that transformers can be removed without damaging grounding system. Install a copper ground connect between ground plates and the transformers.

D. Grounding Conductors: Connect the grounding conductor between the equipment and the grounding system. Where a ground bar is furnished with the panelboard, connect the grounding conductor to the bar.

E. Miscellaneous Grounding: Provide grounding for the following:

1. Ground receptacles and switches and their metal plates through positive ground connection to the yoke/strap, outlet box and grounding system grounding wire installed in the conduit.

2. Ground racks, supports, frames, covers and metal parts in manholes or handholes, controllers, motor frames, surge capacitors, arrestors, lighting fixtures, metal structures, exposed noncurrent carrying metal, mechanical equipment, hoist beams, cranes and similar items. Provide grounding jumpers around equipment that is hinged.

3. Provide ground connections to equipment using ground plates imbedded in the concrete pad so that the equipment can be removed without damaging grounding system. Provide a copper ground connection between ground plates and the equipment.

3.02 FIELD QUALITY CONTROL

A. Tests: Conduct a witnessed test to determine the ground impedance for the entire system using a ground loop impedance tester. Provide a maximum impedance of 2 ohms at any point of the test. Add additional grounding rods if necessary to meet this requirement.

END OF SECTION

SECTION 26 05 33

ELECTRICAL RACEWAY SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing electrical raceway systems as indicated, in accordance with the Contract Documents.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 43 - Underground Electrical Distribution System

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. ANSI C80.5 - Specifications for Rigid Aluminum Conduit

2. ANSI/NFPA 70 - National Electrical Code

3. NEMA TC2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)

3. UL 1 - Flexible Metal Conduit

4. UL 6 - Rigid Metal Conduit

5. UL 360 - Liquid-Tight Flexible Steel Conduit

6. UL 651 - Schedule 40 and 80 Rigid PVC Conduit

7. Federal
Specification
WW-C-540C - Conduits, Metal, Rigid (Electrical, Aluminum)

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 26 00 00.

1.04 QUALITY ASSURANCE

A. Codes: Provide all materials and workmanship to meet the requirements of ANSI/NFPA 70 National Electrical Code.

B. Regulatory Requirements: Provide UL listed components.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Rigid nonmetallic conduits:

   a. Carlon Company
   b. Certainteed Corporation
   c. National Pipe Company

2. Aluminum Conduits:

   a. Allied Tube and Conduit
   b. Wheatland Tube Company
   c. Easco Aluminum

3. Non-metallic flexible conduit:

   a. Electri-Flex Company
   b. The International Metal Hose Co.
   c. Alflex Corp.
   d. Anamet, Inc.

4. Conduit Fitting and Connectors

   a. Appleton Electric Company
   b. Thomas & Betts
   c. Crouse Hinds Company
   d. OZ/Gedney Company
   e. Killark
   f. Adalet-PLM

5. Boxes and Enclosures:

   a. Appleton Electric Company
   b. Hubbel/Wiegmann
   c. Hammond
   d. Raco/Bell
   e. Crouse Hinds Company
   f. Thomas & Betts
   g. Hoffman
   h. Hope
   i. OZ/Gedney Company

6. Strut Channel and Fittings

a. Allied Tube and Conduit
b. B-Line Systems, Inc.
c. Kindorf
d. Enduro
e. Strut Tech
f. Unistrut

7. Fire Stop System

a. 3M/Electrical Products Division
b. International Protective Coatings
c. Nelson Electric

8. Terminal Blocks

a. Phoenix Contact
b. Entrelec
c. Weidmuller

2.02 RACEWAYS

A. General: Provide minimum 3/4-inch raceways.

B. Raceway Requirements: Provide raceways meeting the following requirements:

1. Provide rigid heavy wall aluminum alloy 6063T-1 conduit in accordance with the requirements of UL 6, Federal Specification WW-C-540C and ANSI C80.5.

2. Provide rigid nonmetallic Schedule 80 PVC in accordance with requirements of NEMA TC2 and UL 651 with solvent cement joints.

3. Provide liquidtight flexible non metallic conduit in accordance with requirements of UL 1660.

4. Provide explosion-proof, heavy duty construction, stainless steel flexible conduit, with internal insulation liner for Class I, Division 1, Group D hazardous areas.

2.03 FITTINGS

A. General: Provide fittings of similar material as raceways.

B. Fittings Requirements: Provide fittings meeting the following requirements:

1. Set screw or indenter type fittings are not acceptable. Provide threaded connectors for all rigid metal conduits.

2. Provide solvent cement connections for all rigid nonmetallic conduits.

3. Provide insulated connectors for liquidtight flexible conduit.

4. Expansion/Deflection Fittings:

a. Provide a deflection and expansion coupling for rigid metal conduits that have a ¾ inch movement in all directions from normal and a 30-degree angular deflection. Provide coupling that includes internal bonding jumper.

b. Provide a nonmetallic expansion coupling for nonmetallic conduits that have a 4-inch maximum expansion.

5. Bushings

a. Provide insulated nonmetallic bushing rated 105 degrees C for all installations where bonding is not required.

b. Provide insulated metallic grounding and bonding bushing rated 150 degrees C where bonding is required.

6. Fittings for Hazardous Locations:

a. Provide fittings that conform to the requirements of NEC Chapter 5 for Class I, Division 1 or 2, Group D hazardous locations as defined in Section 16050 or as shown.

b. Provide seal fittings designed for 40 percent fill capacity suitable for either horizontal or vertical installation.

2.04 WALL AND FLOOR PENETRATIONS

A. Watertight:

1. For conduit penetrations in new exterior walls or floors provide watertight sealing sleeves consisting of a steel sleeve with pressure ring and clamps.

2. For conduit penetrations in existing walls or floors, provide watertight sealing bushing consisting of a neoprene sealing ring between two PVC coated steel pressure discs. Provide stainless steel captive screws for sealing ring compression.

2.05 BOXES AND CABINETS

A. Outlet Box Requirements:

Provide cast aluminum boxes for aluminum conduit systems.

Provide nonmetallic boxes and covers in PVC conduit systems.

1. Provide boxes located in Class I, Division 1 hazardous areas meeting NEMA 7 requirements.

2. Provide corrosion-resistant fiberglass reinforced polyester boxes with stainless steel hardware in corrosive areas as defined in Section 26 00 00 or as shown.

3. Provide watertight gasketed covers held with nonferrous screws for all cast metal boxes.

B. Junction and Pull Box Requirements:

1. Provide cast aluminum boxes with mounting lugs, threaded hubs and gasket covers for surface mounted boxes.

2. Provide fabricated sheet metal boxes when cast metal box weight exceeds 50 pounds. Construct box from 1/8-inch thick aluminum with sides return channel flanged around cover opening. Provide angle or channel supporting frame. Provide continuously welded and ground smooth seams. Provide mounting lugs and threaded conduit hubs.

3. Provide watertight gasketed covers held with stainless-steel captive screw slot bolts.

4. Provide metal barriers in all boxes that isolates instrumentation wiring from all other wiring systems.

5. Provide fabricated boxes located indoors above grade meeting NEMA 12 requirements.

6. Provide all boxes located outdoors and indoors below grade meeting NEMA 4X stainless steel requirements.

7. Provide boxes located in Class I, Division 1 hazardous areas meeting NEMA 7 requirements.

C. Terminal Box Requirements:

1. Provide minimum 12-gauge aluminum sheet metal fabricated box with mounting lugs, floor stand, and hinged doors.

2. Provide the door with continuous piano hinge and 3-point lockable latch. Provide print pocket on inside of door.

3. Provide back plate fabricated from 12-gauge minimum steel with white enamel finish for mounting terminals and wire troughs.

4. Provide wire troughs consisting of plastic ducts with snap slot design and removable covers. Run all wiring within wire troughs.

5. Furnish a schedule of terminals with the following information

   a. Source
   b. Type of Signal
   c. Function

6. Provide removable jumpers to allow operation of the equipment.

7. Separate analog terminals from all other terminals.

8. Provide number of terminals shown. Where the number of terminals are not shown, provide sufficient terminals for each wire entering the terminal box plus 20 percent but not less than 10 spare terminals.

9. Terminals:

   a. All catalog numbers refer to Phoenix Contact Type for the purpose of establishing the standard of quality and general configuration desired.

   b. Provide symmetrical type aluminum mounting rails, DIN-EN50022.

   c. Analog Signals: Provide terminals in enclosed housing suitable for wires from 22 to 12 AWG rated 600 volts with gray body, knife disconnect and test connection socket on both sides of disconnect, Phoenix Contact Type UK 5-MTK-P/P.

   d. Control and Alarm Signals: Provide terminals suitable for wires from 30 to 10 AWG rated 18 amperes at 600 volts, blue body, Phoenix Contact Type UK5N BU.

   e. 120-Volt Power Wiring: Provide terminals suitable for wires from 18 to 10 AWG rated 30 amperes at 600 volts, hot (black body), neutral (white body), ground (green body), Phoenix Contact Type UK5N BK, UK5N WH & UK5N GN, respectively.

2.06 SUPPORTING DEVICES

A. Raceway Supports: Provide raceway supports meeting the following requirements:

1. Do not use perforated straps or plumbers tape for conduit supports.

2. Provide expansion bolts or inserts for fasteners in concrete, toggle bolts for hollow masonry or frame construction, and preset inserts for prestressed concrete.

3. Conduit Straps and Backs:

   a. For metallic conduits, provide aluminum or stainless steel.

4. Conduit Hangers

   a. For metallic conduits, provide adjustable stainless steel conduit hangers or clevis hangers.

5. Beam Clamps:

   a. For metallic conduits, provide stainless steel with stainless steel bolt.

6. Trapeze Hangers:

   a. For metallic conduits provide 1-5/8-inch stainless steel channels. Provide PVC coated straps with stainless steel bolts for securing conduits.

   b. Provide addition channels as required to limit the deflection to 1/240th of span.

7. Thread Rod

a. Provide stainless steel thread rod with the minimum size as follows:

(1) Conduit Hangers

(a) 3/4-inch to 1-1/2-inch conduit: 1/4-inch thread rod

(b) 2-inch to 3-1/2-inch conduit: 3/8-inch thread rod

(c) 4-inch and larger: 1/2-inch thread rod

(2) Trapeze Hangers: Provide stainless steel thread rod of sufficient size to support the load. Provide a minimum of 3/8-inch thread rod.

PART 3 EXECUTION

3.01 PREPARATION

A. General: Install electrical equipment and material of the size, type and general routing as shown or required.

B. Coordination with Reinforcing: Install raceway, fittings, boxes and cabinets free from direct contact with reinforcing steel.

C. Alignment: Provide fasteners, anchor bolts, anchorage items and supports as required to insure proper and rigid alignment. Attach equipment with fasteners sized according to size and weight of the equipment and the thickness of the supporting surface.

D. Aluminum Coating: Where aluminum is placed in contact with dissimilar metal or concrete, separate contact surfaces with gasket, nonabsorptive tape or coating as specified in Section 24 to prevent corrosion.

E. Grounding: Make metallic raceways electrically and mechanically continuous and ground as required. Install conduits continuous between outlets, boxes, cabinets and panels.

3.02 INSTALLATION

A. General: Unless otherwise indicated, install conduits exposed, parallel or perpendicular to building floors, ceilings and walls, and to avoid interference with other work. In architecturally finished areas, conceal conduits within finished walls, ceilings and floors. Cut conduits square and deburr the cuts to the same degree as the conduit manufacturer. Fasten conduit securely to outlets, junction, pull and terminal boxes. Provide caps and seals to prevent the entrance of foreign material and moisture during installation and before pulling wire.

1. Where conduit size is not shown, provide conduits one size larger than indicated in Table 4, Chapter 9 of the NEC.

2. Saw cut aluminum conduit to prevent reduction in internal area.

3. Support raceways concealed above suspended ceilings from the slab above suspended ceiling in same manner as exposed raceways. Do not support raceways from suspended ceiling supports.

4. Keep conduit at least six inches away from high temperature piping, ducts, flues and surfaces. For mounting on concrete and masonry surfaces provide a minimum of 1/4-inch air space between conduit and mounting surface. Support and fasten conduit to building structural members spaced in accordance with electrical codes. Support conduit at least every eight feet or less in accordance with NEC requirements.

5. When two or more exposed conduits are in the same general routing, provide parallel installation with symmetrical bends and for three or more provide trapeze hangers. Size trapeze hangers with space for 25 percent additional conduits.

6. Make changes in direction with bends or fittings. Use factory-made bends or elbows wherever possible. Make field bends and offsets with a hand bender or conduit-bending machine.

7. Run conduit in buildings with no more than the equivalent of (three) 90-degree bends between pull points. Provide no more than (125) feet of conduit runs between pull points. Provide pull boxes where shown, specified or wherever required to install conductors and to meet the above requirement.

8. Install pull and junction boxes in accessible locations with working space in front of and around the installation.

9. Install an expansion fitting when a conduit crosses a building structural expansion joint.

10. Unless otherwise approved, install conduits to cross at right angles to building structural expansion joints.

11. Where approved for encased installation, install conduits in slabs as close to the middle of concrete slabs as practicable without disturbing reinforcement. Do not use conduit with an outside diameter exceeding one-third of the slab thickness. Do not place conduits closer than three diameters on centers, except at cabinet locations where the slab thickness is increased.

12. Pitch conduits to outlet boxes to avoid trapping moisture. Where dips are unavoidable in exposed conduit runs, install drain fitting at low point.

B. Conduit Material Types: Provide conduit as follows:

1. Provide rigid aluminum conduit throughout for all exposed applications both indoors and outdoors unless otherwise specified.

2. Provide rigid nonmetallic Schedule 80 conduits underground, concrete encased or direct buried, unless specifically detailed otherwise.

3. Provide rigid aluminum conduits for all instrumentation wiring.

4. Hazardous Locations:

a. Hazardous locations are defined in Section 26 00 00 or as shown.

b. Install all conduits and appurtenances in accordance with the requirements of Chapter 5 in NEC.

c. Provide seal fittings for all conduits that enter or leave a hazardous location.

C. Connections to Equipment

1. Provide double locknuts and bushing for all boxes, enclosures and cabinets located in dry areas.

2. Provide watertight hub fittings for all boxes, enclosures and cabinets located below grade or in wet, damp or corrosive areas. Fittings shall be of the same material as the conduit.

3. Provide rigid conduit connection where equipment is fixed and not subject to adjustment, mechanical movement or vibration. Provide union fittings to permit removal of equipment without cutting or breaking conduit.

4. Provide liquidtight flexible conduit connection where equipment is subject to adjustment, mechanical movement or vibration.

5. Coat all threads in aluminum conduit runs with graphite or other corrosion preventive compound.

D. Underground Conduits: Provide underground conduits meeting the requirements of Section 26 05 43.

E. Penetrations: Make concealed penetrations for single conduits not more than 1/4-inch larger than the diameter of the conduit. Make penetrations through walls, ceilings and floors other than concrete for exposed conduits not more than 1/4-inch larger than the diameter of the conduit. Fill the voids around conduit with caulking compound and finish the surface the same as the wall, ceiling or floor.

1. Where a conduit enters through a concrete roof or membrane waterproofed wall, floor or ceiling, provide a watertight sealing sleeve that can be tightened from one or both sides. If the sealing sleeve is not placed with the concrete, core drill the proper size hole to provide a mechanically watertight installation.

2. Where a conduit enters through a concrete non-waterproofed wall, floor or ceiling, provide a Schedule 80 PVC sleeve and fill the space between the conduit and sleeve with a plastic expandable compound. If the sleeve is not placed with the concrete, drill the hole not less than 1/2-inch nor more than one inch larger than the sleeve, center the sleeve and grout the sleeve for the total depth of penetrated concrete with non-shrink grout, polyurethane or silicone sealant.

F. Spare Conduit: Provide spare conduits for future use as shown or required. Provide a minimum 200-pound strength nylon pull line in each spare conduit and identify the origin and termination of the conduit at each end. Terminate spare

conduits in equipment, boxes or by couplings plugged flush with the inside of building surfaces.

G. Boxes: Provide boxes of the proper dimensions for the size and quantity of conductors enclosed.

1. For boxes mounted on steel, concrete and masonry surface, provide a minimum 1/4-inch non-metallic spacer to hold the box away from the surface.

2. Provide separate support for boxes and bolt units to buildings with expansion anchors, toggle bolts or appropriate screws. For lighting fixture outlet boxes, provide supports adequate to support the weight of the fixture to be mounted on the box.

3. Remove debris including dust, dirt, wire clippings and insulation from the interior of boxes. Replace boxes with open conduit holes. Repair or replace damaged boxes as directed.

4. Unless otherwise indicated, surface mount outlet boxes on the finished wall or ceiling, with the long axis vertical. Unless otherwise shown or specified, provide mounting heights measured from the finished floor to centerline of the outlet box as follows:

a. For switches: 4'-6". Mount the box for lighting switches on the strike side of the door.

b. For duplex convenience outlets: Unfinished areas 2 feet.

c. For clock receptacles outlets: 8 feet.

d. For fixtures and equipment: As shown.

e. For desk telephone outlets: 12 inches.

f. For wall telephone outlets: 57 inches.

3.03 CLEANING AND PAINTING

A. Field Painting: Paint conduits meeting the requirements of Section 24.

END OF SECTION

SECTION 26 05 43

UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing and installing underground electrical raceway system consisting of concrete encased conduits, direct buried conduits and cables, manholes, handholes, and outdoor electrical equipment pads as shown.

B. Related Work Specified in Other Section Includes:

1. Section 1 - Excavation - Earth and Rock
2. Section 2 - Backfilling
3. Section 4 - Concrete
4. Section 26 00 00 - Basic Electrical Materials and Methods
5. Section 26 05 33 - Electrical Raceway Systems
6. Section 26 05 19 - Wire and Cable - 600 Volts and Below
7. Section 26 05 26 – Grounding

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Route conduits to allow pulling-in of conductors as indicated without exceeding the conductor's tension limits.

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish manufacturer's data for conduits, manholes and handholes and all accessories.

C. Contractors Shop Drawings: Furnish working drawings for underground electrical raceway system showing conduits, concrete encasement, manholes, handholes, electrical equipment pads and reinforcing. Indicate designation, type, size, location, elevations and slope.

D. Quality Control: Furnish a signed and sealed certification from a professional engineer registered in Florida stating that the design calculations and drawings for the precast concrete manholes and handholes were prepared by that professional engineer or under his direct supervision.

1.04 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

1.05 PROJECT CONDITIONS

A. Existing Conditions: Examine record drawings to determine the location of all obstructions along the conduit or cable route and at the sites of manholes, handholes and outdoor electrical equipment pads.

B. Field Measurements: Field survey, and in critical areas, excavate test pits to verify locations of probable obstacles along the conduit or cable route and at the sites of manholes, handholes and outdoor electrical equipment pads.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Conduit Spacers

a. Carlon Company
b. Underground Devices, Inc.

2. Buried warning tape

a. Thomas & Betts
b. W. H. Brady Company

2.02 MATERIALS

A. Conduit: Provide conduits meeting the requirements of Section 26 05 33.

B. Cable: Provide cables meeting the requirements of Section 26 05 19.

C. Spacers: Provide rigid plastic, conduit spacers to maintain conduit separation as indicated.

D. Reinforcing Steel: Provide reinforcing steel meeting the requirements of Section 5.

E. Concrete: Provide concrete meeting the requirements of Section 4. Dye all concrete used for duct bank encasements “red”.

F. Underground Warning Tape: Provide 6-inch wide detectable type plastic tape in red (electric), yellow (utility) and orange (communications) colors with suitable warning describing the type of buried electrical lines.

PART 3 EXECUTION

3.01 CONDUIT INSTALLATION

A. General: Install underground, concrete encased and direct buried conduits as indicated.

B. Conduit Route: Establish and mark exactly conduit or cable routing. Resolve routing near existing obstacles and coordinate with other sitework. Maintain a 12-inch minimum longitudinal clearance from the conduit bank encasement or direct buried conduit to adjacent utility lines. Maintain a 6-inch minimum vertical clearance from the conduit bank encasement or direct buried conduit to utility lines at crossovers. Adhere to lines, grades, elevations and dimensions as shown.

C. Trench Excavation: Perform excavation work in accordance with other specifications.

D. Workmat: Install concrete mat on trench bottom to provide an even base for concrete encased conduit bank in accordance with the requirements of Section 3.

E. Bedding: Provide a sand cover on trench bottoms for a firm and smooth surface for direct buried conduits.

F. Spacers: Locate spacers at intervals of approximately four feet and stagger locations at each conduit tier to provide not less than 12-inches of longitudinal separation.

G. Conduit: Place conduit in straight lines and with a minimum slope of 0.25 percent (3 inches per 100 feet). Slope conduit down to manholes, handholes and structures. Install expansion fittings in straight runs exceeding 100-feet. Secure conduits in place to prevent floating and movement.

H. Bends: Install 12-foot minimum radius bends in horizontal turns and vertical deflections. For bends used at ends of conduit runs install elbows with 4-foot minimum radius for 6-inch and 5-inch conduits, and elbows with 3-foot minimum radius for 4-inch and smaller conduits.

I. Inside Cleaning: Pull a standard flexible mandrel not less than 12-inches long, having a diameter approximately 1/4-inch less than the inside diameter of the conduit, through each conduit, then pull a brush with stiff bristles through each conduit. Replace conduit runs that do not allow the passage of the mandrel at no increase in Contract Price. Use the pneumatic method to draw into conduit the nylon or polypropylene pull line. Plug and seal all conduits after cleaning.

J. Concrete Reinforcing: Install concrete reinforcing meeting the requirements of Section 5. Provide ductbanks with No. 5 reinforcing, spaced 12 inches on centers, top and bottom, with No. 3 ties at 18 inches, unless otherwise shown.

K. Concrete Formwork: Install concrete formwork meeting the requirements of Section 4.

L. Outside Cleaning: Remove dirt, sand and debris around conduits and from workmat, prior to concrete placement.

M. Concrete Placement: Place concrete meeting the requirements of Section 4.

N. Connections to Structures: Install as shown.

O. Backfilling: Backfill meeting the requirements of Section 2. Provide a sand cover that is 6 inches over direct buried conduits or cables.

P. Underground Warning Tape: Install one underground warning tape for each trench up to 18 inches wide. For trenches wider than 18 inches provide two underground warning tapes, one at each edge of the trench. Place the tape or tapes 12 inches below the finished grade.

Q. Markers: Provide 4-inch round, 6-inch thick, concrete markers identified with the letter "E" and directional arrows. Place these markers approximately every 200 feet along straight portions of conduit and cable runs, at each change in direction and at the conduit run end. Install markers to protrude 1-inch above adjacent ground. Allow markers to protrude 1/2-inch in finished lawns. Do not place conduit markers at structures and at conduit risers.

3.02 OUTDOOR ELECTRICAL EQUIPMENT PADS

A. General: Provide reinforced concrete pads for supporting Outdoor Electrical Equipment as shown or otherwise required.

B. Location: Establish and mark pad locations exactly. Resolve locations near existing obstacles and coordinate with other sitework under this Contract. Adhere to orientation, elevations and dimensions as shown.

C. Site Excavation: Provide site excavation meeting the requirements of Section 1.

D. Pad Construction: Install pad construction meeting the requirements of Section 4.

E. Conduit Entrances: Install conduit risers and laterals under pads prior to placement of pads. Separate conduits from pads as shown.

F. Grounding: Install grounding conductors through pads meeting the requirements of Section 26 05 26.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing materials for the identification of electrical equipment, components, conduits, cables and wiring, and furnishing and installing safety signs.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1.	ANSI C2	-	National Electrical Safety Code (NESC)
2.	ANSI Z535.1	-	Safety Color Code
3.	ANSI Z535.2	-	Environmental and Facility Safety Signs
4.	ANSI Z535.3	-	Criteria for Safety Symbols
5.	OSHA	-	Occupational Safety and Health Act

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish manufacturer's catalog data for safety signs, nameplates, labels and markers.

1. Furnish manufacturer's instructions indicating application conditions and limitations of use; and storage, handling, protection, examination and installation of product.

C. CONTRACTOR's Record Drawings: Furnish CONTRACTOR's record drawings accurately showing actual location of markers for underground ducts at completion of the Project.

1.04 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

1.05 SPARE PARTS

A. General: Furnish the following spare parts.

1. Ten safety signs of each size and wording.

B. Packaging: Package spare parts in containers bearing labels clearly designating contents. Identify all spare parts with information needed for reordering. Deliver spare parts in original factory packages.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. W. H. Brady Company
2. Seton
3. Thomas & Betts

2.02 MATERIALS AND COMPONENTS

A. General: Provide identification materials listed and classified by UL or tested by an acceptable Electrical Testing Company certifying the equivalence of the materials to UL listing requirements and OSHA approved.

B. Laminated Plastic Nameplates: Provide engraved three layer laminated plastic nameplates with black letters on white background and fastened with stainless steel screws. Do not use mounting cement for fastening nameplates.

1. Provide nameplates with 1-inch high lettering for switchgears, motor control centers, control panels, relay panels, contactor panels, panelboards, and similarly grouped equipment, transformers and disconnect switches.

2. Provide nameplates with 1/2-inch high lettering for individual components of a group such as main breakers, switchgear units, switchboard units, motor control center units and similar devices.

3. Provide nameplates with 1/4-inch high lettering for remote motor controllers, control stations, relays and similar equipment.

4. Provide nameplates for each motor identifying service or function and lettering of an appropriate size to suit each motor.

5. Provide approved laminated directories of circuits with typewritten designations of each branch circuit in each panelboard.

6. Provide smaller lettering for a neat, legible nameplate where the amount of lettering causes excessively large nameplates.

C. Wire Markers: Identify wire bundles and each individual wire.

1. Wire bundles: Provide a brass or rigid fiber identifying tag attached with nylon self locking "Ty-Raps".

2. Wire identification markers: Provide a printed white, heat-shrink, seamless tubing type with black bold lettering for wires size No. 10 AWG and smaller. Provide a printed self-laminating white, vinyl type with black bold lettering for wires No. 8 AWG and larger.

D. Conduit Marking Paint: Provide conduit marking paint meeting the requirements of other sections of the contract documents specifications.

E. Safety Signs: Provide safety signs in accordance with OSHA standard meeting the requirements of ANSI C2, ANSI Z535.1, ANSI Z535.2 and ANSI Z535.3.

1. Provide safety signs manufactured from vinyl having a minimum thickness of 60 mils with red and black letters and graphics on a white background.
2. Size: 10 inches by 14 inches except signs 7-inch by 10-inch may be provided where the larger size cannot be applied.

3. Mount safety signs using stainless steel screws. Do not use mounting cement.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Preparation: Degrease and clean surfaces to receive nameplates, labels and marking paint.

3.02 INSTALLATION

A. General: Install nameplates on the front of equipment, parallel to the equipment lines and secured with stainless steel screws.

1. Install laminated nameplates identifying:

a. Each electrical equipment enclosure
b. Individual equipment and devices

B. Wire Markers: Identify wire bundles and each individual wire with identification tags as follows:

1. Wire Bundles: Install an identifying tag engraved with the conduit number where conduits enter motor control centers, switchgear, switchboards, control panels, terminal boxes and the like.

2. Wire identification markers: Provide wire identification markers on each wire at all termination points.

a. On power and lighting circuits: The branch circuit or feeder number as indicated on drawings

b. On control circuits terminated in motor control centers, switchgears, control panels and alike: The field device and terminal number of the opposite end connection.

c. On control circuits at each field device: The panel or compartment number and terminal number of the opposite end connection.

3. Oversize wire markers so that after heat shrinking the wire marker can be rotated on the wire. Rotate wire markers so that wire identification number is visible.

C. Conduit Markers: Paint colored marking bands on each conduit that is longer than 6 feet at intervals of 20 feet on centers to identify the wiring voltage system contained in the conduit or for identifying the different conduit systems as follows:

480-Volt System
208/120-Volt System
24/48/125-Volt dc System
Telephone System

D. Safety Signs: Provide safety signs as follows or as shown:

1. Type DS-2

   a. Wording: “DANGER - ELECTRICAL EQUIPMENT, AUTHORIZED PERSONNEL ONLY”

   b. Location: At each entrance to electrical rooms, and enclosed outdoor electrical equipment.

2. Type DS-3

   a. Wording: “DANGER - HIGH VOLTAGE, KEEP OUT”

   b. Location: At each entrance to electrical rooms, and enclosed outdoor electrical equipment operating at over 600 Volts. Also, on the sides of fences or walls which enclose outdoor equipment operating at over 600 Volts.

3. Type DS-4

   a. Wording: “DANGER - HIGH VOLTAGE”

   b. Location: Outside all equipment operating at over 600 Volts.

4. Type DS-5

   a. Wording: “DANGER - POWERED FROM MORE THAN ONE SOURCE”

   b. Location: Outside all equipment that operates from more than one power source.

5. Type DS-6

   a. Wording: “NOTICE - KEEP DOOR CLOSED”

   b. Location: On all doors with another safety sign installed.

6. Type DS-7

   a. Wording: “CAUTION - CONTROLS & INTERLOCKS POWERED FROM MULTIPLE SOURCES”

   b. Location: On all control panel doors.

END OF SECTION

SECTION 26 05 73

SHORT CIRCUIT AND COORDINATION STUDY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Short circuit and coordination study for the entire power distribution system.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 26 23 13 - 480 Volt Switchgear
2. Section 26 24 19 - Motor Control Centers
3. Section 26 08 13 - Electrical Testing Requirements

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. IEEE 242, "IEEE Recommended Practices for Protection and Coordination of Industrial and Commercial Power Systems"

2. IEEE 399, "IEEE Recommended Practices for Industrial and Commercial Power Systems Analysis"

3. NEC - National Electrical Code

1.03 SYSTEM DESCRIPTION

A. Requirements: Furnish a short circuit and coordination study for the entire distribution system. Include the following in the short circuit study:

1. One-line diagram of the entire distribution system identifying all components considered and ratings of all power devices. Use ANSI device numbers to identify all protective devices.

2. Calculation of momentary and interrupting fault duties for each bus.

3. Calculation of bus-to-bus impedance values reduced to a common MVA base.

4. Individually consider all motors 100 horsepower and greater. Group motors less than 100 horsepower into one equivalent motor at the motor control center bus or switchboard distribution section.

5. A table indicating the rating of each interrupting device related to the calculated duty and suggest changes when appropriate.

6. A table showing settings for all adjustable devices. Furnish these settings as a practical compromise between protection of equipment and coordination of downstream devices.

7. Time-current coordination curves to illustrate the protection and coordination achieved. Furnish these curves that include:

   a. Appropriate NEC protection points

   b. Appropriate ANSI protection points

   c. Transformer magnetizing inrush and through-fault protective curve

   d. Motor starting characteristics

   e. Cable damage limit levels

   f. One-line diagram of system plotted

   g. Short circuit current levels

8. Analysis and recommended settings for all adjustable overvoltage, undervoltage and voltage unbalance protective devices. Include voltage and time delay settings.

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

1. An executive summary of the study results and data

2. A tabulation of all protective device ratings compared with calculated fault duties

3. A tabulation of settings for all adjustable protective devices

4. Copies of all time-current coordination curves

5. Analysis of the data that led to the conclusions and recommendations included in the executive summary

6. The one-line diagram of the system studied, including all rating and identifications

7. Copies of all computed results referenced to the one-line diagram and the impedance listing

8. Furnish six bound copies of the final report

9. Furnish four CD-ROM containing the following:

   a. Complete copy of the report in PDF format

   b. Acrobat Reader

c. Distribution system one-line diagrams in AutoDesk AutoCAD latest version drawing format.

d. All short circuit and coordination study input data and component library files in format suitable for input into SKM PowerTools.

e. All voltage data.

1.05 QUALITY ASSURANCE

A. Qualifications: Conduct the study using a power-system engineering, study or analysis organization with the following qualifications:

1. Five or more years experience on this type of work

2. A proven computer program for performing 3-phase fault-duty calculations

3. Demonstrated capability for calibrating and setting protective devices.

4. Furnish the services of a lead individual for the study who has a minimum of five years experience in performing 3-phase, fault-duty calculations.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 PREPARATION

A. General: Gather the necessary data to complete the short circuit and protective curve coordination calculations. Obtain from field surveys and shop drawings informational data pertaining to product manufacturer, type and rating of PT's, CT's, circuit breakers, fusing, relays, auxiliaries, and the like. Distribution equipment and shop drawing data may be reviewed at the site.

B. Data: Estimate the lengths and sizes of cables shown on the one-line diagrams from the Contract Drawings or from field observations and measurements.

3.02 SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE EVALUATION STUDY

A. General: Include in the input data for the short circuit study the power company's short circuit contribution, resistance and reactance components of the branch impedances, the X/R ratios, base quantities selected, and other source impedances.

B. Calculations: Calculate the three-phase, bolted, short circuit and single-phase, line-to-ground short circuit current values. Calculate close and latch duty values and interrupting duty values on the basis of calculated

three-phase, bolted, short circuit currents at each bus. Buses include, but are not limited to, transformers, switchgears, low-voltage motor control centers, distribution panelboards, pertinent branch circuit panels and other significant locations throughout the system. Include in the short circuit tabulations symmetrical fault currents and X/R ratios. List for each fault location, the total duty on the bus, as well as the individual contribution from each connected branch, with its respective X/R ratio.

C. Protective Device Evaluation Study: Perform a protective device evaluation study to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Apply appropriate multiplying factors based on system X/R ratios and protective device rating standards.

3.03 PROTECTIVE DEVICE COORDINATION STUDY

A. General: Perform a protective device coordination study to provide the necessary calculations and logic decisions required to select or to check the selection of power-fuse ratings, protective-relay characteristics and settings, ratios and characteristics of associated current transformers, and low-voltage, breaker trip characteristics and settings.

B. Study Items: Include in the coordination study all medium and low voltage classes of equipment from the building service protective devices down to and including the highest rated device in the low-voltage motor control centers and panelboards. Include the phase and ground overcurrent protection as well as the settings of all other adjustable protective devices.

C. Plotted Data: Plot the time-current characteristics of the specified protective devices on log-log paper. On the plots, include complete titles, representative one-line diagram and legends, significant motor starting characteristics, complete parameters of transformers, and the complete operating bands of low-voltage, circuit breaker, trip curves and fuses. Indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. Adhere to all restrictions of the National Electrical Code and proper coordination intervals and maintain separation of characteristic curves. Furnish the coordination plots for phase and ground protective devices on a system basis. Use a sufficient number of separate curves to clearly indicate the coordination achieved.

D. Tabulation of Data: Furnish the selections and settings of the protective devices separately, in tabulated form, listing circuit identification; IEEE device number; current transformer ratios and connection; manufacturer and type; range of adjustment and recommended settings. Furnish a tabulation of the recommended power fuse selection for the medium-voltage fuses where applied in the system.

E. Settings: Furnish the protective relay characteristics; tap and time dial settings required by the coordination study to the switchgear manufacturer for selection of protective devices.

3.04 STUDY REPORT

A. General: Summarize the results of the power system study in a final report.

B. Presentation of Report: Include the following sections in the report.

1. Executive Summary

2. Description, purpose, basis and scope of the study and a one line diagram of that portion of the power system which is included within the scope of the study

3. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding the same

4. Protective-device, time–versus-current, coordination curves; tabulations of relay and circuit breaker trip settings; fuse selections, and commentary regarding the same

5. Fault current calculations including a definition of terms and guide for interpretation of computer printout

END OF SECTION

SECTION 26 08 13

ELECTRICAL TESTING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements of field acceptance testing of materials and equipment provided under various other sections to determine suitability for installation and energization. Requirements of field testing and certification of electrical equipment and materials provided under various other sections to assess their equivalence to UL Inc. listing/labeling.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. All relevant electrical sections.

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NETA - International Electrical Testing Association

2. NIST - National Institute of Standards and Technology

1.03 SUBMITTALS

A. General: Furnish all submittals including the following, as specified in Section 26 00 00.

1. Acceptance Testing Reports: Furnish acceptance testing reports for all equipment and materials including the following information:

a. Summary of the test
b. Description of material or equipment tested
c. Description of test including acceptable test values
d. Test results
e. Analysis of test results with recommendations

2. UL Testing: Furnish standard test parameters in accordance with the acceptable codes and standards for all the equipment and materials tested for equivalence to UL listing.

3. UL Test Reports and Certificates: Furnish test reports and certificates for all equipment and materials tested for equivalence to UL listing, for approval.

PART 2 PRODUCTS

2.01 TESTING COMPANIES

A. Acceptable Testing Companies: Acceptable testing companies are as listed below:

1. MET Electrical Testing Co., Inc.

2. ASET Power Systems Services, Inc.

3. Electric Power Systems, Inc.

4. Electro-Test, Inc.

5. High Voltage Maintenance Corp.

6. UL Underwriters Laboratories, Inc.

7. Other OSHA and NETA approved testing facilities

2.02 SOURCE QUALITY CONTROL

A. Tests: Furnish all testing and certification in accordance with the latest NETA, ANSI, IEEE and NEMA Standards to meet the UL requirements, NFPA Standards and NEC.

B. Test Equipment: Furnish all testing equipment, cables and appurtenances required to perform all tests and certifications in accordance with the following:

1. Use instruments that have been calibrated, to assure that they are within rated accuracy in accordance with NIST.

2. Select test instruments that are appropriate for the variable being measured

PART 3 EXECUTION

3.01 UL TESTING AND CERTIFICATION

A. General: Furnish the test reports and certifications for UL equivalence prior to acceptance of all materials and equipment requiring such tests and certifications.

3.02 ACCEPTANCE TESTING

A. General: Furnish acceptance test reports prior to acceptance of all materials, equipment and installations requiring such tests.

END OF SECTION

SECTION 26 22 13

GENERAL PURPOSE DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for furnishing and installing ventilated, dry-type transformers.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 33 - Electrical Raceway Systems
3. Section 26 05 26 - Grounding

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM D 635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

2. NEC - National Electrical Code

3. NEMA ST 20 - Dry Type Transformers for General Applications

4. NEMA TP 1 - Guide for Determining Energy Efficiency for Distribution Transformers

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish manufacturer's data including:

1. KVA ratings
2. Service voltages
3. Impedance and X/R ratio
4. Number of phases
5. Taps
6. Insulation class/temperature rise
7. Sound level
8. Dimensions
9. Weights
10. Mounting details

C. Quality Control: Furnish the following:

1. Test Reports:

a. Certified production reports for sound-level and temperature in accordance with NEMA ST 20

2. Manufacturer's Installation Instructions

D. Operations and Maintenance Manuals: Furnish 6 copies of manufacturer's operations and maintenance manuals.

1.04 QUALITY ASSURANCE

A. UL Label: Provide UL listing label or mark.

B. Energy Star Compliance: Provide “Energy Star” label for all transformers rated 15 kVA in accordance with NEMA TP 1.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Cutler Hammer
2. General Electric Company
3. Square D Company

2.03 MATERIALS

A. General: Provide dry-type transformers suitable for indoor use.

B. Insulation: Provide transformers above 15 kVA with 220-degree C temperature insulation materials (150-degree standard temp. rise).. Provide transformers 15 kVA and below with a minimum of 185-degree C insulation materials (115-degree standard temp rise).

C. Flame Retardant Materials: Provide transformers with flame retardant materials that will not support combustion as defined in ASTM D 635.

2.04 FABRICATION

A. Transformer Taps: Provide transformers rated over 15 kVA with at least two 2-1/2 percent full capacity taps above and below nominal in the primary winding. Provide transformers rated 15 kVA and below with two five percent taps or with four 2-1/2 percent taps below rated voltage on the primary winding.

B. Windings: Provide primary and secondary windings fabricated from copper conductors.

C. Voltage and KVA Ratings: Provide three-phase or single-phase transformers with primary and secondary voltages and kVA ratings as specified.

D. Connections:

1. Three phase: Primary - 3-wire Delta; Secondary - 4-wire, solidly-grounded wye.

2. Single Phase: Primary - 2-wire; Secondary - 3-wire with mid-point solidly-grounded.

E. Continuous Operations: Provide transformers suitable for continuous operation at the rated kVA with a normal life expectancy as defined in NEMA ST 20 and the performance obtained without exceeding 115 degrees C average temperature rise by resistance or 145 degrees C hot spot temperature rise in 40-degree C maximum ambient and 30-degree C average ambient. Do not provide transformers that exceed 185-degree C maximum coil hot spot temperature.

F. K-Factor: Provide three-phase transformers with a K-Factor not less than 13.

G. Electrostatic Shields: Provide electrostatic shields between windings.

H. Construction: Provide transformers with core mounting frames and enclosures of welded and bolted construction with sufficient mechanical rigidity and strength to withstand shipping, erection and short circuit stresses.

I. Sound Levels: Do not provide transformers that exceed the following sound levels:

Transformer kVA	Average Sound Level in dB NEMA ST 20
0 – 09	40
10 - 50	45
51 – 150	50

J. Lifting Lugs and Jacking Plates: Provide lifting lugs and jacking plates as required on the transformer.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all transformers and provide guards as specified by the latest NEC and ANSI standards, and in accordance with manufacturer's instructions.

B. Clearances: Provide clearance around the transformer meeting the manufacturer's recommendation.

C. Supports: Provide suitable supports for all transformers. Mount transformers on one inch of Korfund, or equal sound-absorbent material.

D. Primary Disconnect: Provide primary disconnect circuit breaker or disconnect switch as shown or required.

3.02 CLEANING AND PAINTING

A. Shop Painting: Paint transformers meeting the requirements of painting specifications.

B. Field Painting: Clean and touch up scratched and marred surfaces to match the original finish.

END OF SECTION

SECTION 26 23 13

480 VOLT SWITCHGEAR

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing, installing and testing front accessible only 480-volt switchgear including the following major components:

1. Stationary structure including bus bars
2. Main and tie power air circuit breakers
3. Distribution power air circuit breakers
4. Control, protection, monitoring and metering equipment
5. Remote Breaker Control Panel

B. Related Work Specified in Other Sections Includes:

1. Section 25 31 03 – PLC Systems
2. Section 26 00 00 - Basic Electrical Materials and Methods
3. Section 26 05 26 - Grounding
4. Section 26 05 53 - Electrical Identification
5. Section 26 08 13 - Electrical Testing Requirements
6. Section 26 05 73 - Short Circuit and Coordination Study
7. Section 26 05 19 - Wires and Cables - 600 Volts and Below
8. Section 26 00 16 – Electric Utility Coordination and Requirements

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEC - National Electrical Code (NEC).
2. IEEE C37.13 - Low-Voltage AC Power Circuit Breakers Used in Enclosures
3. IEEE C37.20.1 - Metal-Enclosed Low Voltage Power Circuit Breaker
4. ANSI C37.51 - Conformance Testing of Metal-Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies.
5. IEEE C37.90 - IEEE Standard for Relays and Relay-Systems Associated with Electric Power Apparatus
6. NEMA SG3 - Low-Voltage Power Circuit Breakers.
7. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits

8. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits

9. MIL-STD-220A - Method of Insertion-loss Measurement 12/1/59; with N1 and N2 (Fed/mil H-q)

10. NEMA SG5 - Power Switchgear Assemblies.

11. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors

12. UL 1283 - Electromagnetic Interference Filters

13. UL 1449 - Transient voltage surge suppressors

14. UL 1558 - Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear

B. Material Workmanship Requirements: Provide all materials and workmanship meeting the requirements of NFPA Standards and Codes.

C. Design and Testing Requirements: Provide all switchgear components designed, manufactured and tested in accordance with the latest NEMA, IEEE and ANSI Standards; and UL listed.

D. Installation Requirements: Install the switchgear assemblies meeting the requirements of NEC and local Electrical Codes.

1.03 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish the following.

1. Manufacturers catalog data on switchgear assemblies and on each component detailing materials, ratings, type, model and reference number.

2. Layout drawings customized for the project including physical details, dimensions, clearances, mounting, elevations, sections, and nameplates.

3. Electrical control schematics, wiring diagrams, internal interconnection diagrams and interconnection diagrams, including equipment external to the switchgear.

4. Terminal lists for all connections.

5. Furnish instruction booklets and time-current curves for each circuit breaker supplied.

6. Furnish microprocessor-based metering system and overload protection systems address, memory map and instruction booklets.

7. Furnish the following information on surge protection devices (SPDs):

   a. Verification that the SPDs comply with UL 1449.

   b. Actual let through voltage test data in the form of oscillograph results for both the ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (ringwave) tests in accordance with ANSI/IEEE C62.45.

   c. Spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying that the device's noise attenuation exceeds 50 dB at 100 kHz.

   d. Test reports from a recognized independent testing laboratory verifying the suppressor components can survive published surge current ratings on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Note: Test data on individual modules are not acceptable.

C. Contractors' Drawings: Furnish switchgear installation details including concrete pad details, mounting details, conduit and cable termination details and shipping section split field connection details.

1.04 QUALITY CONTROL

A. Test Reports: Furnish the manufacturer's certified shop test report and field test report for each 480-volt switchgear.

1.05 OPERATIONS AND MAINTENANCE MANUALS

A. Furnish operation and maintenance manuals, including spare parts lists, as specified in the Specific/General Provisions.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

B. Storage and Protection: Store all equipment in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

1.07 SPARE PARTS

A. General: Furnish the following spare parts:

1. One transfer truck with fixed and swivel wheels and rubber tires suitable for moving the largest circuit breakers.

2. One portable circuit breaker test kit.

3. Two auxiliary power modules to power breaker trip units when breaker is not in the "connected" position.

4. One complete solid-state sensor unit for each size furnished.

5. Six replacement indicating light color lens for each color furnished.

6. Three current transformers of each type and rating.

7. Two potential transformers of each type and rating.

8. Twelve potential transformer primary fuses.

9. Twelve potential transformer secondary fuses.

10. Two sets of control jumpers.

11. One hand crank per switchgear for circuit breaker withdrawal and insertion.

12. Three 12-ounce spray cans of the final finish for touch-up

13. PLC spare parts as required by Section 25 31 03 – PLC Systems.

B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. 480-Volt Switchgear

   a. Cutler-Hammer Magnum DS Low Voltage Metal Enclosed Switchgear with Magnum DS drawout power circuit breakers with Digitrip RMS solid state tripping units.

2. Microprocessor Based Protective Relays and Metering Systems

   a. Cutler-Hammer Power Xpert 6000 Series

3. Surge Protection Devices (SPDs):

   a. Cutler-Hammer Model SPD250480Y3B
   b. Advanced Protection Technology

4. Power Transducers

a. Scientific Columbus Type Exceltronic
b. Rochester Instrument Systems

2.02 SERVICE CONDITIONS

A. Utility Company Stationary Structure: The power supply to the switchgear will be from the secondary of Tampa Electric Company pad mount transformers. Coordinate the circuit breaker trip units with the power company incoming feeder protection

B. Switchgear:

1. Provide switchgear with the following features:

a. Individually mounted, drawout power air circuit breakers

b. Front accessible cable compartments

c. Maximum compartment depth of 40”

d. Full insulated and isolated bus

e. Insulated run back bus

f. Circuit breakers rated for 100 percent continuous ampere when installed in the switchgear enclosure

g. Interrupting rating of 65,000 rms symmetrical amperes at rated voltage

2. Label the switchgear suitable for use as service entrance equipment where appropriate.

3. Provide all components required for complete functioning units as specified and as shown using factory built standardized units, completely dead front, totally enclosed and freestanding. Each unit comprises a stationary structure and a drawout circuit breaker.

4. Design, manufacture and test all equipment in accordance with the NFPA 70, NEMA SG3, and SG5; IEEE C37.13, C37.20.1 and C37.51 and UL 1558 Standards.

5. Provide the required number of units based on the necessary controls and metering as shown and specified.

C. Distribution System: Connect the switchgear to 480-volt, 3-phase, 60-hertz, 3 wire, solidly grounded neutral power system.

D. Provide a Programmable Logic Controller (PLC) based control system designed to control the switchgear circuit breakers as detailed in the operation parameter listed in this section.

E. Provide a Remote Breaker Control Panel enabling an operator to remotely open and close all switchgear main, tie, feeder and generator circuit breakers clear of the arc flash boundary of the switchgear.

2.03 COMPONENTS

A. Stationary Structure: Construct the stationary structure of the switchgear as follows:

1. Build each unit out of bolted structural steel members, together with formed or fitted sections of smooth sheet steel approximately 90 inches high.

2. Form completely enclosed compartments for various combinations of circuit breakers and auxiliary equipment.

3. Provide sufficient structural strength to support all the equipment mounted within, withstand the handling and shipment of the units, maintaining the proper alignment, and be rigid and freestanding.

4. Provide a formed front door panel for each compartment consisting of concealed type hinges.

5. Reinforce panels as required to retain alignment and to support instruments, relays, and control equipment mounted thereon.

6. Provide removable plates to permit access to all compartments individually.

7. Isolate circuit breaker, buses, and incoming or outgoing cables with separate compartments formed by sheet steel barriers.

8. Provide a circuit breaker cubicle that allows the front face of the circuit breaker to extend to the front of the switchgear enclosure or be enclosed behind the circuit breaker compartment door.

9. Provide suitable ventilation for the individual compartments to keep the temperature of devices and buses within the permissible temperature limits as specified by the Standards.

10. Include insulated buses, fixed portion of primary disconnect devices, insulated connections, instrument transformers, control devices and fuses in the stationary structure. Provide removable boots to give access to bus joint for inspection and maintenance.

11. Provide a positioning mechanism for moving the removable circuit breaker to or from the connected position.

12. Provide guides for proper alignment of all engaging parts during movement of circuit breakers between the connected or disconnected position.

13. Provide stationary structure and circuit breakers that are interchangeable with every other circuit breaker of the same rating.

14. Extend the control and potential buses across units of the switchgear as required.

15. Fully isolate the main bus compartment from the circuit breaker compartment and cable terminations.

16. Provide main buses rated not less than shown, consisting of rigidly supported insulated copper bars of suitable design and cross-sectional area to satisfactorily carry the rated current without exceeding the temperature rise as specified in the IEEE and NEMA standards.

17. Connect the bus with bolts having Belleville type lock washers.

18. Tin plate the copper bars at current-carrying connections.

19. Insulate all standard bus joints with preformed insulating boots secured by nylon hardware. Insulate nonstandard joints with tape and insulating compound.

20. Equip each switchgear unit with a 1/4-inch by 2-inch bare tin-plated copper ground bus with a momentary rating at least equal to the highest momentary rating of the unit's circuit breakers. Extend the ground bus the entire length of the structure and comply with all applicable codes and regulations.

21. Ground each stationary unit directly to the ground bus.

22. Provide suitable lug terminals on the ground bus for connections to the station grounding system.

23. Construct and arrange the stationary structure so that circuit breakers are completely isolated from each other within the same section and that sections are isolated from adjoining sections.

24. Provide steel floor channels suitable for embedding into the concrete floor for leveling and anchoring the switchgear. Drill and tap the floor channels as required. Provide bolts, nuts, and washers for anchoring the switchgear to the channel.

B. Switchgear Enclosure:

1. Provide front accessible switchgear suitable for installation indoors. Maximum compartment depth shall be 42".

C. Drawout Circuit Breakers and Tripping Units:

1. Provide 480 volt, 3-pole, 600-volt class, drawout-type, power air circuit breakers with solid-state trip units rated as shown, having 65,000 rms amperes interrupting rating without current limiting fuses. Provide breakers having a 100 percent ampere rating when installed in the switchgear enclosure.

2. Provide circuit breakers with trip free, manual-operating handles, stored-energy type trip mechanism and push-to-trip button; rated for 40 degrees C ambient operation. Circuit breakers shall be electrically and mechanically interlocked to prevent paralleling of sources.

3. Equip the circuit breaker with mechanical interlocks to prevent moving the circuit breaker to and from the connected position without the circuit breaker open.

4. Provide circuit breakers that cannot be closed at any point between the operating and test positions.

5. Provide means to padlock the circuit breaker in the disconnect position.

6. Provide electrically-operated distribution circuit breakers and electrically operated main and tie circuit breakers.

7. Provide electrically operated circuit breakers suitable for 120 volts ac operation. Provide all auxiliary relays, electrical interlocks and cell position switches to accomplish the operation shown or specified.

8. Provide control connections between the stationary structure and removable circuit breaker that have floating terminals mounted in the stationary structure and engaging mating contacts on the breaker that are engaged when the breaker is in either the connected or test position.

9. Provide all circuit breakers with true rms sensing and microprocessor-based logic circuitry having the following protection features for tripping the circuit breaker.

    a. Trip Indicators
    b. Long time setting and time delay
    c. Short time setting, time delay and I^2t response.
    d. Instantaneous setting (distribution circuit breakers only).
    e. Ground fault setting, time delay and I^2t response.
    f. Short time and ground fault zone interlocking.

10. Provide all breakers with a maintenance switch enabling the reduction of arc flash potential by overriding the breaker protective settings. Furnish with an auxiliary dry contact for the purpose of remote monitoring.

D. Switchgear Connections and Terminals:

1. Construct all current-carrying connections of copper having suitable capacity, bracing, insulation, temperature rating as the main bus.

2. Connect current transformers in such a way that the transformers may be removed and changed without damaging the connection.

E. Instrument Transformers:

1. Current Transformers

a. Provide dry type current transformers, suitable for indoor service and rated as shown.

b. Provide sufficient thermal and mechanical capacity to withstand the maximum momentary current rating of the circuit breaker.

c. Provide solderless, clamp type shorting terminal blocks for secondary connections.

d. Properly identify the polarity of all current transformers with standard marking symbols.

e. Provide current transformers having an accuracy suitable for the instruments and meters specified using the normal burdens of the various devices, and not less than ANSI Standard requirements.

2. Potential Transformers

a. Provide dry type potential transformers, suitable for indoor service. single-phase, 60 hertz, 120 volts.

b. Provide potential transformers that fit into and coordinate with the complete switchgear units, and with the instruments, relays, meters, and devices specified.

c. Rate the potential transformers not less than 100-volt-amperes at 55 degrees C ambient or 150-volt-amperes at 30 degrees C ambient thermal rating.

d. Provide potential transformers that can withstand a secondary short circuit for at least one second.

e. Provide the transformers meeting the requirements of the ANSI Standard accuracy classifications.

f. Provide current-limiting type primary fuses.

g. Provide secondary fuses sized for the protection of potential transformers.

3. Grounding

a. Ground current and potential transformer secondaries with copper conductors not smaller than No. 10 AWG and connecting to the ground bus.

b. Ground potential transformer neutrals, where shown or required with a 600-volt green insulated copper conductor not smaller than No. 10 AWG.

c. Provide connections to the bus that can be easily disconnected and isolated for field testing individually.

d. Install each ground wire as a continuous run without intervening splices or terminal blocks.

e. Ground secondary circuits of metering and relaying transformers at one point only.

f. Effectively ground meter, relay and instrument transformer cases.

F. Protective Relays: Provide protective relays meeting the following:

1. Drawout type with targets, test switches and devices incorporated in the relay unit.

2. Semiflush case.

3. Hand reset indicators.

4. Finish exposed metal surfaces of relays in dull black.

5. Wired so that the tripping current of the circuit breaker trip coil will be interrupted by means other than relay contacts.

G. Lightning Arresters and Surge Capacitors:

1. Provide lightning arresters and surge capacitors for each incoming service.

H. Control Devices:

1. Provide control switches of the standard rotary, multistage type suitable for the use specified.

2. Provide auxiliary relays, switches and mechanisms required for the particular manufacture of the breaker.

3. Provide a manually-operated trip bar or lever for each circuit breaker.

4. Equip with provisions for manual closing of each circuit breaker.

I. Instruments:

1. Instruments shall be electronic, microprocessor based provided as an integral unit to the associated circuit breaker.

J. Voltage Indicator

1. A flashing LED-type voltage indicator shall be connected to the load side of each circuit breaker. This indicator shall be mounted through the door of each compartment containing a circuit breaker to readily indicate to

the operator the presence of voltage on the load side of the circuit breaker.

2. The voltage indicator shall be phase sensitive, U.L. listed and suitable for voltages between 40-750 VAC / 30-1000 VDC. The voltage indicator shall be compatible with flashing LED's, flush-monted bezel assembly and voltage warning label.

3. The voltage indicator shall be a Safeside R-3W-KB, manufactured by Grace Engineering or equal.

K. Power Transducers:

1. Provide voltage, current, watt, var, frequency and power factor transducer as shown or required in accordance with the following:

a. Solid state devices.

b. Output: 4-20 ma into a 750-ohm load.

c. Provisions for zero and span adjustment with 0.25 percent accuracy.

d. Operate on external 120 volts ac, single phase, 60-hertz or derive their power supply from input signals.

e. Calibrate power factor transducer between 50 percent lag and 50 percent lead.

f. Use watt and var transducers designed for 3-phase, (3) (4) wire system.

L. Microprocessor-Based Metering System: Provide a microprocessor-based metering system having the following features:

1. LCD Graphic Display Module with Meter Modules as indicated.

2. Embedded LAN/WAN Web Server for managing the electrical distribution system by providing real time circuit information with energy and demand readings and trending capabilities.

3. Output: Modbus via RS-485 multi-drop connections.

4. LCD Graphic Display Module

5. Sag/Swell/Transient Capture and Recording

6. Historical Trend Logging

7. Energy Profile Data

8. Energy and Demand Comparisons capability

9. Event Triggers

10. Event Logging

11. Digital I/O Card

12. Derive control power from metered line

13. Multiple communications ports

14. Metering / monitoring parameters:

    a. Volts: L-L, L-N Avg., L-L Avg., L-N, N-G
    b. Phase neutral and ground currents
    c. Power: real, reactive and apparent
    d. Frequency
    e. Power Factor: apparent and displacement
    f. Energy
    g. Demand
    h. % THD
    i. Minimum and maximum values
    j. Harmonics
    k. Flicker
    l. Individual harmonics
    m. Interharmonics
    n. % TDD
    o. ITIC events plot, duration, magnitude
    p. Energy and demand comparisons
    q. Event calendar
    r. Event time line and sequence
    s. Phasors
    t. Sequence components
    u. Crest factor
    v. K-factor
    w. PQ index

15. Separate relay trip and alarm outputs contacts rated 5 amperes at 240-volt ac or 30-volt dc resistive.

M. Surge Protection Devices (SPDs):

1. Provide surge protection devices that comply with UL 1449.

2. Provide units with a maximum continuous operating voltage that exceeds 115 percent of the nominal system operating voltage.

3. Provide SPDs suitable for wye-configured systems.

4. Provide SPDs having directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G).

5. Provide SPDs that distributes the surge current to all MOV components to ensure equal stressing and maximum performance and provides equal impedance paths to each matched MOV.

6. Provide high-performance EMI/RFI noise rejection filters that attenuate the electric line noise at least 50 dB at 100 kHz using the MIL-STD-220A insertion loss test method.
7. Wire internal components with connections utilizing low impedance conductors and compression fittings.

8. Provide a monitoring panel for each system that incorporates the following features:

    a. Green/red solid state indicator light to indicate which phase(s) have been damaged.
    b. A flashing trouble light to indicate fault detection
    c. Transient event counter
    d. Audible alarm
    e. Form C dry contacts for remote indication of the unit status.

9. Provide SPDs for service entrance application with a minimum total surge current capable of withstanding 250kA per phase respectively or as shown.

N. Wiring:

1. Completely assemble, wire and test each switchgear section at the factory, including buses, phase, neutral and ground connections, insulators, cleats, terminals, and terminal blocks.

2. Insulate all current-carrying parts.

3. Route all secondary wiring in the front of secondary compartments in wiring troughs and terminate at approved, molded-type terminal blocks with numbered marking strips, conveniently located with respect to the control conduits.

4. Provide terminal blocks with covers mounted so that the wires can be grouped and laced together.

5. Mark and identify all wiring in accordance with the manufacturer's wiring diagrams.

6. Label control wiring with an identification tag that indicates the terminal number of the opposite end connection.

7. Include wire labels and terminal numbers on schematic control and wiring diagrams.

8. Provide spade connectors for wires No. 12 and smaller and solderless lugs for larger sizes.

9. Provide terminals for all connections and an additional 15 percent spare terminals for all control and instrument wiring.

10. Provide No. 10 AWG stranded copper or larger with NEC Type SIS insulation for all current transformer secondary wiring.

11. Provide No. 14 AWG stranded copper or larger with NEC Type SIS insulation for all other control wiring.

12. Provide a fused switch or circuit breaker for the control power supply in each breaker compartment.

O. Programmable Logic Controller (PLC)

1. Provide the PLC in accordance with Section 25 31 03 – PLC Systems.

P. Identification:

1. Provide identification of the switchgear and its components as specified in Section 26 05 53.

2. Install nameplates for devices located on doors so they are readable to a person 5'-8" tall standing 3'-0" in front of the equipment.

3. Locate nameplates so that they are readily associated with the items labeled.

4. Where nameplates are installed on removable relays or removable device doors, install a nameplate within the relay or device.

5. Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

Q. Remote Breaker Control Panel RBCP

1. Provide NEMA 12 enclosure with hinged latching cover as detailed on the drawings.

2. Furnish with pistol grip type switches with maintained and momentary contacts as required for the application.

3. Refer to Paragraph O. for identification.

4. Panel is to be by the same manufacturer as the switchgear.

R. Uninterruptable Power Supplies (UPS): Provide two UPS with 120V input and 120V output sized to power the following loads for the lengths of time listed.

1. UPS No. 1. Size to provide power to the Microprocessor Based Metering System for Bus “A”, the Microprocessor Based Metering System for Bus “B” and the Automatic Transfer Scheme Programmable Logic Controller for a period of 30 minutes.

2. UPS No. 2. Size to provide power to the Generator Breakers Control Power for a period of 60 minutes.

2.04 ACCESSORIES

A. Circuit Breaker Lifting Device: Provide a traveling type circuit breaker lifting device rail mounted on the top of each switchgear assembly. Provide all accessories required for lifting and lowering circuit breakers.

B. Remote Racking System: Provide a remote racking system CBSARC Safe RRS-3 or equal. Remote racking system shall be compatible with switchgear circuit breakers provided.

C. Remote Switch Operator: Provide a remote switch operator CBSARC Safe RSO-IV or approved equal. Remote switch operator shall be compatible with switchgear circuit breakers provided.

2.05 OPERATION SEQUENCE

A. General

1. There will be two TECO service sources feeding the Louisiana Pumping Station.

2. Program the PLC circuit breaker automatic controls to prevent paralleling of the two TECO services through the switchgear.

3. The main and tie breakers will be capable of being manually controlled from the switchgear or the Remote Breaker Control Panel (RBCP).

4. Each bus of the switchgear has a dedicated circuit breaker for connecting to an engine driven generator set in case of a utility power failure.

5. Program the PLC circuit breaker automatic controls to prevent paralleling of the engine driven generator set through the switchgear.

6. Program the PLC circuit breaker automatic controls to prevent paralleling of a TECO service with the engine driven generator set through the switchgear.

7. The engine driven generator set breaker will be capable of being manually controlled from the switchgear or the Remote Breaker Control Panel (RBCP).

8. All switchgear feeder circuit breakers will be capable of being manually controlled from the switchgear or the RBCP.

B. Normal Service

1. The switchgear main circuit breakers, 52-1 and 52-2, are normally closed.

2. The switchgear tie circuit breaker, 52-T, is normally opened.

3. The switchgear generator circuit breaker, G-1, is normally opened.

4. The portable generator circuit breaker, G-2, is normally opened.

C. Automatic Mode of Operations

1. Switch the Manual-Automatic Selector Switch to the Automatic position.

2. Loss of TECO line feeding Transformer T-1

a. Once the voltage on switchgear Main Bus A drops below an adjustable set point, open main circuit breaker 52-1 (after an adjustable time period).

b. Display an alarm at the Pump Station SCADA PLC Panel CP-L01.

c. Send an alarm to the SCADA system.

d. After an adjustable time period, close the switchgear tie circuit breaker, 52-T

e. Once the automatic sequence is completed the switchgear Main Bus A and Main Bus B are powered from the TECO Transformer T-2.

f. The system will remain under this configuration until the TECO line feeding transformer T-1 is restored.

g. Upon restoration of the TECO line feeding Transformer T-1 monitor the voltage for an adjustable period of time from 0 to 30 minutes.

h. After the adjustable period of time expired, send a signal to SCADA notifying the operator that the TECO line feeding Transformer T-1 has been restored and the monitoring time has expired.

i. The system will remain unchanged until the SCADA operator sends a signal initiating the retransfer to the TECO line feeding Transformer T-1. Note: the circuit breakers will also be provided with a hardwired push button to allow for manual transfer.

j. Once the operator signal is received, open the switchgear tie circuit breaker, 52-T and close the switchgear main circuit breaker, 52-1.

k. Once the sequence is completed the system is back to normal configuration.

2. Loss of TECO line feeding Transformer T2

a. Once the voltage on switchgear Main Bus B drops below an adjustable set point, open main circuit breaker 52-2 (after an adjustable time period).

b. Display an alarm at the Pump Station SCADA PLC Panel CP-L01.

c. Send an alarm to the SCADA system.

d. After an adjustable time period, close the switchgear tie circuit breaker, 52-T.

e. Once the automatic sequence is completed the switchgear Main Bus A and Main Bus B are powered from the TECO Transformer T-2.

f. The system will remain under this configuration until the TECO line feeding Transformer T-2 is restored.

g. Upon restoration of the TECO line feeding Transformer T-2 monitor the voltage for an adjustable period of time from 0 to 30 minutes.

h. After the adjustable period of time expired, send a signal to SCADA notifying the operator that the TECO line feeding Transformer T-2 has been restored and the monitoring time has expired.

i. The system will remain unchanged until the SCADA operator will send a signal initiating the retransfer to TECO line feeding Transformer T-2. . Note: the circuit breakers will also be provided with a hardwired push button to allow for manual transfer.

j. Once the operator signal is received, open the switchgear tie circuit breaker, 52-T and close the switchgear main circuit breaker, 52-2.

k. Once the sequence is completed the system is back to normal configuration.

3. Loss of TECO line feeding Transformer T1 and loss of TECO line feeding Transformer T-2

a. If the system was in the configuration where the station was being fed from only one TECO transformer with the tie circuit breaker closed, the tie circuit breaker shall be opened. If the tie circuit breaker was initially open it shall remain open.

b. Display an alarm at the Pump Station SCADA PLC Panel CP-L01.

c. Send an alarm to the SCADA system.

d. The PLC shall start the generator set.

e. After an adjustable time period, close generator circuit breakers G-1.

f. After an adjustable time period, close switchgear tie circuit breaker 52-T.

g. Once the automatic sequence is completed the switchgear Main Bus A and Main Bus B are powered from the generator set.

h. The system will remain under this configuration until the TECO line feeding Transformer T-1 or Transformer T-2 is restored.

i. Upon restoration of a TECO line feeding either transformer, monitor the voltage of the associated bus for an adjustable period of time from 0 to 30 minutes.

j. After the adjustable period of time expired, send a signal to SCADA notifying the operator that the TECO line feeding the associated transformer has been restored and the monitoring time has expired.

k. The system will remain unchanged until the SCADA operator will send a signal initiating the retransfer to TECO line feeding the associated bus. . Note: the circuit breakers will also be provided with a hardwired push button to allow for manual transfer.

l. Once the operator signal is received, open the associated generator circuit breaker. After an adjustable time period, close the associated main circuit breaker.

m. The opposite bus shall remain on generator power for an adjustable period of time. Once this period of time has expired, a signal shall be sent to SCADA notifying the operator that the monitoring time has expired, and if both TECO sources are available open the tie circuit breaker and close the other main circuit breaker.

n. The system will remain unchanged until the SCADA operator will send a signal to open the generator breaker and subsequently close the tie circuit breaker. . Note: the circuit breakers will also be provided with a hardwired push button to allow for manual transfer.

o. The system shall remain on a single TECO feed until the point where all power issues are resolved.

4. In the Automatic Mode of Operation all load transfers are occur through an open transition.

D. Manual Operations

1. Switch the Manual-Automatic Selector Switch to the Manual position.

2. IN MANUAL MODE THE PARALLELING OF THE TECO FEEDS FROM TRANSFORMER T-1 AND TRANSFORMER T-2 IS STRICTLY FORBIDDEN. Hardware interlocks are provided in the switchgear to prevent paralleling of the two TECO sources.

3. IN MANUAL MODE THE PARALLELING OF THE GENERATOR FEEDS FROM GENERATOR G-1 AND GENERATOR G-2 IS STRICTLY FORBIDDEN. Hardware interlocks are provided in the switchgear to prevent paralleling of the two generator sources.

4. IN MANUAL MODE THE PARALLELING OF THE TECO FEED FROM TRANSFORMER T-1 AND THE GENERATOR FEED FROM GENERATOR G-1 IS STRICTLY FORBIDDEN. Hardware interlocks are provided in the switchgear to prevent paralleling of the TECO T-1 source and the Generator G-1 source.

5. IN MANUAL MODE THE PARALLELING OF THE TECO FEED FROM TRANSFORMER T-2 AND THE GENERATOR FEED FROM GENERATOR G-2 IS STRICTLY FORBIDDEN. Hardware interlocks are provided in the switchgear to prevent paralleling of the TECO T-2 source and the Generator G-2 source.

6. IN MANUAL MODE THE PARALLELING OF THE TECO FEED FROM TRANSFORMER T-1 AND THE GENERATOR FEED FROM GENERATOR G-2 IS STRICTLY FORBIDDEN. Hardware interlocks are provided in the switchgear to prevent paralleling of the TECO T-1 source and the Generator G-2 source.

7. IN MANUAL MODE THE PARALLELING OF THE TECO FEED FROM TRANSFORMER T-2 AND THE GENERATOR FEED FROM GENERATOR G-1 IS STRICTLY FORBIDDEN. Hardware interlocks are provided in the switchgear to prevent paralleling of the TECO T-1 source and the Generator G-2 source.

8. Provide software interlock to prevent paralleling of the two TECO sources.

9. Provide software interlock to prevent paralleling of the generators with either TECO source.

10. Provide software interlock to prevent paralleling TECO source T-1 and Generator G-1.

11. Provide software interlock to prevent paralleling TECO source T-1 and Portable Generator G-2.

12. Provide software interlock to prevent paralleling TECO source T-2 and Generator G-1.

11. Provide software interlock to prevent paralleling TECO source T-2 and Portable Generator G-2

13. In Manual Mode all load transfers occur through an open transition.

14. In Manual Mode the operator has the freedom to manually operate the switchgear to any desired configuration within the systems limitations by closing and opening any of the switchgear circuit breakers using the control switches on the Remote Circuit Breaker Panel.

E. Generator Exercising

1. The switchgear PLC shall provide for automatic exercising of each generator set. Automatic generator exercising shall be fully capable of modification by the operator (via OIT) and shall at a minimum provide:

a. Provide adjustable time of day exercising start time.

b. Provide adjustable, repeatable scheduled start day(s). Schedule may be on a daily, weekly or monthly basis.

c. Provide an adjustable exercising run time.

d. If the generator is run under load, the PLC shall provide an adjustable generator cool-down time once the load has been retransferred back to line power.

e. Provide selection of loaded or non-loaded exercising. The operator shall be capable of selecting preconfigured load scenarios to be used under loaded exercising. These preconfigured load scenarios shall meet the criteria of section 2.05.D above. The PLC shall automatically open/close circuit breakers as required for the loaded exercising configuration and shall reestablish the original configuration once the exercising period is complete.

2.06 SOURCE QUALITY CONTROL

A. Tests:

1. Conduct shop tests after the switchgear has been assembled to determine general operating condition and circuit continuity, high voltage withstand and other safety standards.

2. Witness Tests: Carry out inspection and witness test of the completed switchgear assembly to assess its state of workmanship and standard of performance.

3. Notify the ENGINEER of the proposed date of testing a minimum of ten working days prior to the test.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install the switchgear in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the Specific/General Provisions.

B. Conformance: Install the switchgear as shown, in conformance with manufacturers' written instruction and recognized industry practices. Comply with requirements of NEMA standards, and applicable ANSI publications.

C. Coordination: Coordinate with other work including cabling and wiring work as necessary to interface installation of switchgears with other work.

D. Torque Requirements: Tighten electrical connectors and terminals including screws and bolts, in accordance with equipment manufacturer's published torque tightening values of equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.

E. Fuses: Provide fuses in switchgear assemblies as required.

F. Circuit Breaker Parameters: Set the circuit breaker protection parameters in accordance with the protective coordination study specified in Section 16085.

G. Grounding Connections: Make equipment grounding connections for the switchgear as shown. Tighten connections in accordance with UL standard 486A for permanent and effective grounding.

H. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation of the system.

3.02 FIELD QUALITY CONTROL

A. Manufacturer's Representative: Provide a factory-trained experienced, competent, and authorized representative of the switchgear manufacturer to visit the site of the Work and inspect, check, adjust if necessary, approve the equipment installation and provide training as specified in the General Provisions. Provide all instruments and equipment necessary to conduct required tests, adjustments and training. Have the manufacturer's representative utilize prepared comprehensive check sheets covering inspections, checks and tests required for the assembly of the switchgear. Submit copies of these documents executed and signed by the manufacturer's representative. Have the representative present when each equipment item is placed in operation. Provide representative service as often as necessary until all problems are corrected and each equipment item is installed and operating satisfactorily.

B. Certified Report: Furnish a written report certifying that the equipment:

1. Has been properly installed.

2. Is in accurate alignment.

3. Is free from any undue stress imposed by connections or anchor bolts.

4. Has been operated under full load conditions and that it operated satisfactorily.

C. SCADA Programming: Provide manufacturer's representative at the job site as often as necessary to assist in the programming of the SCADA system for accessing the memory map of each device.

D. Tests and Inspections: Perform the following tests and inspections. Record all tests and submit a written report for approval. Retest as necessary.

1. Check all breakers, relays, meters, power and control fuses and auxiliaries for proper size, rating, and location. Clean control panels and cubicles. Remove all shipping materials.

2. Inspect equipment and each breaker and report installation or shipping damage, loose materials, shipping blocks or contamination.

3. Torque test bus connections where field joints are made.

4. Test key interlock systems to demonstrate proper function.

5. Check that all control and panel circuits are numbered and tagged and panel door legends are engraved and installed as per drawings.

6. Check equipment to determine that it is level, secured to foundations and that doors operate properly.

7. Test insulation of all control and relay circuits to ground with a suitable megohmmeter. Take suitable precautions where electronic devices, instruments and instrument transformers are involved.

8. After installation, but before any external connections are made to the switchgear, subject the switchgear to a 10-minute high potential test applied on the stationary structure and breakers. Use a test voltage of 75 percent of the standard factory production tests.

9. Test all bus, cable, wire and other equipment operating at the service voltage that is energized by closing the incoming main line breakers. This test may be witnessed by the ENGINEER.

10. Test protective relays to verify settings and determine proper operation.

11. Demonstrate the operation of all breakers to confirm correct operation per the contract drawings.

E. Training: Following completion of installation and field testing provide training for 6 employees of the CITY in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the CITY'S facilities at a time agreeable to the CITY:

1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

3.03 GROUNDING

A. System Inspections: Inspect ground system for compliance with the latest approved drawings.

B. Connection Inspections: Inspect all ground connections for evidence of looseness and/or corrosion.

3.04 CLEANING AND PAINTING

A. Shop Painting: Paint the switchgear as specified in painting specifications.

B. Field Painting: Touch up scratched and marred surfaces to match with original finishes.

3.05 IDENTIFICATION

A. General: Provide identification meeting the requirements of Section 26 05 53.

B. Component Identification: Identify all system components, cables and wires by labels indicating unit numbers, circuit numbers and date of installation.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing lighting and distribution panelboards including circuit breakers and cabinets.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 53 - Electrical Identification
3. Section 26 05 26 - Grounding

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEMA PB 1 - Panelboards
2. UL 67 - Panelboards
3. Fed. Spec. W-P-115 - Power Distribution Panel
4. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors
5. NEC - National Electrical Code

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 26 00 00.

B. Product Data and Information: Furnish the manufacturer's catalog data for panelboards, circuit breakers and accessories.

C. Operations and Maintenance Manuals: Furnish operation and maintenance manuals for the panelboards as specified in the Specific/General Provisions.

1.04 QUALITY ASSURANCE

A. Codes: Provide all materials and workmanship meeting the requirements of the NFPA, the National Electrical Code and local codes.

1. Design, fabricate and test the panelboards in accordance with applicable ANSI, IEEE and NEMA standards.
2. Provide panelboards suitable for operation at their standard nameplate ratings in accordance with ANSI standards.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Panelboards

a. Cutler Hammer
b. General Electric Company
c. Square D Company

2.02 MATERIALS

A. General: Provide factory-assembled fully rated dead-front type, panelboards, suitable for surface or flush mounting with branch circuit breakers and a main circuit breaker or main lugs as indicated.

1. Provide panelboards with a full capacity separate ground bus and connected to a three-phase four-wire or a single-phase three-wire service with insulated neutral buses as indicated.

2. Provide panelboards with the voltage, frequency and current ratings as indicated conforming to NEMA Standard PB 1, Fed. Spec. W-P-115, UL 67 and the NEC.

3. Provide panelboards with tin-plated copper main, neutral and ground buses.

4. Where required, label panelboards suitable for use as service entrance equipment.

B. Bracing: Provide main bus bracing exceeding the lowest interrupting rating of any circuit breaker installed.

C. Fabrication: Fabricate panelboards using galvanized steel, continuously welded. Provide cabinet fronts with doors over the circuit breakers. Provide doors fastened with concealed hinges and equipped with flush type catches.

1. Provide panelboards at least 20 inches wide, 5-3/4 inches deep, with wiring gutters on both sides.

2. Provide all panelboard trims exceeding five square feet in area with an inside permanently secured angle to support the trim during fastening.

2.03 COMPONENTS

A. Circuit Breakers: Provide bolt-on type branch and main circuit breakers.

1. Furnish the frame sizes, trip settings and number of poles as indicated. Mark ampere trip rating on the circuit breakers clear and visible.

a. For lighting panelboards, provide 20-ampere, single-pole, 120 or 277-volt circuit breakers unless otherwise shown or scheduled.

b. For distribution panelboards, provide 20-ampere, three-pole, 600-volt circuit breaker, unless otherwise shown or scheduled.

2. Provide all breakers with quick-make, quick-break, toggle mechanisms with automatic thermal-magnetic, inverse time-limit overload and instantaneous short circuit protection on all poles, unless otherwise indicated. Indicate automatic tripping by the breaker handle assuming a clearly distinctive position from the manual ON and OFF position. Design the breaker handle to be trip-free on overloads.

3. Interrupting Rating: 10,000 rms symmetrical amperes for circuit breakers on 240 volt systems or less, and 65,000 rms symmetrical amperes for circuit breakers on 277 or 480 volt systems.

4. Provide multipole breakers that utilize a common tripping bar.

5. Provide ground fault interrupter circuit breakers for all circuits serving receptacles located below grade and outdoors and as scheduled.

6. Provide full module size single-pole breakers. Do not install two-pole breakers in a single-pole module.

2.04 ACCESSORIES

A. Directories: Provide directories in accordance with Section 26 05 53.

B. Circuit Breaker Handle Lock: Where shown provide circuit breakers with handle clamp that holds the circuit breaker handle in the ON position.

C. Keying: Key all panelboards alike.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all panelboards in accordance with manufacturer's recommendations and approved shop drawings and as specified in the General Provisions and in compliance with the requirements of NEMA standards, NEC, and applicable ANSI Publications.

B. Mounting Height: Mount all panelboards either surface or flush mounted as shown such that the height of the top operating handle does not exceed 6 feet 6 inches from the floor.

C. Coordination: Coordinate with other Work including cabling and wiring work to interface the installation of the panelboards.

D. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with the equipment manufacturer's published torque tightening values for the equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL 486A.

E. Circuit Breaker Handle Lock: Install circuit breaker handle clamp on each circuit breaker as shown.

F. Directory: Provide a laminated typewritten directory with the following information:

1. Circuit number
2. Area served
3. Utilizing equipment

3.02 CLEANING AND PAINTING

A. Shop Painting: Paint the panelboards as specified in painting specification.

B. Field Painting: Touch up scratched and marred surfaces to match the original finish.

END OF SECTION

SECTION 26 24 19

MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing new motor control centers.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 26 - Grounding
3. Section 26 05 53 - Electrical Identification
4. Section 26 08 13 - Electrical Testing Requirements
5. Section 26 05 19 - Wires and Cables - 600 Volts and Below
6. Section 26 29 23 - Adjustable Frequency Drives

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. IEEE C37.90 - IEEE Standard for Relay and Relay Systems Associated With Electrical Power Apparatus
2. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits
3. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits
4. MIL-STD-220A - Method of Insertion-loss Measurement 12/1/59; with N1 and N2 (Fed/mil H-q)
5. NEMA ICS 2- Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.
6. NEMA ICS 3- Industrial Control and Systems Factory Built Assemblies
7. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
8. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors
9. UL 845 - Motor Control Centers
10. UL 1283 - Electromagnetic Interference Filters
11. UL 1449 - Transient Voltage Surge Suppressors

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent noncondensing.

1. Provide motor control centers designed for 480-volt, three-phase, three-wire, 60-hertz operation.

2. Provide all control devices in the center suitable for operation at 120-volts, 60-hertz, unless specifically noted otherwise.

3. Provide all control equipment and devices that meet the requirements of the 600-volt insulation class.

4. Provide motor control centers to include the indicated number of 20 or 21-inch deep sections and the components arranged as shown.

5. Arrange the equipment for convenient and ready accessibility from the front for inspection and maintenance of devices, terminals and wiring.

6. Where shown or required, label the motor control center suitable for use as service entrance equipment.

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 26 00 00.

B. Product Data and Information: Provide catalog data for all associated equipment and devices.

C. Shop Drawings: Furnish shop drawings customized to the project for motor control centers to include the following:

1. Outline drawings showing dimensions, weights, arrangement, elevations, identification of components and a nameplate schedule for all units.

2. Bill of materials including manufacturers' name and catalog number.

3. Interconnecting wiring diagrams, where required.

4. Individual schematic and wiring diagrams for each compartment.

5. Furnish details showing electrical connections between main and tie circuit breakers and corresponding main buses.

6. Furnish instruction booklets and time-current curves for each circuit breaker supplied.

7. Furnish microprocessor-based metering system and overload protection systems address, memory map and instruction booklets.

8. Furnish the following information on surge protection devices (SPDs):

   a. Verification that surge protection devices comply with UL 1449.

   b. Actual let through voltage test data in the form of oscillograph results for both the ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (ringwave) tests in accordance with ANSI/IEEE C62.45.

   c. Spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying that the device's noise attenuation exceeds 50 dB at 100 kHz.

   d. Test reports from a recognized independent testing laboratory verifying the suppressor components can survive published surge current ratings on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Test data on individual modules are not acceptable.

Obtain and enter full performance details on all motors and other equipment being served on the above drawings.

D. Quality Control: Furnish the following test reports and certificates as specified below:

   1. Certified Shop Test Reports for motor control centers and related components. Provide a minimum of 15 days written notice prior to shop tests.

   2. Detailed field test reports of all tests indicating test performed as specified, discrepancies found, and corrective action taken.

E. Operation and Maintenance Manuals: Furnish operation and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Standards: Provide motor control centers in accordance with NEMAICS 2, ICS 3, and UL Standard No. 845.

B. Codes: Provide motor control centers in accordance with the NEC and local codes.

C. UL Label: Provide a UL Label on each vertical section of each motor control center.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store, and handle all products and materials as specified in the Specific/General Provisions.

B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.

C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

1.07 SPARE PARTS

A. General: Furnish the following spare parts:

1. One current transformer of each type and each rating.

2. One set of contact tips, control power transformers and operating coils for each six or less of each size of motor starter.

3. One auxiliary contact unit or one set of auxiliary contact tips for each six or less motor control units.

4. Ten percent but not less than two complete control, latching and timing relays of each type used in motor control centers.

5. One complete reset and repeat cycle timer of each type and rating used in motor control centers.

6. Two complete replacements of overload heater units for each catalog number installed in motor control centers and motor starters.

7. Two central monitoring units.

8. Two complete replacements of all LED indicating lamps and fuses used in the installation.

9. One complete magnetic starter with motor circuit protector for each size required.

10. Two sets of replacement indicating light color lenses of each color furnished.

11. One circuit breaker test unit.

12. Three 12-ounce spray cans of the final finish for touch-up

B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Motor Control Centers:

a. Cutler-Hammer 2100 Series

b. General Electric Company (Evolution Series E9000)

2. Surge Protection Devices (SPDs):

a. Cutler-Hammer Model SPD160480Y3J
b. Advanced Protection Technology

2.02 MOTOR CONTROL CENTER

A. Basic Structural Components: Provide totally enclosed, dead-front, rigid, NEMA 1A, gasketed, self-supporting and freestanding structures.

1. Construct the various sections from channels not less than 12 gauge, formed into proper shape, suitably reinforced and welded. Grind all internal welds smooth and round off all corners to give a neat and pleasing appearance. Construct doors and covers from a minimum of 14-gauge steel sheets.

2. Provide steel bottom plates in each compartment section.

3. Provide both ends of a completely assembled center so that extensions can be easily added in the future.

4. Provide hinges, screws, bolts, circuit breaker operating mechanisms, nameplate mounting screws and other metallic appurtenances with a noncorrodible metal covering.

5. Install full height steel barriers on each side of the tie breaker structure to prevent the passage of flames and ionized gases.

6. Provide each motor control center with a three-phase bus compartment at the top and a conduit and cable compartment at the top and bottom.

7. Provide the cable compartments that run the full length of the motor control center.

8. Provide access to cable compartments by means of removable hinged doors.

9. Provide each structure with a vertical wiring space between the starter cells and side sheet for unit wiring.

10. Equip the vertical wiring space with cable supports to hold the cables and wiring in place.

B. Motor Control Center Enclosure:

1. Provide motor control centers suitable for installation indoors.

C. Bus Requirements: Provide main buses of tin plated copper bars across each structure, sized in accordance with UL temperature rise of 50 degrees C based on a 40-degree C ambient temperature.

1. Provide a 600-ampere minimum, main horizontal bus, unless otherwise shown.

2. Support all bus bars in each structure by means of bus supports fabricated from an insulating material.

3. Connect the horizontal bus to the incoming line circuit breakers and from both sides of the tie breaker with tin plated copper bars securely fastened in place.

4. Provide tin-plated vertical three-phase copper bus of sufficient size to carry loads served.

5. Insulate main and vertical buses over their entire length. Provide insulated covers over all bolted connections.

6. Separate the bus bar compartments from breaker and controller cubicles by insulated barriers or steel plates.

7. Provide a 300-ampere uninsulated copper grounding bus with lugs for connections to the plant grounding system in the bottom of each motor control center.

8. Brace all bus work suitably to withstand a minimum of 65,000 rms amperes symmetrical short circuit current. Substantiate construction by a certified laboratory test covering units of similar construction.

D. Individual Units: Provide motor control or circuit breaker units in combinations of not less than 12-inch modular heights.

1. Provide units of the plug-in or nonremovable type in accordance with the manufacturer's standard for type and size of controller.

2. Provide plug-in units within-plated, pressure-type line disconnecting stabs of high strength copper alloy. Hold each plug-in unit in place and arrange the units such that they can be removed or remounted readily without access to the rear of the structure.

3. Provide units that are totally enclosed and effectively baffled to isolate ionized gases that may occur within each unit. In addition, ventilate each unit so that it can be located anywhere within the structure using the same overload heaters for the same load.

4. Provide automatic shutter mechanism to cover the vertical bus stub area when a unit is removed.

5. Provide spaces for future equipment in unit structures with blank hinged doors and removable metal barriers for isolation of the vertical buses.

6. Construct doors to be drip-proof and dust-tight. Provide all doors with hinges and screw fasteners for holding the doors closed. Fabricate each door as a part of the structure and not part of the unit.

7. Equip the doors for motor control compartments with a motor circuit protector operating mechanism, thermal overload relay reset mechanism, voltage indicator, controls and indicating lights and other required devices as shown.

8. Equip the doors for branch feeder equipment with a circuit breaker operating mechanism.

9. Provide mechanical interlocks between the compartment door and circuit breaker operating mechanism to prevent opening of the door unless the breaker is in the OFF position, and to prevent closing the breaker unless the door is fully closed. Interlock may be defeated by tool only.

10. Provide circuit breaker operating mechanisms or handles that are padlockable in the OFF position with room for a minimum of three padlocks.

11. Provide units having devices that are serviceable from the front, without provisions for rear access.

12. Provide control power transformers, relays, timers, alternators and accessories for each unit as shown or specified.

E. Wiring:

1. Provide NEMA Class II Type B wiring for the motor control centers, including internal interlock and internal wiring between controller units and devices.

2. Provide internal wiring runs for interconnecting units with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Provide No. 14 AWG wire for control interconnections. Provide power connections as required for the service.

3. Provide No. 10 AWG or larger stranded copper wire with NEC Type SIS insulation for all current transformer secondary wiring. Provide only ring lugs for wiring of current transformers.

4. Provide wire markers at each end of all wires.

5. Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.

6. Provide the wiring of all control connections to individual terminal blocks at each motor starter. Locate terminal blocks for front access.

7. Provide interlocking wiring between units of a motor control center or between units of grouped centers as internal wiring with terminals provided for external connections.

8. Provide sufficient pull apart terminal blocks for all devices external to the motor control center.

9. Provide communication cables from the microprocessor-based metering system and microprocessor-based overload protection systems to a single terminal block located in the incoming line structure.

F. Magnetic Starters: Provide 480-volt, 3-phase, 60-hertz across-the-line combination motor circuit protector and magnetic starters having individual control power transformers.

1. Provide full-voltage nonreversing; full voltage reversing; full voltage two-speed nonreversing two-winding; and full voltage two-speed nonreversing one-winding starters as required.

2. Provide starter contacts of the replaceable, spring-loaded, wedge type with silver-cadmium oxide-plated contact surfaces. Provide replaceable coils of the epoxy sealed type.

3. Thermal Overload Elements: Provide each magnetic starter unit with a Class 20 thermal overload element and all required accessories. Provide size five and larger starters with current transformer operated overload relays.

a. Provide overload relays of the bimetallic type with an adjustment knob that allow plus or minus 15 percent adjustment of the nominal heater rating.

b. Provide and adjust overload relays to match the associated motor nameplate running current rating. Size the overload relays after approval of the corresponding motor.

c. Provide a set of isolated normally-open and normally-closed contacts for each overload relay.

4. Microprocessor Based Overload Protection: Provide each magnetic starter unit with overload protection consisting of a current sensor located in each phase monitored by a microprocessor that yields a time current curve closely paralleling that of the motor heating damage boundary, accurate to 2 percent. Running overload protection shall be DIP switch selectable for the specific motor full-load amperes within the starter range. Provide DIP switch selectable overload trip class of 10, 20 or 30, factory set for class 20.

a. Provide and adjust overload protection to match the associated motor nameplate running current rating. Size the overload relays after approval of the corresponding motor.

b. Provide an isolated normally-open and normally-closed contact for each overload relay.

c. Provide an addressable communication card capable of transmitting the following data over a two-wire network to the Plant SCADA system.

(1) Status (ON, OFF, TRIPPED, NO RESPONSE)
(2) Current in each phase

(3) Percent phase unbalance
(4) Control voltage
(5) Overload protection settings
(6) Cause of trip
(7) Trip current magnitude.

5. Replaceability: Provide starters having component parts that are easily replaceable.

6. Equip each starter with all required auxiliary contacts.

G. Supply Fan Adjustable Frequency Drives (AFD's):

1. Refer to specification section 26 29 23 for supply fan Adjustable Frequency Drive requirements.

H. Feeder Circuit Breakers: Provide molded-case type, two- or three-pole feeder circuit breakers as shown, with a minimum voltage rating of 600-volt ac.

1. Interrupting Ratings: Provide an interrupting capacity of 65,000 rms symmetrical amperes at 480 volts. Base interrupting rating on the IEEE and NEMA Standard duty cycle for this class of equipment.

2. Provide circuit breakers trip units as follows:

a. Provide individual, thermal-magnetic trip units for all frame sizes smaller than 400 amperes.

b. Provide solid-state trip units for all frame sizes 400 amperes and larger.

c. Provide trip units that actuate a common tripping bar to open all poles when an overload or short circuit occurs on any one.

d. Provide trip elements with inverse time tripping and instantaneous tripping at about ten times the normal trip device rating.

e. Provide circuit breakers with trip-free handles.

I. Main and Tie Circuit Interrupters: Provide all main and tie circuit interrupters rated as shown, of equal construction to the feeder breakers, and with the following additional features:

1. Adjustable ground fault pickup and delay setting for breakers with trip ratings of 1,000 amperes or larger.

2. Auxiliary normally open and normally closed contacts and tripped alarm contacts.

3. Key interlocks as shown.

J. Instrument Transformers: Provide transformers in an accuracy class to meet the requirements of ANSI Standards, and for the secondary burdens connected to the transformers.

1. Provide dry-wound type, current transformers with fully coordinated insulation for 600-volt insulation class.

2. Provide window-type, current transformers for ground sensing where shown.

3. Provide potential transformers rated at 480 to 120 volts.

K. Instruments: Provide flush or semiflush-mounted instruments with cases of similar design in accordance with the following:

1. Antiglare glass fronts.

2. Antiparallax scales consisting of white faces with black numerals and markings.

3. Length of the scale arc not less than 7 inches.

4. Approximately 4-1/2 inches square.

5. Instrument scales based on the instrument transformers provided, unless otherwise specified.

6. Accuracy: One percent of full scale values.

7. Drawout watt-hour meters with test disconnect facilities.

L. Surge Protection Devices (SPDs):

1. Provide surge protection devices (SPDs) that complies with UL 1449.

2. Provide units with a maximum, continuous-operating voltage that exceeds 115 percent of the nominal system operating voltage.

3. Provide surge protection devices suitable for wye configured systems.

4. Provide surge protection devices having directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G).

5. Provide surge protection devices that distribute the surge current to all MOV components to ensure equal stressing and maximum performance and provides equal impedance paths to each matched MOV.

6. Provide high-performance EMI/RFI noise rejection filters that attenuate the electric line noise at least 50 dB at 100 kHz using the MIL-STD-220A insertion loss test method.

7. Wire internal components with connections utilizing low impedance conductors and compression fittings.

8. Provide a monitoring panel for each system that incorporates the following features:

    a. Green/red solid state indicator light to indicate which phase(s) have been damaged.
    b. A flashing trouble light to indicate fault detection
    c. Transient event counter
    d. Audible alarm
    e. Form C dry contacts for remote indication of the unit status.

9. Provide SPDs suitable for service entrance or branch location application with a minimum total surge current capable of withstanding 100kA per phase respectively.

M. Control Power Transformers: Provide individual control power transformers for each starter to derive the 120 volts for the unit's control circuit meeting the requirements of Section 26 27 19.13. Ground the unfused leg of the secondary to the enclosure.

N. Push Buttons, Selector Switches and Indicating Lights: Provide push buttons, selector switches and indicating lights including legend plates having the same type, appearance, shape and catalog number throughout each motor control center meeting the requirements of Section 26 27 19.13.

O. Control Components: Provide control components including elapsed time meters, control relays, latching relays, time delay relays, reset timers, repeat cycle timers, alternators, phase failure and undervoltage relay and ground fault protection relays meeting the requirements of Section 26 27 19.13.

P. Feeder Cable Terminals: Provide closed-end, compression-type, solderless connectors and terminals, suitable for copper conductors for terminating cables in accordance with Section 26 05 19.

Q. Wiring Schematic: Provide a schematic wiring diagram of each unit and affix it to the inside of the door of that unit.

R. Identification: Provide nameplates having the same type, appearance and shape throughout each motor control center in accordance with the requirements of Section 26 05 53.

S. Voltage Indicator

1. A flashing LED-type voltage indicator shall be connected to the load side of each circuit breaker. This indicator shall be mounted through the door of each compartment containing a circuit breaker to readily indicate to the operator the presence of voltage on the load side of the circuit breaker.

2. The voltage indicator shall be phase sensitive, U.L. listed and suitable for voltages between 40-750 VAC / 30-1000 VDC. The voltage indicator shall be compatible with flashing LED’s, flush-monted bezel assembly and voltage warning label.

3. The voltage indicator shall be a Safeside R-3W-KB, manufactured by Grace Engineering or equal.

2.03 SOURCE QUALITY CONTROL

A. Tests: Shop test each motor control center in accordance with IEEE and NEMA standards.

1. Operational Tests: After the equipment has been completely assembled, perform operational tests to determine the general operating conditions and circuit continuity. Also, perform high potential tests and other standard tests for that particular class of equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the Specific/General Provisions.

B. Adjustments: Set all motor circuit protectors and circuit breakers for the approved short circuit and coordination study.

C. Overloads: Adjust the thermal overloads on each phase of the starter units to the actual motor installed.

D. Cable Connections: Terminate and label all field wiring per the approved diagrams.

E. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.

3.02 FIELD QUALITY CONTROL

A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

B. Tests: Perform the following field tests:

1. Close and open each circuit breaker and motor circuit protector to test operation.

2. Energize the motor control center and test for hot spots.

3. When site conditions permit, energize and de-energize each equipment item served by each motor control center, testing the complete control sequence of each item.

3.03 OPERATION DEMONSTRATION

A. Manufacturer's Representative: Furnish the services of a qualified, factory-trained service engineer to assist in installation, start-up, field testing, calibration, placing into operation and provide training of each motor control center.

1. Furnish the services of a service engineer when the equipment is placed into operation.

2. Furnish the services of a service engineer at job site as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.

3. Training: Following completion of installation and field testing provide training for 6 employees of the City in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the City's facilities at a time agreeable to the City:

a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

B. Operation and Maintenance: Furnish operation and maintenance instructions as specified in the General Provisions.

3.04 CLEANING AND PAINTING

A. Shop Painting: Paint motor control centers in accordance with painting specifications.

B. Field Painting: Clean and touch up any scratched or marred surface to match original finish.

END OF SECTION

SECTION 26 27 19.16

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing and installing enclosed (fused) (nonfused) safety switches for use as feeder and branch circuit switching and disconnect devices for motors and equipment.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 53 - Electrical Identification
3. Section 26 05 26 – Grounding
4. Section 26 23 13 – 480V Switchgear

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEC - National Electrical Code

2. NEMA KS1 - Enclosed Switches

3. UL 198E - Class R Fuses

4. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the General Provisions and Section 26 00 00.

B. Product Data and Information: Furnish manufacturer's data indicating disconnect switch ratings and dimensions. Furnish manufacturer's data on fuses including time-current curves.

1.04 QUALITY ASSURANCE

A. Codes: Provide disconnect switches meeting the requirements of NFPA, the National Electrical Code and local codes.

B. Regulatory Requirements: Provide all disconnect switches designed, manufactured and tested in accordance with latest ANSI, IEEE and NEMA Standards, and UL listed.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific Provisions.

1.04 SPARE PARTS

A. General: Furnish the following spare parts:

1. Twelve of each size and type fuse installed.

B. Packaging: Plainly tag and mark spare parts for identification and for reordering and properly box and wrap spare parts to prevent deterioration. Completely identify the box on the outside.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are as listed below. Other manufacturers of equivalent products may be submitted for review.

1. Disconnect Switches

a. Square D Company
b. Cutler Hammer
c. Killark

2. Fuses

a. Bussmann
b. Littelfuse

2.03 DISCONNECT SWITCHES

A. General: Provide disconnect switches of the NEMA KS-1, heavy-duty, load–interrupter, enclosed-knife switch type with externally operating handle interlocked to prevent opening of the front cover with the switch in the ON position. Provide an interlock that is be defeatable and operable from the front of the switch. Provide handle lockable in the OFF position.

B. Disconnect Switch Ratings: Provide disconnect switches rated for 600-volts as applicable and horsepower rated when used in motor circuits. Current ratings are as indicated.

C. Interrupting Rating: If the approved short circuit and coordination study indicates that the available fault current at any disconnect switch exceeds the interrupting rating of the switch, provide a fused disconnect switch with UL 248 listed Class RK1 dual element, time-delay fuses with an interrupting rating of 200,000 rms symmetrical amperes. Size the fuses for the load served.

D. Service Entrance: Where shown, provide disconnect switches suitable for service entrance.

E. Fusible Switches: Furnish switches with rejection feature to allow only Class R fuses to be installed.

F. Disconnect Switch Housings: Provide disconnect switches housed in NEMA rated enclosures as follows:

AREA	ENCLOSURE
All areas listed Class 1, Division 1 and 2, Group D as defined in Section 16050 or as shown.	NEMA 7 - Explosion-proof
Outdoor and below grade elevation indoors	NEMA 4X – Watertight 316 Stainless Steel
Above grade indoor	NEMA 12 – Industrial

G. Key Interlocks: Provide a key interlock with weatherproof cover on each of the portable generator disconnect switches as described under spec section 26 23 13.

2.04 FUSES

A. Characteristics: Provide UL 198E listed Class RK1 dual element, time-delay fuse with an interrupting rating of 200,000 rms symmetrical amperes.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install disconnect switches as shown or required. Comply with requirements of NEC and local electrical codes.

B. Provide fusible switches where shown or where otherwise determined that the available short circuit current at the line side terminals of the switch exceeds 8000 symmetrical amperes.

C. Coordination: Coordinate with other work including cabling and wiring work.

D. Torque Requirements: Tighten electrical connectors and terminal including screws and bolts, in accordance with equipment manufacturers', published torque tightening recommendations. Where manufacturers' torquing requirement are not available, tighten connectors and terminals in accordance with UL Standard 486A.

E. Fuse: In each disconnect switch install the proper type and size fuse for the load served.

F. Labels: Provide adhesive label on inside of door of each fusible disconnect switch indicating type and size of fuse for replacement.

3.02 CLEANING AND PAINTING

A. Painting: Paint the disconnect switches as specified in painting specifications.

END OF SECTION

SECTION 26 27 19.19

ELECTRIC MOTORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for electric motors as specified.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 33 - Electrical Raceway Systems
3. Section 26 05 53 - Electrical Identification
4. Section 26 05 26 - Grounding

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. ABMA L10 – Basic Rating Life
2. NEMA CP1 - Shunt Capacitors
3. NEMA MG1 - Motors and Generators
4. NEC - National Electrical Code

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 26 00 00.

B. Product Data and Information: Furnish manufacturer's catalog data for each motor.

C. Shop Drawings: Furnish shop drawings for each motor detailing arrangement, wiring, conduit boxes, and motor application.

D. Certificate of Compatibility: For each motor controlled by an adjustable frequency drive, furnish a certificate that the motors are compatible with the adjustable frequency drives and the equipment loads to be driven.

E. Quality Control: Furnish test reports for motors as follows:

1. Certified standard commercial test reports for motors 5 hp through 250 hp.

2. Actual shop test reports for motors over 200 hp.

3. Witnessed test reports as specified.

F. Operations and Maintenance Manuals: Furnish operation and maintenance manuals for all motors.

1.04 QUALITY ASSURANCE

A. Codes: Comply with local codes and all other applicable codes.

B. Regulatory Requirements: Comply with requirements of the Regulatory Agencies having jurisdiction over this Project.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified the Specific/General Provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. General Electric Company
2. Magnetek
3. Baldor
4. Reliance Electric
5. Siemens
6. U.S. Electrical Motors
7. TECO/Westinghouse Corp.
8. AEGIS (Bearing Protection Rings)

2.02 MATERIALS

A. General: Provide motors and accessories with the equipment as specified under the equipment sections.

B. Motor Requirements: Unless otherwise specified, provide motors as follows:

1. Polyphase motors of the high energy efficiency and high power factor type.

2. Motor nameplate horsepower as specified for the driven equipment.

3. Motors that operate continuously over the entire load range of the driven equipment without loading motor in excess of nameplate rating and its specified temperature limit.

4. For motors rated ½ hp to 200 hp operating at 460 volts, 3-phase, 60-hertz, provide squirrel cage induction type.

5. For motors rated over 200 hp, operating at 460 volts or higher voltages, 3-phase, 60-hertz, provide squirrel cage induction or synchronous type, as specified.

6. For motors less than ½ hp, provide 115-volt, single phase, 60-hertz type.

7. Motors that are suitable for continuous operation with a line voltage variation within ± 10-percent of rated voltage.

8. Motors that operate continuously in a 40 degrees C ambient.

9. Inverter duty motors when powered from an adjustable frequency drive.

10. Sewage Pumps Motor Grounding Shaft Protection:

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

    b. Motors shall have the bearing protection installed per manufacturers specifications, and as specified herein, either in a qualified motor maintenance shop or at the project site.

    c. Provide protection for vertical mounted motors as follows:

        (1) Top Bearing (NDE): Bearing journal installed must be insulated or insulated ceramic or hybrid ceramic.

        (2) Drive End (DE): Install one AEGIS™ SGR Bearing Protection Ring on drive end.

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

        (4) Colloidal Silver Shaft Coating (PN CS015) is required for this type of application

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

C. Frequent Start Requirements: Provide motors for frequent starting as specified.

2.03 MECHANICAL PROTECTION

A. Indoor Locations:

1. For motors located in dry, clean and well ventilated areas provide open drip-proof type.

2. For motors located below grade, provide totally-enclosed, fan-cooled type with removable drain plug.

3. For motors located in wet, damp or dusty areas, provide totally-enclosed, fan-cooled type with removable drain plug.

4. In corrosive areas as defined in Section 26 00 00 or as shown, provide totally-enclosed, fan-cooled type with removable drain plug.

B. Outdoor Locations: For motors located outdoors, provide a totally-enclosed, fan-cooled type with removable drain plug.

C. Hazardous Locations: As defined in Section 26 00 00 or as shown or required by the NEC.

1. Class 1, Division 1 Area: Provide totally enclosed fan-cooled explosion-proof motor.

2. Class I, Division 2 Areas: Provide totally enclosed fan-cooled without brushes, switching mechanisms or other arc-producing devices.

2.04 BOXES

A. General: Provide oversized conduit boxes on motors to facilitate conductor installation and auxiliary components as required.

3. Provide separate boxes for motor power leads, accessory terminals and RTD leads.

4. Make conduit box NEMA enclosure ratings compatible with motor enclosures.

5. Where shown, provide additional space in the power terminal box for the mounting and wiring of the current transformers furnished under the motor protection system.

2.05 NEMA DESIGN AND INSULATION

A. Design Classification: Provide NEMA Design B, unless otherwise specified with NEMA Class F moisture resistant insulation and NEMA Class B, 80 degrees C temperature rise at rated nameplate load.

B. Variable Speed Operation: Provide insulation to protect against adverse affects of a nonsinusoidal waveform.

2.06 WINDINGS

A. General: Provide copper windings unless otherwise specified.

2.07 BEARINGS

A. Ball and Roller Bearings: Use antifriction ball or roller type bearings at manufacturer's option, unless otherwise specified.

B. Regreasable Bearings: Use regreasable bearings with support side thrust loadings, with an ABMA L10 bearing life rated at least 100,000 hours, based on a reliability of 90 percent.

2.08 SERVICE FACTOR AND LOADINGS

A. Service Factor: Provide 1.15 service factor for sinusoidal voltage waveforms and 1.0 for nonsinusoidal voltage waveforms unless otherwise specified. Where motors with a 1.0 service factor are furnished, provide motors rated at least 15 percent greater than required brake horsepower.

B. Shaft Loading: Provide steady state shaft loading not to exceed 100 percent of full load rating under maximum load, excluding the service factor, unless otherwise specified.

2.09 SPEED

A. General: Provide motor speed as specified for the driven equipment.

B. Multispeed: Provide multispeed motors as specified for the driven equipment.

C. Adjustable Speed: Provide motors specifically designed and rated for use with the adjustable speed device furnished.

2.10 TORQUE

A. General: Provide breakdown torque of 200 percent or more of motor full load torque.

B. Locked Rotor: Provide locked rotor torque of 80 percent or more of motor full load torque.

C. Inertia: Provide necessary WK^2 data for special loads to coordinate with motors.

D. Special Motors: Supply special motors where torque requirements exceed standard design.

2.11 SLIDE RAILS AND SOLE PLATES

A. General: Provide slide rails and sole plates as required for proper installation.

2.12 SINGLE PHASE FRACTIONAL HORSEPOWER MOTORS

A. Small Motor Requirements: Provide capacitor or open split phase start, for smaller than 1/2 hp motors unless otherwise specified.

2.13 THREE-PHASE MOTORS

A. Induction Motors: Provide horizontal or vertical squirrel cage induction motors for continuous duty with full voltage starting except as otherwise specified.

2.14 EFFICIENCY

A. General: Provide motor meeting the requirements as stated in Table of Full Load Efficiency of Energy Efficient Motors in NEMA MG1-12.

2.15 POWER FACTOR

A. General: Provide motors having the following minimum power factor ratings:

Motor Power Factor - Minimum

	Percent	
Horsepower	At 1800 RPM Power Factor	At 1200 RPM Power Factor
1	74.3	69.7
1-1/2	76.5	62.0
2	70.3	70.1
3	79.9	73.7
5	83.8	75.8
7-1/2	82.4	78.2

Motor Power Factor - Minimum		
	Percent	
Horsepower	At 1800 RPM Power Factor	At 1200 RPM Power Factor
10	85.0	76.4
15	85.0	81.1
20	84.6	81.9
25	84.5	82.0
30	84.2	82.5
40	84.2	83.3
50	85.0	84.9
60	86.8	85.7
75	86.6	86.0
100	88.3	86.4
125	89.3	85.8
150	88.5	87.5
200	88.5	87.9

2.16 NOISE

A. General: Limit motor machine noise to sound power levels listed in NEMA MG 1-12.

2.17 ACCESSORIES

A. Identification: Provide identification meeting the requirements with Section 26 05 53.

B. Space Heaters: Sewage Pump Motors shall be provided with motor space heaters to prevent moisture condensation when the motor is not operating. Provide space heaters suitable for 115-volt, single phase, 60-hertz operation.

C. Provide redundant motor winding thermistors (six total) in the windings of the motors for sewage pumps p1, p2, and p3.

D. Provide vibration sensors and multi-channel monitoring system Model VPR100 Series by CTC Company.

2.18 SOURCE QUALITY CONTROL

A. Shop Tests: Perform actual job motor shop tests for motors over 200 hp. Include standard commercial and additional tests listed below, and special tests listed in other sections.

B. Standard Commercial Tests: Perform the following tests in accordance with NEMA standards.

1. No load running current and speed

2. Locked rotor current

3. Dielectric routine tests

4. Motor efficiency tests

5. Motor power factor tests

C. Additional Testing: Perform the following additional tests in accordance with NEMA standards.

1. Winding resistance

2. Bearing inspection

3. Power factor at full, 3/4 and 1/2 load

4. Efficiency at full, 3/4 and 1/2 load

5. Motor starting torque

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install motors in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the General Provisions. Make all necessary adjustments to equipment to provide a complete operational system.

B. Install additional grounding connections where shaft grounding protection is applied.

3.02 FIELD QUALITY CONTROL

A. Inspections and Tests: Perform field preliminary and final inspection and testing for motors as follows:

1. Preliminary Inspection:

a. Demonstrate that each motor has been properly connected.

b. Check for proper rotation by bumping prior to connecting motor to driven equipment.

2. Final Test:

a. Measure motor applied voltage and current with equipment operating at full load.

b. Operate equipment as specified.

3.03 CLEANING AND PAINTING

A. Shop Painting: Paint the motors in accordance with the requirements painting specifications.

B. Field Painting: Clean and touch up marred surfaces to match the original finish.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing, wiring devices and appurtenances as indicated, in accordance with the Contract Documents.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 33 - Electrical Raceway System
3. Section 26 05 26 - Grounding

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. Fed Spec WC 596 - Electrical Power Connector, Plug, Receptacle and Cable Outlet
2. Fed Spec WS 896 - Toggle and Lock, Flush Mounted Switches
3. CSA C22.2-182.1 - Industrial-type, Special-Use Attachment Plugs, Receptacles and Connectors
4. UL 20 - General - Use Snap Switches
5. UL 498 - Attachment Plugs and Receptacles
6. UL 508 - Industrial Control Equipment
7. UL 894 - Switches for Use in Hazardous (Classified) Locations
8. UL 1010 - Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations
9. UL 1682 - Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type
10. UL 1686 - Standard for Pin and Sleeve Configurations

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in Section 26 00 00.

1.04 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified the Specific/General Provisions.

1.05 SPARE PARTS

A. General: Furnish the following spare parts.

1. Five 20-ampere, 125-volt, 2-pole, 3-wire, grounding type plugs, NEMA 5-20P, nylon housing, Hubbell Cat. No. HBL5366C

2. Ten 20-ampere, 125-volt, 2-pole, 3-wire, grounding type plugs, NEMA 5-20P, corrosion resistant, yellow nylon housing, Hubbell Cat No. HBL 53CM66C

3. Ten percent but not less than 5 matching plugs for each type and rating of receptacles furnished

B. Packaging: Package spare parts in containers bearing labels clearly designating contents. Identify all spare parts with information needed for reordering. Deliver spare parts in original factory packages.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Standard of Quality and General Configuration: Use of manufacturer's name and model or catalog number is for the purpose of establishing the desired quality and configuration.

B. Configuration and Rating: Provide NEMA specification grade wiring devices in the type, color, configuration and electrical rating for the service indicated.

C. Symbols: See the electrical symbol list shown for identification of all device types.

D. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Hubbell Inc. Wiring Device/Kellems Division
2. Pass and Seymour
3. Cooper Wiring Devices
4. Leviton
5. Appleton Electric Company
6. Crouse-Hinds Company
7. Meltric
8. Tork
9. Tay Mac Corporation
10. Thomas & Betts

2.02 LIGHTING TOGGLE SWITCHES

A. General: Provide toggle switches of specification grade rated 20- amperes, 120-277 volts ac conforming to Fed. Spec. WS 896 and UL Standard 20. Manufacture switches with back and side wired binding screw type terminals, one-piece spring contact arm and terminal plate with silver alloy contacts, one-piece steel mounting strap with an assured grounding clip, thermoset body color coded for identification by amperage and a brown toggle. Provide ivory toggles in finished areas.

B. Types:

DESCRIPTION	HUBBELL CAT. NO.
Single pole	HBL1221
Three way	HBL1223
Four way	HBL1224
SPDT center off momentary contact	HBL1557

C. Accessories: Provide a flush neon "ON" pilot light in conjunction with switches controlling equipment whose operation is not evident at the switch location. Provide an engraved nameplate to identify equipment controlled.

2.03 AC MANUAL MOTOR STARTING SWITCHES

A. General: Provide ac manual motor starting switches where overload protection is not required or is provided separately. Provide switches similar in construction to the lighting toggle switches except conforming to UL 508 and rated 30-amperes, 120-277 volts ac.

B. Types:

DESCRIPTION	HUBBELL CAT. NO.
Single pole	HBL-3031

Double pole HBL-3032

C. Accessories: Provide a flush neon "ON" pilot light in conjunction with switches controlling equipment whose operation is not evident at the switch location. Provide an engraved nameplate to identify the equipment being controlled.

2.04 CONVENIENCE RECEPTACLES

A. General: Provide specification grade convenience receptacles conforming to Fed. Spec. WC 596 UL listed, with nylon impact resistant face, one-piece metal wrap around mounting strap with assured grounding clip, back and side wired binding screw type terminals, brass power contacts and a heavy duty heat stabilized thermoset plastic base. Provide brown devices in unfinished areas and ivory devices in finished areas unless otherwise specified.

B. TYPES:

DESCRIPTION	RATING	COLOR	HUBBELL CAT. NO.
Duplex	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	HBL5362/ HBL5362I
Duplex-corrosion-resistant	NEMA 5-20R 20A, 125V, 2P, 3W	Yellow	HBL53CM62

2.05 SPECIAL USE RECEPTACLES

A. General: Provide special use receptacles of specification grade in accordance with applicable Fed. Specs., UL, ANSI and CSA Standards.

B. Types:

DESCRIPTION	RATING	COLOR	HUBBELL CAT. NO.
Duplex-ground fault circuit interrupter	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	GFR5352L/ GFR5352IL
Duplex-isolated ground	NEMA 5-20R 20A, 125V, 2P, 3W	Orange	IG5362
Duplex – surge suppression w/isolated ground	NEMA 5-20R 20A, 125V, 2P, 3W	Blue	IG5352S
Single-clock hanger	NEMA 5-15R 15A, 125V, 2P, 3W	Brown	HBL5235

2.06 TELEPHONE/DATA COMMUNICATIONS OUTLETS

A. General: Provide non-metallic single gang telephone/data communication outlets consisting of a two or three hole straps for mounting modular telephone jacks or Category 6 data jacks.

B. Types:

DESCRIPTION	COLOR	HUBBELL CAT. NO.
Two hole strap	Ivory	FCX2441
Three hole strap	Ivory	FCX3441
Telephone Modular Jack (RJ25)	Ivory	HBLUEI
Category 6 Modular Jack (T568B Wired)	Ivory	HBL6EI

2.07 BOXES

A. Outlet Boxes: Provide outlet boxes in accordance with the requirements specified in Section 26 05 33.

2.08 PLATES AND COVERS

A. General: Provide covers and plates for the various areas as follows:

1. All Areas:

a. For switches provide weatherproof, gasketed, covers with external operating handle.

b. For receptacles provide a weatherproof, gasketed, clear, flame-retardant, jumbo, polycarbonate cover a minimum of 5.4-inches deep, suitable for use with a 10-3 cord that allows the cover to be closed even when the receptacle is in use.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all wiring devices in accordance with manufacturer's recommendations and approved shop drawings.

B. Toggle Switches: Install toggle switches applicable for the area environment for switching lighting or other branch circuit loads.

C. Receptacles: Install receptacles applicable for the area environment.

D. Grounding: Ground all devices in accordance with the requirements specified in Section 26 05 26.

END OF SECTION

SECTION 26 29 23

ADJUSTABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing, installing and testing the 480-volt adjustable frequency drives. Provide drives in individual free standing enclosures, as shown. Furnish harmonic studies as specified.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 19 - Wires and Cables - 600 Volts and Below
3. Section 26 0013 - Electrical Requirements For Shop-Assembled Equipment
4. Section 26 05 53 - Electrical Identification
5. Section 26 05 26 - Grounding
6. Section 26 27 19.13 - Control Components and Devices
7. Section 26 08 13 - Electrical Testing Requirements

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEMA ICS 1 - General Standards for Industrial Control and Systems

2. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.

3. NEMA ICS 3 - Industrial Control and Systems Factory Built Assemblies

4. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives

5. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems

6. NEMA 250 - Enclosures for Electrical Equipment

7. NFPA 70 - National Electrical Code

8. IEEE 85 - Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery

9. IEEE 519- IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

10. UL 845 - Motor Control Centers

1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. Provide adjustable frequency drives to vary the speed of NEMA standard, 3-phase, 460-volt, induction motors and driven equipment by varying the frequency and voltage applied to the motors.

2. Provide adjustable frequency drives that fit in the space shown. Units exceeding the dimensions shown will not be acceptable.

3. Provide adjustable frequency drives that automatically restart when power is restored after a power outage. Provide control logic so the drive is allowed to restart when power is restored.

B. Rated Output Power: Provide adjustable frequency drives with an output that is at least 3 percent greater than the driven motor's full nameplate rating.

C. Torque Output: Provide variable torque or constant torque output drives as required by driven equipment.

D. 6-Pulse Drive Technology: Provide adjustable frequency drives serving motors 75 HP or smaller that utilize 6-pulse drive technology.

E. 12-Pulse Drive Technology: Provide adjustable frequency drives serving motors 100 HP or larger that utilize 18-pulse drive technology.

F. Performance Requirements: Provide adjustable frequency drives to meet the following requirements of IEEE 519:

1. Total harmonic distortion THD (Voltage): Maximum of five percent for general distribution systems as measured at the point of common coupling.

2. Total current harmonic distortion: Not to exceed the values in Table 10.3, Current Distortion Limits for General Distribution Systems (120 V through 69000 V) of IEEE-519 at the point of common coupling.

3. Capacitor traps for controlling harmonics that require tuning to the power system are not acceptable.

4. Operate at a minimum efficiency of 95 percent at rated load.

5. Operate from a 480-volt, 3-phase, 60-hertz supply with a voltage variation of plus 10-percent or minus 20-percent and a frequency variation of plus or minus 2-hertz.

6. Input power factor: Maintain a 95 percent minimum power factor over a 20 to 100 percent speed range.

7. Operate an induction motor as specified, including a high-efficiency, high-power factor, premium-duty motor, with no detriment to motor life.

8. ADJUST THE VFD CARRIER FREQUENCY TO STRIKE A COMPROMISE BETWEEN MOTOR NOISE AND INSULATION STRESS.

9. Operate under the following ambient conditions:

   a. Ambient Temperature: 0 to 50 degrees C
   b. Humidity: 0 to 95 percent

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 26 00 00.

B. Product Data and Information: Furnish catalog data including rating and descriptive literature of all components and systems.

C. Shop Drawings: Furnish the following shop drawings customized for the project:

1. Bill of materials including manufacturers name and catalog number

2. Outline drawings showing dimensions, arrangement, elevations, identification of components and nameplate schedule for all units

3. Interconnection wiring diagrams

4. Individual schematic control diagrams for each unit

5. One line diagrams

6. Obtain and enter full performance data for all motors shown

7. Certification that the adjustable frequency drives are compatible with the motors and the equipment loads to be driven

D. System harmonic distortion study: Furnish a system harmonic distortion study as follows:

1. Obtain data on utility services, plant loads and plant operation. Verify electrical service rating including transformer size, short circuit capacity and X/R ratio.

2. Prepare a harmonic distortion study of plant electrical system to determine voltage and current harmonics at the point of common coupling for worst case speed and load settings.

3. Confirm that the submitted adjustable frequency drives limit the electrical disturbances below the 5 percent THD (voltage) and below the harmonic current distortion per Table 10.3 as established by IEEE 519.

4. Point of Common Coupling: The point of common coupling is the switchgear directly upstream of the adjustable frequency drive.

5. Include analysis of all data with recommendations.

E. Quality Control: Furnish test reports, certificates of inspection and manufacturer's instructions.

F. Operations and Maintenance Manuals: Furnish operations and maintenance manuals as specified in the Specific/General Provisions.

1.05 QUALITY ASSURANCE

A. Standards: Provide all adjustable frequency drives manufactured in accordance with referenced standards.

B. UL Label: Provide a UL Inc. Label or certification of listing by C.S.A. or other recognized testing organization for each adjustable frequency drive.

C. Codes: Manufacture and install each adjustable frequency drive in accordance with the NEC and local codes.

D. Failure to Meet the Harmonic Requirement: Failure to meet the harmonic requirement as determined by field measurement: If the installed adjustable frequency drives fail to meet the harmonic limits specified, modify the adjustable frequency drives as follows:

1. Perform work at no additional cost to the City.

2. Install additional harmonic reduction equipment until the specified limit is achieved.

3. In the event that harmonic distortion limits cannot be achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

B. Shipping and Packing: Rigidly brace and protect against weather, damage, and undue strain, all structures, equipment and materials.

C. Storage and Protection: Furnish clean storage facilities for all equipment delivered but not installed. Provide conditioned air for storage facilities in accordance with the equipment manufacturer's recommendations.

D. Spare Parts: Furnish spare parts at the same time as pertaining equipment. Deliver the spare parts to the City after completion of the work.

1.07 SPARE PARTS

A. General: Furnish the following spare parts per each group of similar sized units.

1. All parts recommended by the manufacturer in published literature as spare parts. As a minimum, provide the following:

a. Six (6) each of each type of fuse used.

b. Eight (8) of each type of converter power semiconductor.

c. Eight (8) of each type of inverter power semiconductor.

d. Two (2) of each type of printed circuit board including diagnostic systems.

e. Three 12-ounce spray cans of the final finish for touch up.

B. Packaging: Package spare parts in containers bearing labels and identify all spare parts for reordering. Deliver spare parts in original factory packages.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers are not acceptable. The Standardization Certificate of Conditions and Circumstances is on file with the City.

1. Yaskawa

B. Thermistor Motor Protection Relay: To be compatible with the stator temperature sensor provided with the sewage pump motor.

2.02 DESIGN

A. Input Disconnect: Provide an input circuit breaker with an interrupting rating of 65,000 rms symmetrical amperes.

B. Input Reactor: Provide input reactor or isolation transformer, if required, as determined by system harmonic distortion analysis.

C. Converter Section: Provide input section that converts 480-volts, 60-hertz, 3-phase input to a fixed dc voltage using diodes, bridged rectifiers or SCR's.

D. Filter Sections: Provide dc link reactor and filter capacitors as required.

E. Inverter Section: Provide adjustable frequency drive inverter section that converts the fixed dc voltage to an adjustable frequency output utilizing a pulse-width modulation inverter. Maintain constant volts per hertz ratio on the output with voltage boost for startup as required.

F. Digital Control Devices: Provide a digital operator keypad located on the front door to allow setting of all programmable parameters and the following control functions:

1. Speed control settings
2. Speed meter with hertz and 0-100 percent scales
3. Output ammeter
4. Diagnostics package with fault indication and reset push button

G. Hard Wired Control Devices: Provide control devices (pushbuttons, selector switches, elapsed time meter and indicating lights) on the front door of the adjustable frequency drive as noted on the drawings.

H. Control Features: Provide a control system for each drive that allows the following functions:

1. Remote, isolated 4-20 ma speed control input
2. Isolated 4-20 ma speed output
3. Alarm outputs
4. ON/OFF status output
5. Additional features and controls as specified with the driven equipment

I. Internal Control Adjustments: Include the following control adjustments for each drive:

1. Acceleration time, 4 to 60 seconds
2. Deceleration time, 4 to 60 seconds
3. Minimum speed limit
4. Maximum speed limit
5. Inverter current limit
6. Supply undervoltage trip

J. Protection Features: Provide the following drive protection features:

1. Input line current limiting fuses rated 200,000 rms symmetrical amperes short circuit current.

2. Electronic overcurrent protection for instantaneous overload

3. AC input line undervoltage protection, adjustable from 60-100 percent nominal voltage with time delay adjustment and low speed override.

4. Overfrequency protection

5. Phase loss protection

6. DC overvoltage protection

7. Logic supply voltage low level protection

8. Line-to-line and line-to-ground output short circuit protection

9. Line-to-line and line-to-ground surge arresters sized for 480-volt 3-phase grounded wye system

10. Overload capability of 110% of the motor FLA based on the NEC ratings for 60 seconds

11. Control circuit fuses

12. Overtemperature protection

13. Diagnostics module to indicate protection trip conditions

K. Communications: Provide an addressable communication card capable of transmitting the following data over a two-wire network to the pump station SCADA System:

1. Status (ON, OFF, TRIPPED, NO RESPONSE)

2. Input and output current in each phase

3. Output frequency

4. Input and output kW

5. Cause of trip

2.03 COMPONENTS

A. General: Provide circuit breakers, fuses, transformers, push buttons, switches, indicating lights, relays and timers as specified in Section16491.

B. Power Solid State Components: Provide power solid state switching components with a one-minute current rating greater than 110 percent of rated current for variable torque drives or 150 percent of rated current for constant torque drives.

C. CONTROL LOGIC: PROVIDE HARD WIRED CONTROL LOGIC AS SHOWN ON THE DRAWINGS.

D. Control Power Transformer: Furnish a constant voltage control power transformer to maintain control power with supply voltage variations from 70-110 percent nominal.

E. Printed Circuit Boards: Apply a clear conformal coating of acrylic to all printed circuit boards.

F. Thermistor Monitoring Relay: Provide a thermistors monitoring relay capable of monitoring the thermistors embedded in the windings of the sewage pump motor as shown on the drawings.

2.04 ENCLOSURES

A. General: Provide adjustable frequency drives in NEMA 12 filtered and gasketed enclosures with full rear cover plates and the ability to externally duct all heat generated to the outside of the enclosure.

2.05 IDENTIFICATION

A. General: Provide identification of the adjustable frequency drives and their components as specified in Section 16075.

B. Nameplates: Install nameplates for devices located on doors so they are readable to a person 5'-8” tall standing 3'-0" in front of the equipment.

C. Location: Locate nameplates so that they are readily associated with items labeled.

D. Additional Nameplate: Where nameplates are installed on removable relay or device doors, install an additional nameplate within the relay or device.

E. Additional Engraving: Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

2.06 WIRING:

A. General: Provide internal wiring with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Use No. 14 AWG wire for control interconnections. Provide power connections as required for the service.

B. Wire Marker: Provide wire markers at each end of all wires.

C. Wiring to Door Mounted Devices: Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.

D. Terminal Blocks: Provide wiring of all control connections to all external connections through individual, positive-latch, pull-apart type control terminal blocks rated 600-volts. Locate terminal blocks for front access.

E. Terminal for External Connections: Provide sufficient terminals for all devices external to the adjustable frequency drive.

F. THERMISTOR TERMINATIONS: CONNECT THE WIRING FOR THREE OF THE SIX MOTOR WINDING THERMISTORS TO THE WINDING MONITORING RELAY IN THE AFD. LAND THE WIRING FOR THE REMAINING THREE THERMISTORS ON A TERMINAL STRIP IN THE AFD AND LABEL AS SPARE.

2.07 SOURCE QUALITY CONTROL

A. Shop Test: Shop test each adjustable frequency drive in accordance with IEEE and NEMA standards, including high potential tests and other standard tests for that particular class of equipment. Notify the City fourteen (14) days prior to start of factory testing so that the City, at his option, may witness the testing.

1. After final assembly, test each adjustable frequency drive at full load with application of line-to-line and line-to-ground bolted faults and show that the adjustable frequency drive trips electronically without device failure.

2. After all tests have been performed, burn-in each adjustable frequency drive for 40 hours at 100 percent inductive or motor load.

3. After the burn-in cycle is complete, subject each adjustable frequency drive to a 30-minute cycling motor load test before inspection and shipping.

B. Operational Tests: After the equipment has been completely assembled, perform operational test to determine operating conditions and circuit continuity. Provide pushbuttons and selector switches to simulate all control input contacts and indicating lights to indicate all control outputs. Provide a 4-20ma signal generator to simulate analog signals.

C. Test Equipment: Provide all equipment, devices, instrumentation, and personnel required to perform the tests. Upon satisfactory completion of the test, submit two (2) certified copies of the test report to the ENGINEER. Component failure during testing will require repeating any test associated with the failure or modified components to demonstrate proper operation.

2.07 SUPPLY FAN ADJUSTABLE FREQUENCY DRIVES

A. Adjustable Frequency Drives for the Supply Fan motors (to be located in the proposed Motor Control Center) shall be Yaskawa P1000 series drives, type CIMR-PU5AFAA.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings.

B. Protective Adjustments: Set all circuit breakers per the approved short circuit and coordination study.

C. Operational Adjustments: Set all operational devices for proper system operation.

D. Cable Connections: Terminate and label all field wiring per approved drawings.

3.02 FIELD QUALITY CONTROL

A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

B. Tests: Perform the following field tests:

1. Close and open each circuit breaker to test operation

2. When site conditions permit, energize and de-energize each equipment item served by each drive, testing the complete control sequence of each item including acceleration and deceleration over complete operating range.

3. Harmonic Measurement: Perform a harmonic system analysis to demonstrate full compliance with IEEE 519 voltage and current harmonic distortion requirements specified. Accurately measure the amplitude of the harmonic current imposed on the 60 hertz sine wave with a harmonic spectrum analyzer. Provide additional harmonic reduction equipment to meet the specified limits. If the

harmonic distortion limits are not achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

4. Operate each adjustable frequency drive with driven equipment at full load and test for hot spots.

5. Test Reports: Furnish detailed test reports of all tests indicating test performed, discrepancies found, and corrective action taken.

C. Manufacturer's Field Services Representative: Provide the services of a factory-trained service engineer, specifically trained on the adjustable frequency equipment to assist in installation, start-up, testing, calibration, placing into operation and provide training as specified in the Specific/General Provisions.

1. Provide a service engineer when each drive is placed into operation.

2. Provide a service engineer at the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.

3. Following completion of installation and field testing provide training for 6 employees of the City in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the City's facilities at a time agreeable to the City:

a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

4. Provide service engineer at the job site as often as necessary to assist in the programming of the SCADA system in accessing the memory map of each device.

3.03 CLEANING AND PAINTING

A. Shop Painting: Paint the adjustable frequency drive equipment as specified in Section 24.

B. Field Painting: Furnish three 12-ounce spray cans of the final finish for touch-up. Touch-up scratched and marred surfaces to meet the requirements of painting specifications.

END OF SECTION

SECTION 26 32 13.13

DIESEL ENGINE DRIVEN GENERATOR WITH WEATHERPROOF ENCLOSURE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install, put into operation, and field test the weatherproof diesel engine driven generator unit and appurtenances as shown on the Drawings and specified herein.

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

C. The unit to be furnished and installed shall include all necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in these Specifications or not. This installation shall incorporate the highest standards for the type of service shown on the Drawings. The CONTRACTOR is responsible for field testing of the entire installation and instruction of the regular operating personnel in the care, operation and maintenance of all equipment.

1.02 DESCRIPTION OF SYSTEM

A. The engine-generator sets shall be mounted as shown on the Drawings and shall be arranged for automatic starting and stopping, and load transfer upon failure of the normal source of power. The unit controls shall provide for automatic exercising on a weekly basis.

1.03 QUALIFICATIONS

A. The engine-generator sets shall be the standard product, as modified by these specifications, of a MANUFACTURER regularly engaged in the production of this type of equipment. The unit to be furnished shall be of proven ability and shall be designed, constructed, and installed in accordance with best practices and methods. To qualify as a MANUFACTURER, the engines must be the principal item manufactured and the completed engine generator sets shall be supplied by the MANUFACTURER's authorized dealer only. The dealer shall have a minimum of ten (10) years experience in the field of power generation.

B. It is the intent of this specification to secure a generator system that has been prototype tested, factory built, production tested, site tested and of the latest commercial design, together with all accessories necessary for a complete installation as shown on the plans and drawings, and specifications herein. The equipment supplied and installed shall meet the requirements of the NEC, along with all applicable local codes and regulations. All equipment shall be new, of current production of a national firm which manufactures the engine/generators and controls, and assembles the generator systems as a matched unit so that there is one-source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.

C. The unit must be of such physical dimensions as to make a good installation in the opinion of the ENGINEER, in the space provided as indicated on the Drawings.

D. The unit shall be assembled in the U.S. with over 50% of the components such as the engine, generator, auxiliary equipment, etc., manufactured in the U.S. by a MANUFACTURER currently engaged in the production of such equipment.

E. The unit shall be shipped to the jobsite by an authorized engine dealer having a parts and service facility within a 250-mile radius of the jobsite. In addition, and in order not to penalize the OWNER for unnecessary or prolonged periods of time for service or repairs to the emergency system, the bidding supplier must have no less than eighty percent (80%) of all engine replacement parts locally available at all times. Certified proof of this requirement shall be furnished to the ENGINEER upon request.

F. All materials and parts comprising the unit shall be new and unused, of current manufacture, and of the highest grade, free from all defects or imperfections. Workmanship shall conform to the best modern practices. Only new and current models will be considered. The unit offered under these Specifications shall be the product of a firm regularly engaged in the production of engine-generator equipment and shall meet the requirements of the Specifications set forth herein. Major exceptions to Specifications will be considered sufficient cause for rejection of the machines.

G. The generator sets shall each be listed to UL 2200.

H. The Engine/Generator Unit shall each be a Kohler Model 750REOZMD, with alternator type 5M4036. The alternator starting capability of the unit shall be 1350.0 SKVA at 15% maximum voltage dip. The unit shall operate at 480V, 0.8 power factor. Unit meeting this specification, as manufactured by Caterpillar or Cummins, shall be considered as acceptable.

1.04 SUBMITTALS

A. Submittals shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required for interconnection between the generator set and the transfer switch included elsewhere in these specifications.

B. The successful bidder shall submit to the ENGINEER for review in accordance with other sections, complete sets of installation drawings, schematics, and wiring diagrams which shall show details of installation and connections to the work of other Sections, including foundation drawings showing location and size of foundation bolts for the spring type vibration isolators and brochures covering each item of equipment.

C. In the event that it is impossible to conform with certain details of the Specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

D. The submittal data for each engine/generator set and sound attenuated, weatherproof enclosure shall include, but not necessarily be limited to, the following:

1. Installation drawings showing plan and elevations of the complete generator unit; foundation plans; exhaust silencers; starting batteries; battery chargers; and sound attenuated, weatherproof enclosures.

2. Engine Data:

   a. Manufacturer
   b. Model
   c. Number of cylinders
   d. RPM
   e. Bore x stroke
   f. BMEP at full rated load
   g. Make and model and descriptive literature of electric governor
   h. Fuel consumption rate curves at various loads
   i. Engine continuous pump drive duty rating (without fan) HP
   j. Gross engine horsepower to produce generator standby rating (including fan and all parasitic loads) HP

3. Generator Data :

   a. Manufacturer
   b. Model
   c. Rated KVA
   d. Rated SKVA
   e. Rated KW
   f. Voltage
   g. Temperature rise above 40° C ambient
      i) Stator by thermometer
      ii) Field by resistance
      iii) Class of insulation

   h. Generator efficiency, including excitation losses, at 80% power factor
      i) Full load
      ii) ¾ load
      iii) ½ load

4. Generator Unit Control Data :

   a. Actual electrical diagrams including schematic diagrams, and interconnection wiring diagrams for all equipment to be provided. Standard preprinted sheets are not acceptable.

   b. Legends for all devices on all diagrams.

   c. Sequence of operation explanations for all portions of all schematic wiring diagrams.

5. Engine/Generator Unit and Sound Attenuated, Weatherproof Enclosures: Dimensional data shall be given for the Engine/Generator sets and for the weatherproof enclosures.

   a. Weight of skid mounted unit

b. Overall length
c. Overall width
d. Overall height
e. Exhaust pipe size
f. CFM of air required for combustion and ventilation
g. Heat rejected to jacket water and lubricating oil - BTU/hr.
h. Heat rejected to room by engine and generator - BTU/hr.
i. Weatherproof enclosure details and certification of manufacturing method per specifications.
j. Data on all miscellaneous items supplied.

6. Furnish the number of copies required of the MANUFACTURER'S certified shop test record of the complete engine driven generator unit.

7. Warranty information.

8. Submit to the ENGINEER operating and maintenance data.

9. Submit to the ENGINEER the equipment MANUFACTURER'S Certificate of Installation, Testing, and Instruction.

10. Submit to the ENGINEER the written warranty as required below.

1.05 TESTING:

A. To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

B. Design Prototype Tests: Components of the system such as the engine/generator sets and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and preproduction models, which will not be sold, shall have been used for the following tests. Prototype test programs shall include the requirements of NFPA 110 and the following:

1. Maximum power (KW).

2. Maximum motor starting (KVA) instantaneous voltage dip.

3. Alternator temperature rise by embedded thermocouple and by resistance method per NEMA MG1-2240 and 16.40.

4. Governor speed regulation under steady-state and transient conditions.

5. Voltage regulation and generator transient response.

6. Fuel consumption at 1/4, ½, 3/4, and full load.

7. Harmonic analysis, voltage waveform deviation, and telephone influence factor.

8. Three-phase short circuit tests.

9. Alternator cooling air flow.

10. Torsional analysis testing to verify that the generator set is free of harmful torsional stresses.

11. Endurance testing.

C. Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

1. Single-step load pickup.

2. Transient and steady-state governing.

3. Safety shutdown device testing.

4. Voltage regulation.

5. Rated power.

6. Maximum power.

7. Upon request, arrangements to either witness this test will be made, or a certified test record will be sent prior to shipment.

D. Site Tests: An installation check, start-up and load testing shall be performed by the manufacturer's local representative for each unit. The Engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site tests. The tests shall include:

1. Fuel, lubricating oil, an antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

2. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery charger, generator strip heaters, annunciator, etc.

3. Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the enclosure, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage, and phase rotation.

4. Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator voltage, amperes, and frequency shall be monitored throughout the test. An external load bank shall be connected to the system if sufficient load is unavailable to load the generator to the nameplate KW rating.

1.06 SPECIAL TOOLS AND SPARE PARTS

A. Furnish two (2) sets of all special tools required for normal operation and maintenance of the equipment being furnished. Furnish suitable steel tool chests complete with locks and duplicate keys.

B. The MANUFACTURER shall furnish two (2) complete spare replacement sets of all filter elements required for each generator unit.

PART 2 PRODUCTS

2.01 RATINGS

A. The standby rating of the generator sets shall not exceed the MANUFACTURER's published prime rating by more than 10%. The gross engine horsepower required to produce the standby rating shall not exceed the MANUFACTURER's published continuous duty rating by more than 150 percent. Continuous duty rating shall be as defined in BS649 or DIN6270 but in no case shall it exceed the MANUFACTURER's published continuous duty rating for the engine as used in continuous rated pump drive applications. The gross engine horsepower required for the generator set standby rating described above shall include all parasitic demands such as generator inefficiencies, fuel pumps, water pumps, radiator fan and all accessories necessary to the unit's proper operation while operating at rated load and at a rotative speed not to exceed 1800 rpm.

B. The diesel engine driven generator sets shall be capable of producing the specified standby KW rating for continuous electrical service during interruption of the normal utility source and shall be certified to this effect by the MANUFACTURER for the actual unit supplied.

C. The Diesel Engine/Generator Unit shall have the KW ratings as indicated on the drawings, (480 volts, 3-Phase, 4-wire, 60 Hertz) at 0.8 power factor with fan.

2.02 ENGINES

A. The engines shall be full compression ignition, four cycle, single acting, solid injection engine, either vertical or "V" type. Speed shall not exceed 1800 revolutions per minute at normal full load operation. Multi block engines are not allowed. The engine governor shall be electronic type with a +/- 0.5 percent accuracy.

B. The engine shall be capable of satisfactory performance on No. 2 fuel oil (ASTM Designation D396). Diesel engines requiring a premium fuel will not be considered.

C. The engines shall be capable of operating at light loads for extended periods of time and shall provide a means to reduce carbonization. Periodic cleaning of exhaust ports shall not be required.

D. The engines shall be equipped with fuel filters, lube oil filters, intake air filters, lube oil cooler, fuel transfer pump, fuel priming pump, service meter, engine driven water pump, and unit mounted instruments. Unit

mounted instruments shall include a fuel pressure gauge, water temperature gauge, and lubrication oil pressure gauge. The engines shall be provided with low oil pressure, high water temperature, low coolant level and overspeed safety shutdowns of the manual reset type. Additional instruments and safety shutdowns shall be provided as noted herein.

E. Injection pumps and injection valves shall be a type not requiring adjustment in service and shall be of a design allowing quick replacement by ordinary mechanics without special diesel experience. The engine shall have an individual mechanical injection pump and injection valve for each cylinder, any one of which may be removed and replaced from parts stock. Fuel injection pumps shall be positive action, constant-stroke pumps, activated by a cam driven by gears from the engine crankshaft. Fuel lines between injection pumps and valves shall be of heavy seamless tubing.

F. The fuel system shall be equipped with fuel filters having replaceable elements. Filter elements shall be easily removable from their housing for replacing without breaking any fuel line connections, or disturbing the fuel pump, or any other part of the engine. All fuel filters shall be conveniently located in one accessible housing, ahead of the injection pumps so that the fuel will have been thoroughly filtered before it reaches the pump. No screens or filters requiring cleaning or replacement shall be used in the injection pump or injection valve assemblies. The engine shall be equipped with a built-in gear-type, engine-driven fuel transfer pump, capable of supplying fuel through the filters to the injection pump at constant pressure.

G. In addition to the standard fuel filters provided by the engine MANUFACTURER, there shall also be installed a primary fuel filter and a water separator in the fuel inlet line to the engine.

H. The engines shall be provided with removable wet-type cylinder liners of close grained alloy iron, heat treated for proper hardness as required for maximum liner life. The cylinder block shall be a one piece stress relieved gray iron casting.

I. The engines shall have a gear-type lubricating oil pump for supplying oil under pressure to main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings, valve rocker mechanism and governor. Effective lubricating oil filters shall be provided and so located and connected that all oil being circulated is continuously filtered and cleaned. Filters shall be accessible, easily removed and cleaned and shall be equipped with a spring-loaded by-pass valve as an insurance against stopping of lubricating oil circulation in the event the filters become clogged. The engines shall have a suitable water cooled lubricating oil cooler.

J. The engines shall be provided with one or more engine mounted dry type air cleaners of sufficient capacity to protect effectively the working parts of the engines from dust and grit.

K. During each initial start of an engine, a system shall be provided to pre-lube at low idle speed. When the internal oil pressure reaches a

predetermined safe value, the engine will then increase to generator set operation speed.

L. Mounting: The unit shall be mounted on a structural steel sub-base and shall be provided with spring type vibration isolators.

M. The engines shall be EPA certified.

2.03 COOLING SYSTEM

A. The engines shall be furnished with a unit mounted radiator-type cooling system having sufficient capacity for cooling the engine when the diesel generator set is delivering full rated load in an ambient temperature not to exceed 110 degrees F. The engines shall be provided with a thermostatic valve placed in the jacket water outlet between the engine and the cooling source. This valve shall maintain the proper jacket water temperature under all load conditions. Total air restriction from the radiator shall not exceed 0.5 inches of water at both inlet and outlet. A flexible connecting section shall be provided between the radiator and discharge louver frame.

B. Closed circuit jacket water system shall be treated with a rust inhibiter as recommended by the engine MANUFACTURER.

C. The expansion tank of the radiator shall be fitted with a low water level switch and wired into the safety shutdown system of the unit.

2.04 GENERATOR, EXCITER AND ACCESSORIES

A. Rating: The generator's KW ratings shall be 750 KW, 0.8 p.f., 1800 RPM, 3 phase, 4-wire, 60 Hertz, 480 volts, 12 leads, with a maximum temperature rise of 130 degrees C (both armature and field) by resistance at full rated load in ambient air of 40 degrees C. The generator shall conform to NEMA Standard MG-1.

B. Performance: The instantaneous voltage dip shall not exceed 15 percent of rated voltage when any load is applied. Recovery of stable operation shall occur within 5 seconds. Steady state modulation shall not exceed + ½ percent.

C. Construction:

1. The generators and exciters shall be dripproof, with split sleeve, or ball race bearings. A shaft-mounted brushless exciter shall be a part of the assembly. The stator cores shall be built up of high grade silicon steel laminations precision punched, and individually insulated. Armature lamination followers and frame ribs shall be welded integral with the frames for support of the stator core. A directional blower shall be mounted on the unit to draw cooling air from the exciter and over the rotor poles and through louvered openings on the opposite end.

2. The exciters shall be a fast response type, with a rotating 3-phase full-wave bridge. The exciters shall have a low time constant and

large capacity to minimize voltage transients under severe load changes.

3. The alternators shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the NEMA standard (MG1-33.40) for Class H and be insulated with epoxy varnish to be fungus resistant per MIL 1-24092. Temperature rise of the rotor and stator shall be limited to 130° C. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within +/- 0.25% at any constant load from 0% to 100% of rating. The regulator must be isolated to prevent tracking when connected to SCR loads, and provide individual adjustments for voltage range, stability and volts-per-hertz operations; and be protected from the environment by conformal coating.

4. Generator rotor poles shall be built up of individually insulated silicon steel punchings. Poles shall be wound and bonded with high strength epoxy resin. Cage connections to the amortisseur rings shall be brazed for strong construction and permanent electrical characteristics. Each pole shall be securely bolted to the rotor shaft with bolts sized for the centrifugal forces on the rotor. Generator windings shall be braced for full line to ground fault currents, with solidly grounded neutral system.

D. Accessories and Attachments

1. Low Voltage Terminal Boxes: The generators shall have separate AC and DC low voltage terminal boxes with suitably numbered terminal strip for required connections.

2. Engine Block Heaters: Thermostatically controlled and sized to maintain the manufacturer's recommended engine coolant temperature to meet start-up requirements of NFPA-99 and NFPA-110, Level 1. Power supply shall be 120 volts single phase.

3. Alternator Heaters: Sized to prevent the accumulation of moisture or dampness in the alternator windings. Power supply shall be 120 volts single phase.

E. Generator Associated Controls:

1. Voltage Regulators:

i) The generator MANUFACTURER shall furnish a hermetically sealed, silicon controlled rectifier type voltage regulators employing a zener reference with a +1 percent regulation for the generator. The regulator shall include 3-phase voltage sensing, automatic short circuit protection and shall include automatic underfrequency protection to allow the generator to operate at no load at less than synchronous speed for engine start-up and shutdown procedures. Switches and/or fuses shall not be used to provide this protection. An over-voltage sensing module

with manual reset shall be furnished with the regulator. A volts per Hz., sensing module shall be provided as part of the regulation system.

ii) A voltage adjustment rheostat for 5 percent voltage adjustment on the unit shall be provided.

iii) High voltage step-down potential transformers shall be provided for the voltage regulator power input and sensing circuits if required.

2. Sustained Short Circuit: A permanent magnetic exciter shall be provided on the unit for sustaining a current of 300 percent during a short circuit, permitting the generator breaker to trip on overload. To prevent possible overheating of the armature windings, appropriate relaying shall be supplied to limit the fault to ten seconds. All current transformers required shall be supplied by the switchgear MANUFACTURER.

2.05 SOUND ATTENUATED, WEATHER-PROTECTIVE ENCLOSURES

A. The intent of this Specification is to provide the OWNER with sound attenuated, weatherproof type generator set enclosures complete in every detail and requiring no additional in-field modifications or assembly, except where specifically allowed by these Specifications. The enclosure is to be accurately dimensioned so as to be in compliance with the National Electrical Code (NEC), and the National Fire Protection Association (NFPA) for clearance of all specified items included therein, and all applicable fire codes for a structure and application of this type.

B. The enclosure shall conform to the following construction and design criteria as set forth. Enclosure shall be manufactured by Advanced Manufacturing & Power Systems, Inc., DeLand, FL. (A.M.P.S.) Ph. (386) 822-5565. Substitutions must be submitted in writing to the engineer and be accepted as an approved equal prior to bid date.

1. Rigidity wind test equal to 180 MPH
2. Roof load equal to 50 lbs. per sq. ft.
3. Rain test equal to 4" per hour
4. Florida Department of Community Affairs Modular Building Insignia

C. Enclosure shall consist of a roof, two (2) sidewalls, two (2) end walls, and be manufactured of formed aluminum components. The enclosure is to be provided with a means for securely attaching the entire structure to the base/fuel tank as specified within.

D. Roof, sidewalls and end walls shall be of formed 0.090 marine grade aluminum. The roof is to be bolted to both side and end walls to form a complete weather and wind resistance assembly.

E. Wall framing shall be incorporated in the panels by forming an open back box structure. Skin material shall be minimum thickness .090” marine grade aluminum. Enclosure shall have a baked on powder-coat finish for maximum corrosion resistance. Exterior skin panels shall be integral to the wall structure and not separate pieces riveted onto framing members. Wall panels shall be no wider than 36” each and shall be removable without the use of special

tools. Wall and roof panels shall be designed so that field replacement can be accomplished without disassembly of the entire structure if damage should occur.

F. Enclosure exterior color shall be white.

G. Roof assembly shall be cambered to aid in rainwater runoff. Roofs with thicknesses of less than 0.090” nominally shall not be considered. Roof applications assemblies are to be mechanically fastened to the vertical wall sections. Glued or crimped roofs shall not be allowed nor considered as an acceptable alternative.

H. Air handling shall be as follows: Air will enter the enclosure through a Hood, Plenum or Sound Attenuated Louvers/Baffles, as determined by the specific application and shall allow for the airflow demand for proper cooling to generator set package. The cooling air Inlet system shall prevent water intrusion into the enclosure with the generator set operating at full rated load while allowing for a maximum air restriction of less than 0.30” H2O. Radiator Discharge shall be through a gravity operated extruded aluminum backdraft type damper and into a vertical discharge plenum or hood. Discharge plenum/hood shall discharge air upward and be provided with a means to positively drain any and all water entering the discharge device. Air discharge devices shall in no event restrict airflow by more than 0.25” H2O. To ensure adequate airflow for cooling and combustion the static restriction over the entire system shall not exceed 0.50" H2O. Both Intake and Discharge hoods and plenums shall be provided with removable bird/rodent screening to prevent the entrance of debris, birds, rodents and other vermin.

I. Acoustical insulation materials shall consist of a UL Classified Thermofiber® insulation material with a heat/fire resistance rating up to 2400º F and provide superior sound attenuation performance. Insulation shall incorporate 2# per square foot, barrier material, to dampen low frequency noise. Acoustical insulation material on interior roof and walls is to be mechanically held in place by 0.032” mill finished perforated aluminum with tuned engineered hole diameter for optimum sound attenuation at 1000 Hz. Interior perforated aluminum material shall protect the insulation material as well as allow noise to permeate the absorptive material.

J. Four-point lifting provisions shall be provided and have sufficient capacity suitable for rigging the entire Enclosure assembly.

K. A minimum of two (2) single access doors shall be provided. Doors shall be manufactured of the same material as enclosure. Doors shall be fully gasketed to form a weather tight perimeter seal. Door hinges shall be full length stainless steel piano type and shall be attached with stainless steel hardware. Door handles shall be of a corrosion resistant material and shall provide for a lockable, secure entry point into the enclosure. Doors shall be insulated with no less insulation than is provided in the enclosure walls for sound attenuation.

L. Enclosure manufacturer shall provide all necessary hardware to internally mount the exhaust silencer(s) specified herein. Silencer mounting hardware shall maintain the weatherproof integrity of the enclosure system. The silencer should discharge upward into the radiator discharge plenum

or hood, otherwise the enclosure manufacturer shall provide an aluminum rain collar and rain dress shield. Rain Collar and Dress Shield shall be manufactured of aluminum or stainless steel and designed as a circular fabricated part that does not require hole indexing by the installing contractor during site installation

M. As a minimum the enclosure shall provide an average 42db(A) sound reduction as measured at one meter, five feet above grade level under free field conditions to allow for a maximum of 75db(A) at 5 meters from the enclosure.

N. Enclosure must bear the Florida Department of Community Affairs Modular Building Insignia.

O. Electrical Package: Enclosure Shall Contain a 60 ampere, 480V, 3-pole disconnect, a 25 KVA, 480V-120/208V, 3-phase transformer, and a 100-Ampere, 120/208V, 3-phase Load Center with a 3-pole 60A, 208V Main Circuit Breaker. The Load Center Shall Contain Adequate Load Circuit Breakers to Support the Following Loads:

1. (4) 48”, LED Lights in Vapor Proof Fixtures. Lights shall be controlled by Switches Located at each of the doors.

2. (2) 20-Ampere, Duplex, 120 VAC, GFI Receptacles. (1) Receptacle shall be located adjacent to each personnel entrance door.

3. Engine Jacket Water Heater

4. Alternator Space Heater

5. Engine Starting Battery Charger

6. Diesel fuel supply pump

7. Diesel fuel return pump

8. Emergency Stop Pushbutton: Provide a NEMA 4X SS, Red, Mushroom-head emergency pushbutton that will immediately stop the generator upon activation. Provide a placard above the pushbutton to read “Generator Emergency Shut Down”. Refer to drawings for pushbutton and placard location and details.

2.06 EXHAUST SYSTEM

A. Exhaust Silencers - A critical type, side inlet, end outlet, Maxim M-51, or Silex JB silencer and a flexible stainless steel exhaust fitting properly sized shall be furnished and installed for each unit according to the MANUFACTURER's recommendation. Mounting shall be provided by the CONTRACTOR as required. The silencers shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust back pressure does not exceed the maximum limitations specified by the engine MANUFACTURER. So called "spiral" or truck mufflers are disallowed and will not be considered as equal to the industrial quality silencers specified above.

B. The silencers shall be fitted with a tail pipe extension terminating at a 45° angle to prevent the entrance of rainwater. It shall also be fitted with an expanded metal bird screen.

C. Rain Skirt - At the point where the exhaust pipe flexible tubing penetrates the roof of the enclosure, a suitable "rain skirt" and collar shall be provided by the MANUFACTURER. It shall be designed to prevent the entrance of rain and allow for expansion and vibration of the exhaust piping without chafing or stress to the exhaust system. This detail must appear on the drawings submitted for approval.

2.10 GENERATOR FUEL SYSTEM

A. 2,000-Gallon, UL 142, FDEP Sub Base Fuel Day Tank as follows:

1. ¼" Mild Steel Secondary Tank

2. Rupture Basin with FDEP Approved Leak Detection Switch (Madison M-7000 EQ#682)

3. Diesel Tank Level transmitter with 4-20mA output.

4. Mechanical Fuel Level Gauge (Visible at Fill Point)

5. Supply and Return Connections

6. Provide and Install (1) 4gpm Supply and (1) 8gpm Return Fuel Pump with Float Switches and Integrated Controls for use with a Remotely Located Primary Fuel Storage Tank

7. 2" Fill with Lockable Cap and spill containment.

8. Normal and Emergency Vent Fittings Installed Per UL-142

9. Low Level Fuel Alarm Switch (Madison M-7000 EQ#682) Wired to Control Panel Terminal Strip.

10. High Level Fuel Alarm Switch (Madison M-7000 EQ#682) Set @ 90% Tank Capacity Wired to Control Panel Terminal Strip.

11. Dry, form-C contact indicating diesel fuel in tank interstitial space.

12. Cable Stub Up Opening Under Circuit Breaker

13. Generator Mounting Pads

14. 2 Lifting Points per Side (4 Total) for Lifting Generator Set, Enclosure and Tank (Empty)

15. Tank coated with Two Part Epoxy Primer and painted Gloss Black

16. Tank sealed and shipped under vacuum per Florida Administrative Code Chapter 62-762 and NFPA30

2.07 AUTOMATIC STARTING SYSTEM

A. Starting Motors - A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be 24 volts.

B. Automatic Control - Fully automatic engine start-stop controls in the generator control panels shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, overspeed, overcrank, and loss of engine coolant. Alarms for approaching high water temperature and impending low oil pressure shall also be included. Controls shall include a 45-second single cranking cycle limit with lockout or a cyclic crank system with lockout and overcrank protection.

C. Batteries - A lead-acid storage battery set of the heavy duty diesel starting type shall be provided for each unit. Battery voltage shall be 24 volts, and the battery set shall be rated no less than 225 ampere hours. Necessary cables and clamps shall be provided.

D. Battery Trays - battery trays shall be provided for the batteries and shall conform to NEC 480-7(b). It shall be constructed of fiberglass and so treated as to be resistant to deterioration by battery electrolyte. Further, construction shall be such that any spillage or boil-over of battery electrolyte shall be contained within the tray to prevent a direct path to ground.

E. Battery Chargers - A current-limiting, automatic 24-volt DC charger shall be furnished to automatically recharge batteries. Charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, DC ammeter, DC voltmeter, and fused AC input. AC input voltage shall be 120 volts, single phase. Amperage output shall be no less than ten (10) amperes. Charger shall be wall mounting type in NEMA 1 enclosure, and U.L. listed as an industrial control panel. The charger shall be as manufactured by LaMarche per NFPA 110 and U.L. 508. The charger shall be mounted and wired within the enclosure for the generator set by enclosure manufacturer.

2.08 MAIN LINE CIRCUIT BREAKERS

A. Type - Main line, 1200 ampere frame, 1200 ampere trip, 600 volts, 100% rated, molded case circuit breaker mounted upon and sized to the output of the generator shall be installed as a load circuit interrupting and protection device. It shall operate both manually for normal switching functions and automatically during overload and short circuit conditions.

Note: The manufacturer may size the main line circuit breaker based on the controller's protective scheme (when said controller meets UL requirements). However, in all cases, the breaker shall operate in a manner to protect the load conductors. For this application, the maximum current allowed is 1200 amperes.

B. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection. The circuit breaker shall meet standards established by Underwriters Laboratories, National Electric Manufacturers Association, and National Electrical Code.

C. Generator exciter field circuit breakers do not meet the above electrical standards and are unacceptable for line protection.

D. Circuit breaker shall have battery voltage operated shunt trip wired to safety shutdowns to open the breaker in the event of engine failure.

E. The circuit breaker shall be equipped with an auxiliary contact for remote annunciation of breaker position.

F. The rating and settings of the main circuit breaker shall allow the starting of full generator SKVA.

G. The circuit breaker enclosure, together with all specified circuit breakers, shall be designed for the specific generator set specified and be equipped with an isolated neutral conductor bus, rear copper stabs, or load cable lugs and be finish painted to match the generator set.

2.09 GENERATOR CONTROL PANELS

A. Type - A generator-mounted, NEMA 1 type, vibration isolated, 14-gauge steel control panel shall be provided for the generator set. The panel must be capable of facing any direction when mounted upon the generator set. Panel shall contain, but not be limited to, the following equipment:

1. Frequency meter, 4-1/2", dial type, 55-65 hertz.

2. Voltmeter, 4-1/2", 2% accuracy.

3. Ammeter, 4-1/2", 2% accuracy.

4. Ammeter (4 position) and voltmeter phase selector switches (individual).

5. Automatic starting controls as previously specified.

6. Voltage level adjustment rheostat with locking knob.

7. Dry contacts for remote alarms wired to terminal strips.

8. Five (5) individual fault indicator lights for low oil pressure, over temperature, overspeed, battery charger low, and low coolant level. All lights to be press-to-test type, 1" diameter.

9. Four (4) position function switch marked "auto", "manual", "off/reset", and "stop".

10. Battery charging voltmeter, running time meter, electric oil pressure gauge, and electric water temperature gauge, all 2" size (nominal).

11. Auxiliary relay, 3PDT, operating each time generator runs, 10 amp contacts brought out to terminal strip.

12. Two (2) alarms and indicators for approaching low oil pressure and high water temperature. Each light to be press-to-test type, 1" diameter.

13. Alarm horn and silence switch with cleared-fault resound circuitry. Alarm shall sound on impending shutdown.

14. Governor motor control switch with cleared-fault resound circuitry.

15. Panel illumination lights and switch.

16. An engraved, identification plate listing dealer's name, address, phone number, etc., as well as unit model and serial number shall be mounted on the panel face in a prominent location and be of a size easily read by maintenance personnel.

B. Digital or solid state meters or metering devices shall be acceptable as a substitute for the electromechanical devices specified.

C. Engraved, screw-on type nameplates will identify each function indicated without abbreviation of function description. So-called international symbols will not be acceptable substitutes for this mandatory requirement.

D. Timing Functions - All control panel timing functions shall be accomplished by metal encased, solid-state, plug-in timing relays with 2PDT output contacts rated for ten (10) amperes. All solid-state time delay relays shall be reverse polarity protected and shall not function or be damaged by the application of improper polarity. Open printed circuit board type time delay circuits will not be accepted.

E. Control Relays - All control relays shall be the 3PDT plug-in type with 187QC blade terminals rated for (10) amperes. Each relay shall be equipped with a manual push to operate check button, L.E.D. or neon visual indicator, and see-thru dust cover for contact inspection and protection. Exposed contact and octal base plug-in relays are not acceptable.

F. Relay Sockets - All relay sockets shall be of the molded thermoplastic type, suitable for snap mounting on standard D.I.N. rail. Relay sockets will have wire clamp type terminals for secure wire connections, and one (1) piece bus bar connectors between the actual relay blade and wire clamp terminal. Relay sockets shall be rated for fifteen (15) amperes at 300V. Printed circuit board type relay sockets and relay sockets with push-on quick connect terminals are not acceptable.

G. It shall be possible to adjust alternator output voltage at the control panel.

H. Outputs :

1) There shall be three (3) dry-contact outputs available for interfacing to the Switchgear PLC system.

i) One (1) output shall indicate any generator fault conditions.

ii) One (1) output shall indicate low fuel level.

iii) One (1) output shall indicate generator running.

2) There shall be four (4) dry-contact outputs available for interfacing to the Pump Control System PLC system.

i) One (1) output shall indicate any generator fault conditions.

ii) One (1) output shall indicate low fuel level.

iii) One (1) output shall indicate high fuel level.

iv) One (1) output shall indicate generator running.

PART 3 EXECUTION

3.01 SERVICES

A. Furnish the services of a competent and experienced MANUFACTURER'S field service technician who has complete knowledge of proper operation and maintenance of the equipment for a period of not less than two (2) days in two separate visits to inspect the installed equipment, supervise the initial test run, and to provide instructions to the operations personnel. The first visit will be for checking and inspecting the equipment after it is installed.

B. At least one (1) of the two (2) days shall be allocated solely to the instruction of operating personnel in operation and maintenance of the equipment. This instruction period shall be scheduled at least ten days in advance with the OWNER and shall take place during start-up and acceptance by the OWNER.

C. Three final copies of operation and maintenance manuals specified must be delivered to the ENGINEER prior to scheduling the instruction period with the OWNER.

3.02 PAINTING

A. The engine generator sets and associated equipment shall be shop primed and finish coated in accordance with the MANUFACTURER's standard practice prior to shipment. An adequate supply of touch-up paint shall be supplied by the MANUFACTURER.

3.03 TESTING

A. The engine-generator sets shall be given the MANUFACTURER'S standard factory load test prior to shipment.

B. Prior to final acceptance of the generator sets, all equipment furnished under this Section shall be field tested per NFPA 110 to show it is free of any defects and the generator set can operate satisfactorily under full load test using resistance type load banks (brine tanks not acceptable). Test shall be for four (4) continuous hours. Any defects which become evident at this time shall be corrected before acceptance.

C. An all-in-place static alignment check of all rotating components shall be made prior to first start-up, after unit is secured in place and all final connections are made.

D. A final alignment check and/or adjustment shall be made after the machines have run four (4) to six (6) hours with its normal connected load.

3.04 SYSTEM SERVICE CONTRACT

A. The supplier of the standby power systems must provide a copy of and make available to the OWNER his standard service contract which, at the OWNER'S option, may be accepted or refused. This contract will accompany documents, drawings, catalog cuts, specification sheets, wiring or outline drawings, etc., submitted for approval to the designing ENGINEER. The contract shall be for the complete services rendered over a period of one (1) year. The first year's service shall be included in the contract price.

3.05 WARRANTY

A. Equipment furnished under this Section shall be guaranteed against defective parts and workmanship under terms of the MANUFACTURER'S and dealer's warranty. But, in no event, shall it be for a period of less than five (5) years (comprehensive) from date of initial start-up of the system and shall include labor, parts and travel time for necessary repairs at the job site. Running hours shall not be a limiting factor for the system warranty either by the MANUFACTURER or the supplying dealer. Submittal data received without written warranties as specified will be rejected in their entirety.

END OF SECTION

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing automatic transfer (bypass-isolation) switches including control modules to provide completely automatic operation.

B. Related Work Specified in Other Sections Includes, But is Not Limited to, the Following:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 26 - Grounding
3. Section 26 05 53 - Electrical Identification
4. Section 26 05 19 - Wires and Cables - 600 Volts and Below

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NFPA 70 - National Electrical Code (NEC)

2. NEMA ICS 10 - AC Automatic Transfer Switches

3. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors

4. UL 1008 - Standard for Automatic Transfer Switches

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent noncondensing.

1. Arrange the equipment for convenient and ready accessibility from the front, for inspection and maintenance of all devices, terminals and wiring.

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in Specific/General Provisions and Section 26 00 00.

B. Product Data and Information: Furnish manufacturer’s data for all associated equipment and devices indicating dimensions, size, voltage ratings, current ratings, withstand and interrupting ratings.

C. Shop Drawings: Furnish shop drawings for automatic transfer switches to include the following:

1. Outline drawings showing arrangement, elevations and identification of components.

2. Bill of materials including manufacturers' name and catalog number.

3. Interconnecting wiring diagrams, where required.

4. Individual schematic and wiring diagrams.

D. Quality Control: Furnish the following test reports and certificates as specified in the Specific Provisions:

1. Certified Shop Test Reports for the automatic transfer switch and related components.

E. Operation and Maintenance Manuals: Furnish operation and maintenance manuals as specified in the Specific/General Provisions.

1.05 QUALITY ASSURANCE

A. Codes: Manufacture all automatic transfer switches in accordance with NEMA ICS10, and UL 1008.

1. Manufacture and install each automatic transfer switch in accordance with the NFPA 70 and local codes.

B. UL Label: Provide a UL Label on each automatic transfer switch.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store, and handle all products and materials as specified in Specific/General Provisions.

B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.

C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

1.07 SPARE PARTS

A. General: Furnish the following spare parts:

1. Two complete replacements of all indicating lamps and fuses used in the installation.
2. Two of each special tool required for maintenance.
3. Three 12-ounce spray cans of the final finish.

B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Automatic Transfer Switch

a. ASCO Controls 7000
b. General Electric Zenith ZTS
c. Russelectric RMT

2. Automatic Transfer Bypass-Isolation Switch

a. ASCO Controls 7000
b. General Electric Zenith ZBTS
c. Russelectric RTB

2.02 AUTOMATIC TRANSFER SWITCHES

A. Description: Provide enclosed, double-throw automatic transfer (bypass-isolation) switches with single operating mechanism.

B. Configuration: Electrically-operated, mechanically held with required relays, controls, and contacts.

2.03 RATINGS

A. Voltage: 480V

B. Switched Poles: 3

C. Amperage: 70A

D. Loads: Combination tungsten, ballast, resistance, and inductive loads.

E. Withstand and Closing Ratings: 22,000 minimum rms symmetrical amperes at 480V, when used with molded-case circuit breaker.

F. Thermal capacity: 20 times continuous ampere rating at 60 cycles.

2.04 COMPONENTS

A. Phase Sequence: A-B-C, left to right, front to back, top to bottom.

B. Contacts: Provide silver surfaced main contacts protected by a separate renewable arcing contact. Mechanically lock normal and emergency contacts by the operating linkage when in the open or closed position. Provide an operating linkage that will not permit a neutral position when a failure of any coil or disarrangement of any part occurs.

C. Bypass-Isolation Switch: Provide a manual bypass-isolation switch to connect the load to either source and permit isolation of the automatic

transfer switch from all source and load power conductors, Design the bypass-isolation switch to have the following features:

1. Switch and all components to be front accessible for all switch ratings.

2. Provide separate bypass and isolation handles for clear distinction between the functions.

3. Provide a bypass handle that operates without opening the enclosure door.

4. Accomplish the bypass to the load-carrying source without interruption of power to the load (make before break contacts).

5. Provide a bypass handle with three operating modes: "Bypass to Normal," "Automatic," and "Bypass to Emergency." The operating speed of the bypass contacts is to be independent of the speed at which the manual handle is operated. Provide the bypass contacts that are out of the power circuit when in the “Automatic” mode.

6. Provide an isolation handle with three operating modes: "Closed," "Test," and "Open." In the "Test" mode, the entire emergency power system, including the automatic transfer switches can be tested with no interruption of power to the load. In the "Open" mode, the automatic transfer switch will be completely isolated from all source and load power conductors allowing the automatic transfer switch to be completely withdrawn for inspection or maintenance without removal of power conductors. Provide an automatic transfer switch that will operate manually when the isolation switch is in either the "Test" or "Open" position.

D. Operating Mechanism: Isolate the mechanical driving system and mechanical interlocks to be electrically dead. Do not use molded plastic parts for the operating linkage between the electrical operator and the main operating shaft of the switch.

E. Main Bearings: Radial, ball-bearing type.

F. Sensing and Control Relays: Continuous-duty, industrial type with wiping contacts rated 10 amperes minimum.

G. Control Logic: Solid-state, microprocessor-based with generator exercise accessories.

H. Arc Barriers: Provide arc barriers and arc suppression for each pole.

2.05 ACCESSORIES

A. Indicating Lights: Provide 30.5 mm, LED type indicating lights mounted in the cover of the enclosure to indicate the following:

1. Normal source available
2. Standby source available

3. Load connection to normal source
4. Load connection to standby source.

B. Test Switch: Mount in the cover of the enclosure to simulate failure of normal source.

C. Preferred Source Selector Switch: Mount in the cover of the enclosure to select the preferred power source.

D. Transfer Switch Auxiliary Contacts: Provide the following auxiliary contacts rated for 10 amperes at 120 volts.

1. Normal power position: 2 set N.O., 2 set N.C.
2. Standby power position: 2 set N.O., 2 set N.C.
3. Normal power failure monitor: 2 sets N.O., 2 sets N.C.

E. Normal Source Monitor: Monitor voltage and frequency on each phase of the normal source.

F. Standby Source Monitor: Monitor voltage and frequency on each phase of the standby source.

G. In-Phase Monitor: Monitor phase timing of the normal and standby sources.

H. Adjustable Time Delay Transfer Logic: Provide adjustable, solid-state, time delays for the following functions:

1. Normal to standby: 0-5 minutes
2. Standby to normal: 0-30 minutes

2.06 ENCLOSURE

A. Enclosure: NEMA Type 12 - Industrial

B. Accessibility: Provide an enclosure with all current carrying contacts and parts readily accessible from the front for maintenance and inspection without removal of the switch panel, disconnecting of the operating linkage, or disconnecting of power conductors.

2.07 AUTOMATIC SEQUENCE OF OPERATION

A. Controller: Provide a programmable, microprocessor-based controller to provide an automatic sequence of operation as follows:

1. The controls shall initiate a transfer to the Alternate Source when the power feeder manually selected (see 2.5.C) falls below the following thresholds:

a. Source “A” Monitor: Initiate transfer when Source “A” voltage drops below 70 percent from rated nominal value or frequency varies more than 10 percent from rated nominal value.

b. Source “B” Monitor: Initiate transfer when Source “B” voltage drops below 70 percent of rated nominal value or frequency varies more than 10 percent of rated nominal value.

c. Time Delay to Transfer Load to Alternate Source: set to minimum delay or five seconds depending on response time of voltage monitors.

2. The transfer switch shall use voltage seeking logic. There is no normal/preferred or emergency source. The switch should not initiate a transfer unless the active source fails, or an Operator initiates a manual transfer.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the Specific Provisions.

B. Cable Connections: Terminate and label all field wiring per the approved diagrams.

C. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.

3.02 FIELD QUALITY CONTROL

A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

B. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation upon completion of the Contract.

C. Tests: Perform field tests as follows:

1. Inspect and test the installation with respect to the safety requirements of NFPA 70 pertaining to grounding and insulation resistance.

2. Demonstrate proper operation of the automatic transfer switch by simulating conditions.

3. Repair or replace defective materials at no cost to the OWNER.

3.03 OPERATION DEMONSTRATION

A. Manufacturer's Representative: Provide the services of the automatic transfer switch manufacturer's representative to assist in installation, start-up, field testing, calibration, placing into operation and providing training, as specified in the Specific/General Provisions. The representative is required to carry out a thorough inspection of the installation and certify that the installation is correct and complete in accordance with the manufacturer's instruction and to confirm that the automatic transfer switch is ready for the final acceptance. Also to instruct operating personnel in the operation and maintenance of the automatic transfer switch.

B. Training: Following completion of installation and field testing provide training for 12 employees of the OWNER in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the OWNER'S facilities at a time agreeable to the OWNER:

1. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

2. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

3.04 CLEANING AND PAINTING

A. Shop Painting: Paint automatic transfer switches in accordance with painting specifications.

B. Field Painting: Clean and touch up any scratched or marred surface to match original finish.

END OF SECTION

SECTION 26 50 00

LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing complete lighting systems as specified and as shown.

B. Related Work Specified in Other Sections Includes:

1. Section 26 00 00 - Basic Electrical Materials and Methods
2. Section 26 05 53 - Electrical Identification
3. Section 26 05 33 - Electrical Raceway Systems
4. Section 26 27 26 - Wiring Devices

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEC - National Electrical Code
2. UL 924 - Emergency Lighting and Power Equipment

1.03 SYSTEM DESCRIPTION

A. System Components: Provide all interior and exterior lighting fixtures including all supports, plaster frames, trim rings, outlet boxes, light standards, concrete bases, ground rods, and all accessories and appurtenances required for complete functioning lighting systems, as shown and as specified.

B. Performance Requirements: Provide lighting systems that are UL listed for their application, adhere to code and are in accordance with manufacturers' recommendations.

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

B. Manufacturer's Data and Information:

1. Furnish catalog data for all equipment provided under this section.

2. Furnish complete photometric data reports from an independent testing laboratory with shop drawings for each luminaire. Luminaires submitted without photometric data will not be reviewed.

C. Shop Drawings: Furnish layout drawings showing arrangement, circuiting, erection requirements of equipment and details of construction and assembly.

D. Quality Control: Furnish the following:

1. Manufacturer's certificates for equipment performance.

2. Manufacturer's test reports.

3. Manufacturer's installation instructions.

E. Operation and Maintenance Manuals: Furnish two copies of the operation and maintenance manuals for lighting equipment.

1.05 QUALITY ASSURANCE

A. Codes: Provide materials and workmanship that meet the requirements of the NFPA Standards and the National Electrical Code.

B. Regulatory Requirements: Provide UL and FMS listed and labeled lighting equipment.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in accordance with the Specific/General Provisions.

B. Storage and Protection: Store and protect equipment, components and accessories in accordance with the manufacturer's instructions.

1.07 SPARE PARTS

A. General: Furnish the following spare parts:

1. Fixtures: Provide one lighting fixture of each type for every 40, but not less than one, for each type provided.

2. Led Drivers: Provide 10 percent, but not less than two, of each type of:

a. LED High Bay Fixtures.
b. LED Strip Fixtures
c. Exterior LED Fixtures
d. Hazardous Area LED Fixtures
e. Hazardous Area LED Emergency Lighting Fixtures
f. LED Exit Fixtures
g. LED Emergency Lighting Fixtures

3. LED Boards or LED drivers: Provide 10 percent, but not less than two, of each type of:

a. LED Area Fixtures.
b. LED Strip Fixtures
c. Exterior LED Fixtures
d. Hazardous Area LED Fixtures
e. Hazardous Area LED Emergency Lighting Fixtures
f. LED Exit Fixtures
g. LED Emergency Lighting Fixtures

4. Emergency battery package for lighting fixtures: Provide 10 percent, but not less than two, of each type of provided.

5. Lens and Globes: Provide 10 percent, but not less than 2, of each type of lens or globes provided.

6. Provide one contactor of each type provided.

7. Provide one of each type photo cell provided.

8. Provide five sets of special tools that may be required for maintenance of lighting fixtures.

B. Packaging: Deliver all spare parts neatly wrapped or boxed, indexed and tagged with complete information for use and reordering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General: The lighting fixture descriptions and catalog numbers listed in the Lighting Fixture Schedule are used to indicate the acceptable quality, design and distribution characteristics of approved lighting fixtures.

B. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

1. Fixtures:

   a. Lithonia Lighting
   b. Columbia Lighting
   c. Eaton – Crouse Hinds

2. Emergency Battery Packages :

   a. Bodine
   b. Radiant
   c. Siltron

3. Emergency Battery Systems:

   a. Chloride Systems
   b. Dual-Lite
   c. Teledyne Big Beam

4. Photocells:

   a. Tork
   b. Intermatic

2.02 MATERIALS

A. General: Provide lighting fixtures complete with all required lamps, LED drivers, ballasts, fittings, gaskets, globes and diffusers, as shown and scheduled.

B. Wiring Channel Construction: Construct the wiring channels to permit access to the auxiliaries and sockets for repair or replacement of components without removal of the fixture.

C. Fixture Diffusers: Secure diffusers for fixtures securely in place in a manner which enables them to be removed when required.

D. Insulation: Provide a wire insulation systems and components that are capable of withstanding the temperatures to which they will be subjected in the fixture, while maintaining normal expected ballast life.

2.03 FIXTURES

A. High Bay LED Fixtures:

1. Provide extruded heat sink made from 6063-T5 aluminum.

2. The channel, endplates and driver tray shall be constructed of 20-gauge aluminum which shall be painted with baked enamel and be pre-treated with five-stage iron phosphate application.

3. 92% lumen LED maintenance at 60,000 hours minimum with a predicted LED life of more than 100,000 hours.

4. LEDs shall be driven at 350mA (nominal) to provide optimal lumens per watt.

5. Fixtures shall utilize pluggable harnesses, with removable electrical tray to allow easy access to components.

B. LED Strip Fixtures:

1. Housing shall be is formed from UL 5VA fiberglass.

2. Provide pour-in-place non-porous gasketing.

3. LEDs shall be affixed to removable heat sinked gear tray.

4. LEDs shall be rated for 50,000 hours at L80 lumen maintenance.

C. Exterior LED Wallpack Fixtures:

1. Rear housing shall be die-cast aluminum rear. Front housing shall be impact-resistant, UV-stabilized polycarbonate.

2. Refractor shall be fully gasketed.

3. Housing shall be completely sealed against moisture and environmental contaminants.

4. The LED driver shall be mounted to the front casting to thermally isolate it from the light engine.

5. Light engine shall consist of 30 high-efficacy LEDs mounted to a metal-core circuit board and integral aluminum heat sink to maximize heat dissipation.

5. LEDs shall be rated for 100,000 hours at L94 lumen maintenance.

6. Electronic driver shall have a power factor >90%, with THD <20%, and an expected life of 100,000 hours.

7. LEDs shall be driven at 700mA (nominal) to provide optimal lumens per watt.

D. Exterior LED Wall Fixtures:

1. Housing shall be single-piece die-cast aluminum.

2. The driver shall be mounted in direct contact with the casting.

3. Door frame shall be die-cast and shall be fully gasketed with a one-piece solid silicone gasket.

4. Housing shall be listed for wet location.

5. Exterior parts shall be protected by a zinc-infused thermoset powder coat finish.

6. Light engine shall consist of 10 high-efficiency LEDs mounted to a metal-core circuit board and integral aluminum heat sink to maximize heat dissipation.

7. LEDs shall be rated for 100,000 hours at L77 lumen maintenance.

8. Electronic driver shall have a power factor >90%, with THD <20%, and an expected life of 100,000 hours.

9. LEDs shall be driven at 700mA (nominal) to provide optimal lumens per watt.

E. Hazardous Area LED Fixtures:

1. Fixture shall be suitable for Class I, Division 1, Groups C, D applications.

2. Fixture shall have a T6 temperature rating at 55°C.

3. The fixture shall be labeled for wet locations, Type 4X, IP66.

4. The fixture body, mounting modules and guard shall be constructed from copper-free aluminum and shall be epoxy powder coated.

5. The globe shall be heat and impact-resistant glass

6. All gaskets shall be silicone and all external hardware shall be stainless steel.

7. LEDs shall be rated for 100,000 hours at L79 lumen maintenance.

F. Hazardous Area LED Emergency Lighting Fixtures:

1. Fixture shall be suitable for Class I, Division 2, Groups B, C, D applications.

2. The power supply and luminaire enclosures shall be constructed of fiberglass-reinforced polyester.

3. The LED lamp head assembly shall be constructed of epoxy powder coated stainless steel.

4. Exterior hardware shall be nylon, plastic coated, and stainless steel.

5. All gaskets shall be silicone and all external hardware shall be stainless steel.

6. The cover gasket shall be synthetic rubber.

7. Fixture shall be supplied with a high temperature rated nickel cadmium battery for operation up to 55ºC ambient.

8. The battery charger shall be solid state.

9. The fixture shall be provided with a factory-installed "push-to-test" button.

G. LED Exit Signs:

1. Provide fully-automatic, self-contained, battery-pack, LED type exit signs, normally operated from the ac wiring system, but capable of remaining lighted for a period of 1.5 hours during an ac power outage.

2. Provide exit signs suitable for dual voltage input with surge protection suitable for operation on either 120 volts or 277 volts.

3. Equip each sign with state of the art batteries and a totally solid-state charger which constantly evaluates the state of charge of the batteries and keeps them fully charged.

4. Provide a charger that is capable of fully recharging the batteries in 24 hours, following a discharge.

5. Provide a press-to-test switch located on the bottom of the housing to test the lamps and battery.

H. LED Emergency Lighting Fixtures:

1. Provide emergency battery lighting equipment as listed in the Lighting Fixture Schedule capable of providing emergency lighting

instantaneously upon the failure or interruption of the normal electric power supply.

2. Provide fully-automatic, self-contained, battery-pack, LED type fixtures, normally operated from the ac wiring system, but capable of remaining lighted for a period of 1.5 hours during an ac power outage.

3. Provide fixtures suitable for dual voltage input with surge protection suitable for operation on either 120 volts or 277 volts.

4. Equip each fixture with state of the art batteries and a totally solid-state charger which constantly evaluates the state of charge of the batteries and keeps them fully charged.

5. Provide a charger that is capable of fully recharging the batteries in 24 hours, following a discharge.

6. Provide a press-to-test switch located on the bottom of the housing to test the lamps and battery.

PART 3 EXECUTION

3.01 PREPARATION

A. Packing: Suitably pack and rigidly brace all equipment and protect it against weather, damage and undue strain during shipment.

3.02 INSTALLATION

A. General: Install lighting fixtures and lamps in accordance with the manufacturer's recommendations and approved shop drawings. Locate fixtures to suit the architectural details of the area involved. Install fixtures in the same location where replacing an existing fixture or in close proximity. Install lamps of proper type, wattage and voltage rating in fixtures prior to completion of project. Install all fixtures to comply with applicable provisions of NEC.

B. Obstructions: In areas, such as equipment and mechanical rooms, which have obstructions at the ceiling or walls such as ducts, large pipes, groups of pipes, and like items, install fixtures so that maximum utilization of the light is achieved.

C. Accessories: Provide straps, mounting plates, nipples, plaster rings, brackets and all accessories necessary for proper installation.

D. Suspended Fixture Support: Support suspended fixtures by approved means, consisting of rods, stems attached to studs, hickeys and suitable outlet box cover aligners of the shock-absorbing, vaportight or swivel type having flexible joints permitting fixtures to hang plumb. Install stems using 3/4-inch rigid aluminum conduits, unless otherwise specified. Where indicated or required, support fixtures by means of a suspended channel. Provide channels that meet the requirements for the type of conduit provided, as specified in Section 16130. Where the channel is

used as the wiring raceway, provide closure strips, end caps and fittings as required for an approved raceway.

E. Emergency Lighting: Connect emergency light fixtures and exit signs to separate unswitched circuits in the lighting panelboard. Lock these circuit breakers in the closed position.

F. Exit Fixtures: In general, mount exit and stair sign fixtures so that the bottom of the fixture will be three inches above the top of the door frame.

G. Existing Conduits: Reuse existing lighting conduits and boxes wherever possible when determined serviceable. Remove all existing conductors and replace with new after mandrel cleaning of any existing conduit to be reused.

3.03 FIELD QUALITY CONTROL

A. Testing: Test the entire lighting system for continuity and balance after installation and prior to acceptance.

3.04 ADJUSTING

A. Fixtures: Aim and adjust fixtures as shown.

B. Exit Sign Arrows: Adjust exit sign directional arrow as shown.

C. Replacement: Replace any LED board or LED driver that have failed at substantial completion.

3.05 OPERATION DEMONSTRATION

A. Replacement: Replace any LED board or LED driver that have failed at substantial completion.

3.06 CLEANING AND PAINTING

A. Shop Painting: Shop paint equipment as specified in painting specifications.

B. Steel Surfaces: Prior to final completion of the Work, thoroughly clean all steel surfaces and retouch all scratches and abrasions. Use the same paint as used for shop finishing coats.

C. Photometric Control Surfaces: Clean photometric control surfaces as recommended by the manufacturer.

END OF SECTION

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Protection of existing trees.

B. Removal of trees and other vegetation.

C. Topsoil stripping.

D. Clearing and grubbing.

E. Removing above-grade improvements.

F. Removing below-grade improvements.

G. Protection of existing improvements (buildings, roads, utilities, etc.)

1.02 PROJECT CONDITIONS

A. Traffic.

1. Provide maintenance of traffic as required to complete construction operations and work of this section.

B. Protection of Existing Improvements.

1. Protect improvements on adjoining properties and on Owner's property.

2. Restore damaged improvements to original condition.

C. Protection of Existing Trees and Vegetation.

1. Water trees and other vegetation: Remain within limits of contract work as required to maintain their health during the course of construction operations.

2. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations.

D. Earthwork

1. Coordinate with Earthwork Specification Section.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

3.01 SITE CLEARING

A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Similar items elsewhere on site or premises are to be removed only if specifically indicated. "Removal" includes digging out and off-site disposing of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner: Alter only where such roots and branches obstruct installation of new construction.

B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil: Whatever depths encountered should be stripped in a manner to prevent intermingling with underlying subsoil or other objectionable material; remove heavy growths of grass from areas before stripping; where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

2. Stockpile topsoil in storage piles in areas indicated or directed: Construct storage piles to provide free drainage of surface water; cover storage piles, if required, to prevent wind erosion.

C. Clearing and Grubbing: Clear shrubs and other vegetation, except for those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface.

2. Fill depressions caused by clearing and grubbing operations with satisfactory soil material (unless further excavation or earthwork is indicated): place fill material in horizontal layers not exceeding 6 inches loose depth and thoroughly compact to a density equal to adjacent original ground.

D. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings, and is included under work of related Division 23 and 26 sections. Removal of abandoned underground piping or conduit interfering with construction is included under this Section.

3.02 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property, unless otherwise indicated.

END OF SECTION

SECTION 32 84 23
UNDERGROUND SPRINKLERS

PART 1: GENERAL

1.1 DESCRIPTION OF WORK

1.1.1 Furnish all materials, equipment and labor as necessary for the installation of an irrigation system per the drawings and specifications. All work should meet City of Tampa standards for materials and workmanship.

1.1.2 Related Work:
See Section 32 93 00: PLANTS

1.2 RELATED DOCUMENTS:

1.2.1 Drawings and general provisions of Contract, including General Provisions, Supplementary General Provisions, Special Conditions, and Division – 1 Specification sections apply to work specified in this section.

1.3 DESCRIPTION OF WORK:

1.3.1 Location of underground sprinkler system is shown on drawings if provided.

1.3.2 Design and installation of system included in this section

1.4 QUALITY ASSURANCE:

1.4.1 Workmanship: All work shall be installed by licensed irrigation contractor using skilled personnel, proficient in the trades required, in a neat, orderly and responsible manner with recognized standards of workmanship. Material installations are to conform to manufacture specs. The Contractor shall have had considerable experience and demonstrated ability in the installation of sprinkler irrigation systems of this type.

1.5 SUBMITTALS:

1.5.1 Product Data: Submit manufacturer's technical data for all materials and installation instructions for underground sprinkler system prior to starting work on the project site.

1.5.2 Drawings: Provide Design drawings that will include plan layout and details illustrating location and type of heads, valves, piping circuits, controls and accessories. If requested by the City, provide design calculations demonstrating how system component sizes were derived.

1.5.2.1 Format: The irrigation system design plans shall be done in AutoCAD to scale. These plans shall be provided to the City of Tampa prior to final acceptance of the project. Provide CD containing AutoCAD (DWG files) 2013 version minimum along with the requirements of the general provisions of the contract.

PART 2 PRODUCTS

2.1 MATERIALS:

2.1.1 Backflow Preventer: PVB (pressure vacuum breaker) with ball valves sized to match the system and installed on galvanized risers.

2.1.2 Irrigation Pipe: All main and lateral lines shall be PVC pipe ASTMD1785 1120 Schedule 40. Exception would be galvanized steel pipe, when specified, and if exposed paint with 2 coats of forest green enamel.

1. Pipe Size: Increased to allow expansion or nozzle size change.

    a. No flow shall exceed 4' per second.

    b. All laterals to heads will be 1" or larger on rotors and ¾" or larger on pop-ups, bubblers and Quick Couplers

    c. Nozzle and zone size will be calculated to provide maximum precipitation rate to reduce watering time based on meter size.

    d. No pipe smaller than ¾".

2.1.3 Sleeving: Sleeving shall be installed for all hardscape surfaces including, but not limited to, sidewalks, courts, etc. Contractor to verify Schedule 40 or HDPE. Sleeve size shall be 2 times irrigation pipe size minimum. For all sleeves containing lateral pipe and wiring, all wire to be in its own conduit.

2.1.4 Adhesives:

2.1.4.1 All connections, 4" and less, shall be Weld-On PC-68 or PC-70 purple primer and Weld-On PVC 717 or 727 clear cement.

2.1.5 Pipe Fittings:

2.1.5.1 ASTM D 2466 socket fittings Schedule 40 shall be used for PVC pipe. Put purple primer first, cement after.

2.1.5.2 ANSI B 16.3 galvanized malleable iron screwed fittings shall be used for all galvanized pipe.

2.1.6 Manual Valves: Manufactured as follows: PVC Schedule 40 ball valves unless otherwise indicated.

2.1.7 Quick Coupling Valve: Standard is Rain Bird #3RC with minimum lateral size ¾". Athletic fields with wells are Rain Bird 44RC with minimum lateral size ½". Ensure 2" of clearance of all valve handles. (See "Quick Coupling Valve Detail" for installation.)

2.1.8 Electric Valves: Irritrol 200B series electric valve with flow control. AC or DC depending upon power source. If DC is specified, a separate common wire for each 6 zones must be installed. Master valve to be used with more than 2 zones or if main line crosses a roadway. No pressure regulator on valves. For reclaimed applications use Irritrol 100P with scrubber kit valve.

2.1.9 Automatic Valve Wiring: 14 gauge direct burial wire, color coded as follows: red for zones; blue for master valve and black for extras. Two black extra wires to be run to the furthest valve from controller in each direction. Wire splices shall be made at a common location, contained in a valve box and spliced using greased filling King wire nuts. All wire to be brought within 6' of timer location, into a junction box, and paired 18 gauge wire run into the timer box with a 3' pigtail. Provide 12 gauge white common wire for any runs over 100'.

2.1.10 Sprinkler Heads: Manufacturer's standard unit designed to provide uniform coverage over entire area of spray shown on drawings at available water pressure and installed using K-flex pipe and Schedule 40 PVC connectors as follows:

2.1.10.1 Rain Bird Bubbler: #1402 – 0.5 GPM on K-Flex pipe (2 per tree).

2.1.10.2 Rain Bird Pop-up: 1800 series SAM with nozzle to match application (No PRS).

2.1.10.3 Hunter rotor: Hunter I-20 or I-25 (athletic fields) with nozzle to match application.

2.1.10.4 Micro (Maxi-Jet): to be matched to job and used only with Parks and Recreation Department approval.

2.1.11 Valve Box: Provide plastic valve box with cover, size as needed, or as specified on drawings. Place level on brick or stone blacks. Open side of the valve box to be wrapped in ground cloth. Top of valve box installed flushed with finished grade. Any valve placed in concrete must be concrete or double wall concrete rated plastic box.

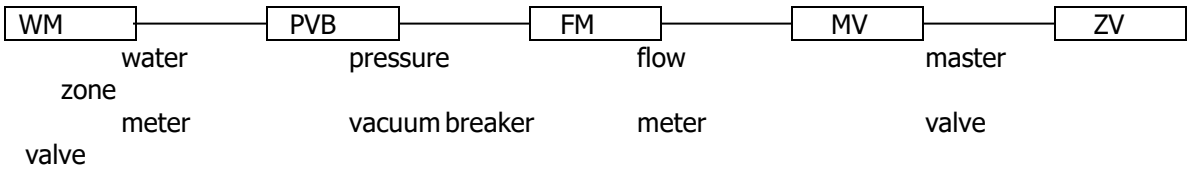
2.1.12 Computerized Irrigation Controller: Computerized irrigation controller and cabinet shall be supplied and installed by Contractor. Coordination of installation of the controller with the City of Tampa is required by the Contractor.

2.1.13 Computerized Irrigation Equipment: The following is part of the computerized system and is the responsibility of the awarded contractor.

2.1.13.1 Computerized systems shall utilize a flow meter by Master Meter Inc. matched to the water meter size, with a 1 or 10 gallon pulse depending on zone GPM.

2.1.13.2 Wiring from flow meter to controller must be 14-2 Maxi-com cable. No splices should be made in the Maxi-com cable. Maxi-com to be run under main line or in conduit.

2.1.13.3 Power source at timer should be A/C. D/C (requires special wiring) used only if all sources of A/C have been exhausted.



2.1.14 Water Source: To be coordinated with City of Tampa prior to design of irrigation system. New water meters shall be requested and paid for by the contractor. If available, reclaimed water must be used for irrigation. Any system that is to be connected to reclaimed water or is indicated to have reclaimed in the near future shall have all materials of the appropriate color to indicate the use of reclaimed water. If a well is required see City of Tampa well specs.

PART 3 – EXECUTION

3.1 SYSTEM DESIGN:

3.1.1 System design shall take into account existing physical and cultural features and all proposed site improvements to avoid conflicts and ensure an efficient optimal system.

3.1.2 Design Pressures: Verify available water source and pressure prior to system design. Design system throughout to be compatible with available water source. Use reclaimed water whenever available. Athletic fields to be on a well system whenever possible.

3.1.3 Location of Heads: Design locations in accordance with accepted sprinkler practice to provide 100% head to head coverage. Make minor adjustments as necessary to avoid structures and other obstructions.

3.1.4 Minimum Water Coverage:

3.1.4.1 100% of all landscape beds and turf areas.

3.1.4.2 Layout may be modified, if necessary to obtain coverage, and to suit manufacturer's standard heads. Do not decrease number of heads indicated unless otherwise acceptable to City Representative. Any proposed decrease must be approved by the City Representative.

3.1.5 Group valves close to water source in 1 or 2 locations. Planting beds, trees and turf areas shall be on separate zones.

3.1.6 Minimize wiring runs. Maximize use of lateral lines. Keep valves 5' from closest hardscape.

3.1.7 No flow shall exceed 4 feet per second.

3.1.8 Top of pipe to grade shall be:

1. Manifolds: 6"
2. Laterals: 12"
3. Mainlines: 18"

3.1.9 Design zones to have matched precipitation rates.

3.1.10 Do not use pressure-regulating sprinklers.

3.1.11 Insert sprinklers 3 inches from curbs, hardscapes and structures to allow for edging.

3.1.12 Computerized irrigation system controller will be installed by the City of Tampa. Verify controller location prior to installation of irrigation system and related electrical wiring.

3.1.13 No pipe smaller than ¾"

3.1.14 Quick Coupler Valve (Rain Bird #3RC or 44RC for athletic field applications) shall be located in a valve box with the quick coupler cap within 2" of the bottom of the valve box lid. Provide 3" of galvanized main line up to and after a galvanized T. Provide 2' of vertical galvanized pipe, capped at bottom. Mount QC valve on galvanized nipple, length as required. Quick Coupler to be on a separate main line (See Quick Coupler valve detail).

3.1.15 Coordinate and confirm exact water source and electric source.

3.2 ELECTRIC and WATER SERVICE:

3.2.1 Water Service: The contractor shall include in the bid price all costs associated with providing water service to system as required. This includes all applications and fees required by City of Tampa Water Department to provide service, connection fees and all materials and labor for a complete functioning system. Contractor shall be responsible for applying and paying for any new water meters as required. Coordinate this requirement with the contract documents.

3.2.2 Electric Service: Contractor shall include in bid price all costs associated with providing power service to system as indicated in the general provisions of the contract. This includes all applications, drawings and fees required by Tampa Electric Company (TECO) and the City of Tampa. All work to comply with City of Tampa codes and TECO standards for power connection. All costs associated with power installation and connection shall be the responsibility of the contractor.

3.2.3 Upon final acceptance of irrigation system, ownership of water and electric meters will be transferred to the City of Tampa.

3.3 TRENCHING AND BACKFILLING:

3.3.1 General: Protect existing utilities, paving, plants, trees and other facilities caused by irrigation operations. Contractor shall be responsible for the repair of any damage to existing utilities and paving. Excavate straight and true with bottom uniformly sloped to low point.

3.3.2 Sunshine: Contactor shall be responsible for notifying underground utilities 48 hours prior to beginning work (800) 432-4770. No site work shall commence until all underground utilities have been properly located and identified.

3.3.3 Backfill: Backfill with clean material from excavation. Remove organic material as well as rocks and debris larger than 1" diameter. Place acceptable backfill material in 6" lifts, compacting each lift.

3.3.4 Existing Lawns: Where trenching is required across existing lawns, trench no wider than necessary to accommodate pipes.

3.3.4.1 Backfill trench to within 6" of finished grade. Continue fill with acceptable topsoil and compact to bring area to the elevation of existing lawn.

3.3.4.2 If trench is more than 6" in width, relay or plant new sod within 7 days after removal, roll and water generously.

3.3.4.3 Restore to original condition any sod areas not in healthy condition equal to adjoining lawns 30 days after planting.

3.3.5 Existing Trees: All efforts shall be made to avoid trenching under the driplines of existing trees and canopy spread of proposed trees. All proposed trenching or other work under the limb spread of any and all trees shall be done by hand so that no limbs or branches or roots are damaged in any way.

3.3.5.1 Trenching shall comply with Chapter 13-146, Technical Manual and shall be done to minimize root disturbance. City of Tampa representative shall be present prior to beginning work, to determine limits of root pruning and shall approve any work taking place within protective radius of trees. All tree roots shall be severed cleanly per the Chapter 13 of the City Code.

3.3.5.2 Protective radius schedule per Chapter 13 of the City Code reads as follows:
1" caliper – no trenching within 4' of tree trunk
6" – 14"caliper – no trenching within 6' of tree trunk
15" – 34" caliper – no trenching within 15' of tree trunk
34" and greater – no trenching within 20' unless approved by City Representative

3.3.6 Pavements:

3.3.6.1 Boring is the preferred method. Open cuts must be approved by City Representative. Where existing pavements must be crossed to install landscape irrigation system, saw cut straight clean lines 6" wider than trench.

3.3.6.2 Excavate trench to required depth and width.

3.3.6.3 Remove cut out pavement and excavated material from the site.

3.3.6.4 Backfill with dry sand fill material, placing in 6" lifts to meet City of Tampa compaction requirements.

3.3.6.5 Repair or replace pavement cuts with equivalent materials and finishes.

3.3.6.6 If a concrete sidewalk is cut or damaged, the full section must be replaced.

3.3.6.7 Piping under hardscape that is 5' wider or greater shall be sleeved.

3.3.6.8 Contractor is responsible for daily clean up of operations to include debris, directional bore slurry and any hydraulic fluids.

3.4 INSTALLATION: (See details on construction drawings)

3.4.1 A pre-construction meeting will occur on site prior to commencement of work.

3.4.2 General: Contractor shall be responsible for filing and obtaining any and all agency permits as described. All work must conform to City of Tampa and the latest adopted plumbing code. Any work taking place along a city, county or state road or median must comply with appropriate regulating authority guidelines for Traffic Control for Construction and Maintenance Operations.

3.4.3 Required Inspections:

3.4.3.1 Piping: prior to covering.

3.4.3.2 All materials prior to planting and/or mulching.

3.4.3.3 24 hour notice of inspection required.

3.4.3.4 Main lines require pressure tests of 50 PSI to be maintained for minimum of 1 hour.

3.4.4 Backflow Preventer: PVB (pressure vacuum breaker) with ball valves sized to match the system and installed on galvanized risers.

3.4.5 Control Valves: Install in valve box. Arrange in box for easy adjustment and removal.

3.4.5.1 Adjust size of automatic control valves to provide flow rate of rated operating pressure required for each sprinkler zone.

3.4.5.2 All zone wiring and Maxi-com cable to be installed under the main line or in conduit. Wiring that shares a sleeve with irrigation water lines shall be contained in its own conduit.

3.4.6 Provide 18" of straight uninterrupted PVC pipe in front of the Master Meter and 12" of straight behind.

3.4.7 Piping: Lay pipe on solid sub-base uniformly sloped.

3.4.7.1 Install PVC pipe in dry weather when temperature is above 40 degrees F in strict accordance with manufacturer's instructions. Allow joints to cure at least 24 hours at temperatures above 40 degrees F (4 degrees C) before testing, unless otherwise recommended by manufacturer. All PVC connections will be cleaned with purple primer prior to cementing.

3.4.7.2 Mainline depth shall be 18".

3.4.7.3 Lateral line depth shall be 12".

3.4.8 Sprinkler Heads: Flush circuit lines with full pressure and install nozzles after hydrostatic test is completed.

3.4.8.1 Install all heads at manufacturer's recommended heights.

3.4.8.2 Locate part-circle heads to maintain a minimum distance of 3" from curbs, hardscape and structures.

3.4.8.3 After completion of grading, seeding or sodding, and rolling of the grass areas, carefully adjust lawn sprinkler heads so they will be flush with grade.

3.4.8.4 Pop-ups installed on ½" flex hose using Schedule 40 PVC connectors.

3.4.8.5 Rotors to be installed on appropriate size flex hose using Schedule 40 PVC connectors. Ensure sprayer rotor water does not directly contact existing structures or hardscape areas.

3.4.9 Dielectric Protection: Use dielectric fittings at connection where pipes of dissimilar metal are joined.

3.4.10 Wiring: All wiring shall be performed by the contractor as shown on drawings. All wiring shall be run from point of connection back to the controller.

3.4.11 Quick Coupler Valves: Build and install per details on construction drawings. Valve box shall be adequately sized and installed so as not to interfere with the operation of the quick coupler key.

3.5 ACCEPTANCE:

3.5.1 Maintenance: Contractor is responsible for all maintenance of the system until final acceptance by City Representative and for the maintenance period specified in section Trees, Plants and Ground Covers.

3.5.2 Final Inspection: The inspection of irrigated areas will be made by the City Representative upon contractor's request. Provide notification at least 2 working days prior. The City Representative will provide a punch list of those items which must be corrected before re-inspection for final acceptance. The City Representative will set an appropriate time period in which the punch list items must be corrected.

3.5.2.1 Contractor to provide notification of at least 2 working days prior to inspection.

3.5.2.2 System to be run through electronically of all zones to ensure all components are working properly.

3.5.2.3 System to be run through City programming for one week prior to final acceptance.

3.5.2.4 As Built drawings: At project closeout, the Contractor shall submit complete electronic drawings showing any changes from approved shop drawing. These shall be included as part of required As-Built/Record Drawing requirement of the general provision.

As-built drawings shall include the following:

- Irrigation system as installed.
- Water source location and size.
- Power source location.
- Changes to controller type or location.
- Changes in type or location of flow meter or master valve.
- Any wiring changes in location, number, type, color.
- Valve locations should be dimensioned and areas controlled identified.
- Location, depth and size of mainline and feeder lines. Off-set to main line requested.
- Location of maxi-com cable.
- Location and depth of all directional bores.

3.6 GUARANTEE:

3.6.1 Guarantee: All work shall be guaranteed by contractor for one year from date of final acceptance against all defects and malfunctions in materials, equipment and workmanship and shall be included as a part of the project closeout document requirements.

3.6.1.1 The guarantee shall also cover repair of damage to any part of the premises resulting from leaks or other defects in materials, equipment and workmanship, to the satisfaction of the City of Tampa. Repairs, if required, shall be done promptly at no cost to the City of Tampa. The contractor shall not be responsible for damage to the irrigation system by others. The guarantee shall state the name of the owner, provide full guarantee terms, effective and termination date, name and license number. It shall be signed by the chief executive of the contracting firm and notarized. Manufacturer's warranties shall not relieve the contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

3.6.1.2 The contractor shall make necessary repairs within 72 hours notice. If the Contractor neglects to make or undertake the repairs with the due diligence, the City of Tampa may make such repairs at the contractor's expense. In the case of an emergency where in the judgment of the City of Tampa, delay would cause loss or damage, repairs or replacement may be mad without notice being sent to the contractor and the contractor shall pay the cost thereof.

END OF SECTION 32 84 23

SECTION 32 92 00
LOUISIANA PUMP STATION
SODDING

PART 1: GENERAL

1.01 DESCRIPTION

A. Provide sodded lawns as shown and specified. The work includes:

1. Soil preparation.
2. Sodding lawns, athletic fields, and other indicated areas.
3. Maintenance.

B. Related work:

1. Section 32 84 00: Irrigation System.
2. Section 32 93 00: Trees, Plants, and Ground Covers.

1.02 QUALITY ASSURANCE

A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.

B. Provide and pay for materials testing. Testing agency shall be acceptable to the City Representative. Provide the following data:

1. Test representative materials samples proposed for use.
2. Soil analysis of existing conditions.

    a. Soil pH and recommendations for correction. Ideal pH for Bahia is 5.0 - 6.5.
    b. Nematode infestation check and recommendation for eradication.
    c. Organic matter check and recommendation.
    d. Starter fertilizer check and recommendations.

1.03 SUBMITTALS

A. Submit sod growers certification of grass species. Identify source location.

B. Submit the following material samples:

1. Topsoil.

C. Submit the following material certification:

1. Submit certificates of inspection as required by governmental authorities and manufacturers or vendors certified analysis for soil amendments, herbicides, insecticides and fertilizer materials; submit other data substantiating that materials comply with specified requirements.

D. Submit soil analysis report.

E. Bidders shall furnish, with their bid, evidence in writing that they maintain a permanent place or places of business and have adequate equipment, finances, and personnel to provide the specified services. This evidence shall include, but not be limited to: a list of current contracts, their value, and a contact person with each firm; at least three references who can verify work of a similar nature done by your firm in the last three year; a list of owned and/or leased equipment available for use on this contract; a list of key personnel and a brief summary of their qualifications. Failure to provide the listed material may cause the Bidder to be deemed non-responsive. The City reserves the right to inspect the apparent low Bidder's place of business and equipment prior to contract of any bid to determine the responsibility and capability of the Bidder to perform the services. The City also reserves the right to solicit references in making judgment on the Bidder's ability to perform said services.

1.04 DELIVERY, STORAGE AND HANDLING

A. Cut, deliver and install sod within a 48-hour period.

1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
2. Protect sod from sun, wind, and dehydration prior to installation.
3. Do not tear, stretch, or drop sod during handling and installation.

1.05 PROJECT CONDITIONS

A. Work notification: Notify City of Tampa representative at least 7 working days prior to start of sodding operations.

B. Protect existing utilities, paving and other facilities from damage caused by sodding operations.

C. Perform sodding work only after planting and other work affecting ground surface has been completed.

D. Existing soil to be amended as determined necessary from soil analysis, including: soil pH, nematode infestation, organic matter check and starter fertilizer check.

E. Restrict traffic from lawn areas until grass is established.

F. Provide hose and lawn watering equipment as required.

G. Verify that there is a water source for use during establishment and maintenance period.

1.06 WARRANTY

A. Provide a uniform stand of grass by watering, mowing and maintaining lawn areas until final acceptance and for a period of 90 days after acceptance. Resod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the City of Tampa Representative.

PART 2: PRODUCTS

2.01 MATERIALS

A. Sod

1. Sod: An "approved" nursery grown sod composed of either Argentine Bahia.
2. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.
3. Furnish sod machine stripped and of supplier's standard width, length, and thickness: uniformly 1" to 1-1/2" thick with clean cut edges. Mow sod before stripping.

B. Fertilizer:

1. Granular, non-burning product composed of not less than 50% organic slow-acting, guaranteed analysis professional fertilizer. **The City of Tampa prohibits the application of nitrogen fertilizers between June 1st and September 30th.**

    a. Type A: Starter fertilizer containing 16% nitrogen, 4% phosphoric acid, and 8% potash by weight or similar approved composition.
    b. Ground Limestone: Containing not less that 85% of total cabonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

C. Stakes: Steel, tee shaped pins, 4" head x 8" leg.

D. Topsoil: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, reasonably free from clay lumps, coarse sand stones, plants, roots and other foreign materials with an acidity level as specified by type of sod.

1. Identify source location of topsoil.
2. Topsoil shall be fertilized.

E. Water: Free of substance harmful to sod growth. Hoses or other methods of transportation to be furnished by contractor. (See Technical Maintenance Table on plans.)

PART 3 EXECUTION

3.01 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. If area to be sodded has existing grass or vegetative cover, apply a non-selective herbicide (Round-up) to area. Wait ten (10) days before continuing with prep work.

B. Excavate areas to be sodded to 2" below adjacent concrete sidewalks or plaza areas. Loosen topsoil of lawn areas to minimum depth of 8". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Add 2" topsoil or organic material as required from organic matter check. Till into top 8" of existing soil.

D. Grade lawn areas to smooth, free drainage and even surface with a loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions as required to drain.

E. Apply ground limestone fertilizer at rate determined by the soil test, to adjust pH of topsoil as specified in sod type. Distribute evenly by machine and incorporate thoroughly into topsoil.

F. Apply "Type A" fertilizer as specified by manufacturer October 1 through June 1, 30 days after installation only. Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to a depth of 3" by discing or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil.

G. Dampen dry soil prior to sodding.

H. Restore prepared areas to specified condition if eroded, settled or otherwise distributed after fine grading and prior to sodding.

3.03 INSTALLATION

A. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains and seed areas.

B. Do not lay dormant sod or install sod on saturated soil.

C. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.

D. Peg sod on slopes greater than 3 to 1 to prevent slippage at a rate of 2 stakes per yard of sod.

F. Water sod thoroughly with a fine spray immediately after laying.

G. Roll with light lawn roller to ensure contact with subgrade.

H. Sod indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

I. Top dress all seams of sodded area with specified topsoil.

3.04 MAINTENANCE

A. Maintain sodded lawns for a period of at least 90 days after completion and acceptance of sodding operations and project.

B. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and resodding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the City of Tampa representative.

1. Water sod thoroughly every 2 to 3 days, as required to establish proper rooting.
2. Repair, rework, and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
3. Mow lawn areas as soon as top growth reaches a 3" height. Cut back to 2" height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing.
4. Apply "Type A" fertilizer to lawns approximately 30 days after sodding at a rate specified by the manufacturer, between October 1 and June 1 only. Apply with a mechanical rotary or drop type distributor. Thoroughly water into soil.
5. Apply herbicides as required to control weed growth or undesirable grass species.
6. Apply fungicides and insecticides as required to control disease and insects.

3.05 ACCEPTANCE

A. Inspection to determine acceptance of sodded lawns will be made by the City Representative, upon contractor's request. Provide notification at least 5 working days before requested inspection date.

1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored viable lawn is established, free of weeds, undesirable grass species, disease, and insects.

B. Upon acceptance, contractor shall maintain area for 90 days. At the end of this period, contractor shall request a final maintenance inspection for acceptance.

C. Upon acceptance at end of maintenance period, the City of Tampa will assume lawn maintenance.

3.06 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from sodding operations.

END OF SECTION

SECTION 32 93 00
LOUSIANA PUMP STATION
TREES, PLANTS AND GROUNDCOVERS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK:

Furnish all materials, equipment and labor as necessary for preparation of planting areas, soil treatment, planting of trees, plants and groundcovers, protection of trees, maintenance, guarantee and replacement of trees, and related items as required to complete the work indicated on the drawings and specified herein.

1.1.1 Related Work:

- Section 32 92 00: Sodding
- Section 32 84 00: Irrigation

1.2 DEFINITIONS

The following words and terms or pronouns used instead shall wherever they appear in these specifications, be construed as follows, unless a different meaning is clear from the context:

Final Acceptance: shall mean that point in time when all requirements of project drawings and specifications are completed, including any punch list items, to the satisfaction of the City of Tampa representative. The contractor shall be notified in writing of final acceptance by a City of Tampa representative.

Warranty Period: shall be a six-month period beginning at Final Acceptance

Maintenance Period: shall begin when plant material is installed and continue for ninety (90) days after notification of Final Acceptance.

Final Maintenance Inspection: shall occur at the end of the ninety (90) day maintenance period.

1.3 QUALITY ASSURANCE

1.3.1 Installer Qualifications: The installer shall be a firm having at least 5 years of successful experience of a scope similar to that required for the work, including the handling and planting of large specimen trees in urban areas.

1.3.2 Installer's field supervisor shall have a minimum of five years' experience as a field supervisor installing plants and trees of the quality and scale of the proposed project, and can communicate in English with the owner's representative.

1.3.3 Plant names indicated shall comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed shall conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

1.3.4 Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock" (ANSI Z60 1) and, sizing and grading standards of the latest edition of

"Grades and Standards for Nursery Plants: Part I and II" by the Florida Department of Agriculture and Consumer Services. All plant material shall be "Florida No. 1" or better.

1.3.5 Caliber measurement shall be taken 6" above ground level if 4" or less. If greater than 4" caliber measurement will be taken at 12" above ground level.

1.3.6 Do not make substitutions. If specified landscape material is not obtainable, submit to City of Tampa representative in writing, proof of non-availability and proposal for use of equivalent material. When authorized, adjustment of contract amount will be made.

1.3.7 All plants shall be nursery grown and 100% acclimatized to local planting conditions.

1.3.8 Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, providing that the larger plants will not be cut back to size indicated or root bound in pots. Provide plants indicated by two measurements so that only a maximum of 25% are of the minimum size indicated and 75% are of the maximum size indicated.

1.3.9 All trees will be inspected and approved by the City of Tampa representative at the place of growth, for compliance with specification requirements for quality, size and variety. When trees cannot be obtained locally, provide sufficient photographs of the proposed plants for approval.

1.3.9.1 Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.

1.3.9.2 Tag trees at the source of supply prior to inspection by the City of Tampa representative.

1.4 AWARDEE SUBMITTALS

The awarded bidder shall submit the following prior to commencing with work:

1.4.1 Submit planting schedule showing scheduled dates for each type of planting in each area of site two weeks prior to beginning work.

1.4.2 Submit certificates of inspection, as required by governmental authorities, and manufacturers or vendors certified analysis for soil amendments, herbicides, insecticides and fertilizer materials, submit other data substantiating that materials comply with specified requirements.

1.4.3 Product data: Submit manufacturer product data and literature describing all products required by this section to the owner's representative for approval. Provide submittal a minimum of two weeks before the installation of plants.

1.4.4 Plant growers' certificates: Submit plant growers' certificates for all plants indicating that each meets the requirements of the specification, including the requirements of tree quality, to the owner's representative for approval. Provide submittal a minimum of 2 weeks before the installation of plants.

1.4.5 Submit the following material samples:

- Mulch
- Topsoil with verification of sterilization and source

- Photographs of all tree material if not available for tagging at a nursery within 60 miles of City of Tampa
- Photographs indicating height for all other plant material.
- Fertilizer cut sheet
- Color photographs of "regenerated root" sabal palms shall be provided by the contractor and submitted to the City of Tampa representative for approval prior to delivery and installation. Photos shall clearly depict: the clear trunk height, the trunk diameter measured at the base, the root ball measurements, regenerated roots on all sides of the root ball, three fully expanded new fronds. All measurements and requirements noted herein shall be clearly identifiable in the color photographs submittals. Upon delivery to the project site or holding area, "regenerated root" sabal palms will be subject to inspection by the City of Tampa representative to confirm compliance with these specifications before installation. Sabal palms that do not meet the minimum requirements will not be accepted.

1.4.6 Upon final acceptance of plant material, submit two written maintenance instructions recommending procedures for maintenance of plant materials for a one-year period.

1.4.7 Provide landscape planting as-built drawings:

- Legibly marked drawings to record actual installation.
- Identify field changes of dimension and detail and changes made by approving authority.

1.5 OBSERVATION OF THE WORK

1.5.1 The owner's representative may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replace at the contractor's expense. The cost of testing materials not meeting specifications shall be paid by the contractor.

1.5.2 The owner's representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The owner's representative shall be afforded sufficient time to schedule a visit to the site. Failure of the owner's representative to make field observations, shall not relieve the contractor from meeting all the requirements of this specification.

1.5.2.1 Site conditions prior to start of work: review the soil and drainage conditions.
1.5.2.2 Completion of plant layout staking: review of the plant layout.
1.5.2.3 Plant quality: review of plant quality at the time of delivery and prior to installation. Review tree quality prior to unloading where possible, but in all cases prior to planting.
1.5.2.4 Completion of planting: review the completed planting.
1.5.2.5 Pre-construction conference: schedule a pre-construction meeting with the owner's representative at least seven (7) days before beginning work to review any questions the contractor may have regarding the work, administrative procedures during construction, and project work schedule.

1.5.3 The owner's representative may review all plants subject to approval of size, health, quality, character, etc. Review or approval of any plant during the process of selection, delivery, installation and establishment period shall not prevent that plant from later

rejection in the event that the plant quality changes or previously existing defects become apparent that were not observed.

1.6 DELIVERY, STOARGE AND HANDLING

1.6.1 Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer.

1.6.2 Protect materials from deterioration during delivery and storage. Adequately protect plants from drying out, exposure of roots to sun, wind or extremes of heat and cold temperatures. If planting is delayed more than 24 hours after delivery, set plants in a location protected from sun and wind. Provide adequate water to the root ball package during the shipping and storage period.

1.6.2.1 All plant materials must be available for observation prior to planting.

1.6.2.2 Using a soil moisture meter, periodically check the soil moisture in the root balls of all plants to assure that the plants are being adequately watered. Volumetric soil moisture shall be maintained above wilting point and below field capacity for the root ball substrate or soil.

1.6.3 Do not deliver more plants to the site than there is space with adequate storage conditions. Provide a suitable remote staging area for plants and other supplies.

1.6.3.1 The owner's representative or contractor shall approve the duration, method and location of storage of plants.

1.6.4 Cover plants transported on open vehicles with a protective covering to prevent wind burn.

1.7 JOB CONDITIONS

1.7.1 Work notification: Notify the city's representative at least seven (7) working days prior to installation of plant material. All plant samples to be reviewed for approval prior to notification.

1.7.2 Protect existing utilities, paving, irrigation, landscaping and other facilities from damage caused by landscaping operations. Notify Sunshine One Call a minimum of 72 hours prior to beginning work. Contractor shall verify all underground and above ground utility locations prior to start of work. Notify the City of Tampa representative of any unsatisfactory conditions prior to start of work. Start of work will indicate acceptance of conditions and full responsibility for completed work. Awardee is responsible for repairing any damage done by landscape installation process.

1.7.3 It is the responsibility of the contractor to be aware of all overhead, surface and sub-surface conditions, and to notify the owner's representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

1.7.4 A complete list of plants and locations, including a schedule of sizes, quantities, and other requirements are shown on the drawings.

1.7.5 Examine the sub-grade, verify the elevations, observe the conditions under which work is to be performed, and examine unsatisfactory conditions before proceeding with the work.

1.7.5.1 When conditions detrimental to plant growth are encountered such as rubble fill, chemicals, adverse drainage conditions or obstructions, notify the city's representative before planting to determine alternative action.

1.7.5.2 Awardee shall be responsible for the removal of existing vegetation, stump, root ball and debris deemed necessary by the city's representative to carry out scope of project.

1.7.6 Any work taking place along a city, county or state road or median must comply with appropriate regulating authority's guidelines for "Traffic Controls for Construction and Maintenance Operations". All applicable Florida Department of Transportation Maintenance of Traffic standards shall be utilized at all times while construction and maintenance activities are being performed as a result of this project. Awardee shall be responsible for filing and obtaining any and all required agency permits. Submit a maintenance plan of traffic plan for approval prior to starting work.

1.7.7 Work shall be coordinated to minimize time between digging of hole, removal of tree, stump, tree grates, and planting of new trees. Open cutouts or holes must be secured at all times from pedestrian traffic. Do not leave open holes overnight.

1.7.8 Response Time: The awardee must begin work within two weeks of submittal approvals for small projects, defined as less than fifty trees, and four weeks for larger projects. Once project work has been started, the awardee must not have more than a 72-hour gap of project work until work is completed.

PART 2 – PRODUCTS

2.1 PLANT MATERIAL GENERAL

2.1.1 Standards and measurement: Provide plants of quantity, size, genus, species, and variety or cultivars as shown and scheduled in contract documents.

2.1.2 All plants including the root ball dimensions or container size to trunk caliper ration shall conform to ANSI Z60.1 "American Standard for Nursery Stock" latest edition, unless modified by provisions in this specification. When there is a conflict between this specification and ANSI Z60.1, this specification section shall be considered correct.

2.1.3 Plants larger than specified may be used if acceptable to the owner's representative. Use of such plants shall not increase the contract price. If larger plants are accepted, the root ball size shall be in accordance with ANSI Z60.1. Larger plants may not be acceptable if the resulting root ball cannot be fit into the required planting space.

2.1.4 If a range of size is given, no plant shall be less than the minimum size and not less than 50 percent of the plants shall be as large as the maximum size specified. The measurements specified are the minimum and maximum size acceptable and are the measurements after pruning, where pruning is required.

2.1.5 Proper Identification: All trees shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by genus, species, variety and cultivar.

2.1.6 Compliance: All trees shall comply with federal and state laws and regulations requiring observation for plant disease, pests, and weeds. Observation certificates required by law shall accompany each shipment of plants.

2.2 PLANT MATERIAL QUALITY

2.2.1 General: Provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores, and larvae. At the time of planting, all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant. All plant material shall be Florida No. 1 or better.

2.2.2 Plants shall be healthy with the color, shape, size and distribution of trunk, stems, branches, buds and leaves normal to the plant type specified. Tree quality above the soil line shall comply with the project Crown Acceptance details (or Florida Grades and Standards, tree grade Florida Fancy or Florida #1) and the following:

2.2.3 Crown: The form and density of the crown shall be typical for a young specimen of the species or cultivar pruned to a central and dominant leader. Crown specifications do not apply to plants that have been specifically trained in the nursery as topiary, espalier, multi-stem, clump, or unique selections such as contorted or weeping cultivars.

2.2.4 Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of prolonged moisture stress or over watering as indicated by wilted, shriveled, or dead leaves.

2.2.5 Branches: Shoot growth (length and diameter) throughout the crown should be appropriate for the age and size of the species or cultivar. Trees shall not have dead, diseased, broken, distorted, or otherwise injured branches. Main branches shall be distributed along the central leader not clustered together. They shall form a balanced crown appropriate for the cultivar/species.

2.2.5.1 Branch diameter shall be no larger than two-thirds (one-half is preferred) the diameter of the central leader measured 1 inch above the branch union.

2.2.5.2 The attachment of the largest branches (scaffold branches) shall be free of included bark.

2.2.6 Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds that penetrate to the wood (properly made pruning cuts, closed or not, are acceptable and are not considered wounds), sunburned areas, conks (fungal fruiting bodies), wood cracks, sap leakage, signs of boring insects, galls, cankers, girdling ties, or lesions (mechanical injury).

2.2.7 Plant roots shall be normal to the plant type specified. Root observations shall take place without impacting plant health. Root quality at or below the soil line shall comply with the project Root Acceptance details and the following:

2.2.7.1 The roots shall be reasonably free of scrapes, broken or split wood.

2.2.7.2 The root system shall be reasonably free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Wounds

resulting from root pruning used to produce a high quality root system are not considered injuries.

2.2.7.3 A minimum of three structural roots reasonably distributed around the trunk (not clustered on one side) shall be found in each plant. Root distribution shall be uniform throughout the root ball, and growth shall be appropriate for the species.

2.2.7.4 Plants with structural roots on only one side of the trunk (J roots) shall be rejected.

2.2.7.5 The root collar shall be within the upper 2 inches of the substrate/soil. Two structural roots shall reach the side of the root ball near the top surface of the root ball. The grower may request a modification to this requirement for species with roots that rapidly descend, provided that the grower removes all stem girdling roots above the structural roots across the top of the root ball.

2.2.7.6 The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices.

2.2.7.7 At time of observations and deliver, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

2.2.8 Balled and Burlapped Plants: Shall be field grown, and the root ball packaged in a burlap and twine and/or burlap and wire basket package. Plants shall be harvested with the following modifications:

2.2.8.1 Prior to digging any tree that fails to meet the requirement for maximum soil and roots above the root collar, carefully remove the soil from the top of the root ball of each plant, using hand tools, water or an air spade, to locate the root collar and attain the soil depth over the structural roots requirements. Remove all stem girdling roots above the root collar. Care must be exercised not to damage the surface of the root collar and toe top of the structural roots.

2.2.8.2 Trees shall be dug for a minimum of 6 weeks and a maximum of 52 weeks prior to shipping. Trees dug 6 to 52 weeks prior to shipping are defined as hardened-off. Digging is defined as cutting all roots and lifting the tree out of the ground and either moving it to a new location in the nursery, or placing it back into the same hole. Trees that are stored out of the ground shall be placed in a holding area protected from extremes of wind and sun with the root ball protected by covering with mulch or straw and irrigated sufficiently to keep moisture in the root ball above wilt point and below saturation.

2.2.8.3 If wire baskets are used to support the root ball, a “low profile” basket shall be used. A low profile basket is defined as having the top of the highest loops on the basket no less than 4 inches and no greater than 8 inches below the shoulder of the root ball package.

2.2.8.4 Twine and burlap used for wrapping the root ball package shall be natural, biodegradable material. If the burlap decomposes after digging the tree then the root ball shall be re-wrapped prior to shipping if roots have not yet grown to keep root ball intact during shipping.

2.2.9 Container (including above ground fabric containers and boxes) Plants:

2.2.9.1 Provided plants shall be established and well rooted in removable containers.

2.2.9.2 Container class size shall conform to ANSI Z60.1 for container plants for each size and type of plant.

2.2.10 Regenerated Root Palms:

2.2.10.1 Root balls shall have new, regenerated, round-tipped roots that have emerged from the root initiation zone. roots shall be whitish-yellow in color, have tapered ends and be present on all sides. To qualify as "regenerated roots" sabal palms, after field harvesting and during the root regenerating period, the root balls shall have been placed in containers or be contained within "plastic fabric or film material", or approved equal. They shall have a minimum of three fully expanded new fronds that have not been pruned. Fully expanded new fronds shall meet the minimum requirements to be considered "excellent leaves", as defined by the glossary of terms in the latest edition of the Florida Department of Agriculture and Consumer Services Grades and Standards for Nursery Plants-Palms & Cycads.

2.3 ACCESSORIES

2.3.1 Refer to drawings and other portions of specifications for accessories specifically used on this project.

2.3.2 ***Topsoil*** for Planting Beds: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, and other foreign materials, with acidity range between pH 5.5 and 6.5. Mixture 50% course native sand and 50% peat by volume as specified.

2.3.2.1 Expressly identify source location of topsoil and/or peat proposed for use on the project.

2.3.2.2 Provide topsoil free of substances harmful to the plant material. Topsoil shall be sterilized.

2.3.3 Peat: Brown to black in color, sterile, weed and seed free granulated raw peat, containing no more than 9% mineral on a dry basis.

2.3.4 Fertilizer shall be complete with the following analysis and source compounds:

2.3.4.1 10% nitrogen derived from ammonium nitrate.
2% phosphorous derived from super phosphate
10% potassium derived from potassium sulfate
4% magnesium derived from magnesium sulfate

2.3.4.2 The fertilizer shall be neutral and contain the essential micro-nutrients (Chelated Fe, Mn, Zn, Mo, Bo, Cu) in sulfates unless otherwise indicated in ppm. Fertilizer shall be slow release.

2.3.5 Anti-Desiccant: Protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with manufacturer's instructions.

2.3.6 Mulch shall be Florimulch or approved equal, clean, bright and free from weeds, moss, sticks and other debris. Mulch shall be spread a minimum of 2" and maximum of 4" in planting beds.

2.3.7 Water: Free of substances harmful to plant growth. Water shall contain less than 300 ppm soluble salts and less than 10 ppm chlorine, fluoride and sodium. Hoses or other methods of transportation furnished by contractor. Contractor shall be able to access water on the west side of the park.

2.3.8 Staking: All trees shall be staked as shown on plans.

2.3.9 Pre-emergent weed killer: Apply 2 granular "Chipco" Ronstar or approved equal, at a rate recommended by manufacturer.

2.3.10 Soil Amendments: Diehard Transplant (or approved equal) mycorrhizal soil amendment.

2.3.10.1 Diehard transplant (or approved equal) mycorrhizal soil amendment shall contain seven speces of endomycorrhizae, at least two species of ectomycorrhizae, bacteria (comprised of bacillus, psuedomonas and streptomyces), trichoderma, 21% humid acid, 10% sea kelp, 4% yucca, and 29% co-polymer gel.

2.3.10.2 Diehard palm transplant (or approved equal) mycorrhizal soil amendment shall contain seven species of endomycorrhizae, bacteria (comprised of bacillus, pseudomonas, and streptomyces), trichoderma, 3% humic acid, 4% sea kelp, 1% yucca, and 25% co-ploymer gel.

PART 3 – EXECUTION

3.1 INSPECTION

3.1.1 Contractor shall examine proposed planting areas and conditions for installation. Do not start planting work until unsatisfactory conditions are corrected.

3.2 PREPARATION

3.2.1 Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.

3.2.2 Layout of individual tree locations shall be performed by the City of Tampa representative prior to starting work at each site. Give 48-hour notice of need for inspection. If obstructions are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected. Verify locations of existing utilities.

3.2.3 Provide pre-mixed planting mixture for use around the balls and roots of the plants consisting of 50% topsoil as specified and 50% native soil to site.

3.2.4 All existing trees, if any, shall be protected through the duration of this project as outlined in the Tree Protection Standards of the City of Tampa Site Clearing Ordinance.

3.3 INSTALLATION

3.3.1 Observe each plant after delivery and prior to installation for damage of other characteristics that may cause rejection of the plant. Notify the owner's representative of any condition observed.

3.3.2 No more plants shall be distributed about the planting bed area that can be planted and watered on the same day.

3.3.3 The root system of each plant, regardless of root ball package type, shall be observed by the contractor at the time of planting to confirm that the roots meet the requirements for plant root quality in Part 2 Products: Plants General: Plant Quality. The contractor shall undertake at the time of planting, all modifications to the root system required by the owner's representative to meet these quality standards.

3.3.3.1 Modifications, at the time of planting, are to meet the specifications for the depth of the root collar and removal of stem girdling roots and circling roots may make the plant unstable or stress the plant to the point that owner's representative may choose to reject the plant rather than permitting the modification.

3.3.3.2 Any modifications required by the owner's representative to make the root system conform to the plant quality standards outlined in Part 2 Products: Plants General: Quality, or other requirements related to the permitted root ball package, shall not be considered as grounds to modify or void the plant warranty.

3.3.3.3 The resulting root ball may need additional staking and water after planting. The owner's representative may reject the plant if the root modification process makes the tree unstable or if the tree is not healthy at the end of the warranty period. Such plants shall still be covered under the warranty.

3.3.3.4 The contractor remains responsible for confirming that the grower has made all required root modifications noted during any nursery observations.

3.3.4 Container and Boxed Root Ball Shaving: The outer surfaces of ALL plants in containers and boxes, including the top, sides and bottom of the root ball shall be shaved to remove all circling, descending, and matted roots. Shaving shall be performed using saws, knives, sharp shovels or other suitable equipment that is capable of making clean cuts on the roots. Shaving shall remove a minimum of one inch of root mat or up to 2 inches as required to remove all root segments that are not growing reasonably radial to the trunk.

3.3.5 Exposed Stem Tissue after Modification: The required root ball modifications may result in stem tissue that has not formed trunk bark being exposed above the soil line. If such condition occurs, wrap the exposed portion of the stem in a protective wrapping with a shite filter fabric. Secure the fabric with biodegradable masking tape. DO NOT USE string, twine, green nursery ties, or any other material that may girdle the trunk if not removed.

3.3.6 Excavation of the Planting Space: Using hand tools or tracked mini-excavator, excavate the planting hole into the planting soil to the depth of the root ball measured after any root ball modification to correct root problems, and wide enough for working room around the root ball or to the size indicated on the drawing or as noted below.

3.3.6.1 For trees and shrubs planted in soil areas that are NOT tilled or otherwise modified to a depth of at least 12 inches over a distance of more than 10 feet radius from each tree, or 5 feet radius from each shrub, the soil around the root ball shall be loosened as defined below or as indicated on the drawings.

- The area of loosening shall be a minimum of 3 times the diameter of the root ball at the surface sloping to 2 times the diameter of the root ball at the depth of the root ball.
- Loosening is defined as digging into the soil and turning the soil to reduce the compaction. The soil does not have to be removed from the hole, just dug, lifted and turned. Lifting and turning may be accomplished with a tracked mini excavator, or hand shovels.

3.3.6.2 If an auger is used to dig the initial planting hole, the soil around the auger hole shall be loosened as defined above for trees and shrubs planted in soil areas that are NOT tilled or otherwise modified.

3.3.6.3 The measuring point for root ball depth shall be the average height of the outer edge of the root ball after any required root ball after any required root ball modification.

3.3.6.4 If motorized equipment is used to deliver plants to the planting area over exposed planting beds, or used to loosen the soil or dig the planting holes, all soil that has been driven over shall be tilled to a depth of 6 inches.

3.3.7 Set top outer edge of the root ball at the average elevation of the proposed finish. Set the plant plumb and upright in the center of the planting hole. The tree graft, if applicable, shall be visible above the grade. Do not place soil on top of the root ball.

3.3.8 The owner's representative may request that plants orientation be rotated when planted based on the form of the plant.

3.3.9 Backfill the space around the root ball with 50% topsoil backfill mixture specified under 2.3.2 and 50% native soil.

3.3.9.1 Do not fertilize at time of planting, instead contractor shall apply diehard mycorrhizal soil amendment per manufacturer's recommendation to all palms, trees, shrubs and groundcovers. Mix product with backfill in upper 1/3 of planting pit. Ensure that the product is next to the roots.

3.3.10 Brace root ball by tamping backfill mixture around the lower portion of the root ball. Place additional soil around base and sides of ball in six inch lifts. Lightly tamp each lift using foot pressure or hand tools to settle backfill, support the tree and eliminate voids. DO NOT over compact the backfill or use mechanical or pneumatic tamping equipment. Over compaction shall be defined as greater than 85% of maximum dry density, standard proctor or greater than 250 psi as measured by a cone penetrometer when the volumetric soil moisture is lower than field capacity.

3.3.10.1 When the planting hole has been backfilled to three quarters of its depth, water shall be poured around the root ball and allowed to soak into the soil to settle the soil. Do not flood the planting space. If the soil is above field capacity, allow the soil to drain to below field capacity before finishing the planting. Air pockets shall be eliminated and backfill continued until the planting soil is brought to grade level.

3.3.11 Per planting details for trees, build a 4-inch-high, level berm of soil around the outside of the root ball to retain water. Tamp the berm to reduce leaking and erosion of the saucer.

3.3.12 Thoroughly water the soil and root ball immediately after planting.

3.3.13 Remove all nursery plant identification tags and ribbons as per owner's representative instructions.

3.3.14 Follow additional requirements for the permitted root ball packages.

3.3.14.1 BALLED AND BURLAPPED PLANTS:

- After the root ball has been backfilled, remove all twine and burlap from the top of the root ball. Cut the burlap away; do not fold down onto the planting soil.
- If the plant is shipped with a wire basket that does not meet the requirements of a "Low Rise" basket, remove the top 6 to 8 inches of the basket wires just before the final backfilling of the tree.
- Earth root balls shall be kept intact except for any modifications required by the owner's representative in Part 2 – Products.

3.3.14.2 CONTAINER (INCLUDES BOXED AND ABOVE GROUND FABRIC CONTAINERS) PLANTS:

- This specification assumes that most container plants have significant stem girdling and circling roots, and that the root collar is too low in the root ball.
- Remove the container.
- Perform root ball shaving as defined in Installation of Plants: General above.
- Remove all roots and substrate above the root collar and the main structural roots according to root correction details so root system conforms to root observations detail.
- Remove all substrate at the bottom of the root ball that does not contain roots.
- Using a hose, power washer, or air excavation device, washout the substrate from around the trunk and top of the remaining root ball and find and remove all stem girdling roots within the root ball above the top of the structural roots.

3.3.15 Mulch:

3.3.15.1 Mulch tree planting pits and beds with required mulching material 3 inches deep as noted immediately after planting. Install no more than 1 inch of mulch over the top of the root balls of all plants. Thoroughly water mulched areas.

3.3.16 Staking:

3.3.16.1 Stake all trees immediately after planting operations and prior to acceptance. When high winds or other conditions which may affect tree survival or appearance occur, the City of Tampa representative may require immediate staking/guying.

3.3.16.2 All work shall be acceptable to the City of Tampa representative.

3.3.16 Pruning:

3.3.17.1 Prune plants as directed by the owner's representative. Pruning trees shall be limited to addressing structural defects as shown in details; follow recommendations in "Structural Pruning": A Guide for the Green Industry" published by Urban Tree Foundation, Visalia, CA.

3.3.17.2 All pruning shall be performed by a person experienced in structural tree pruning.

3.3.17.3 Except for plants specified as multi-stemmed or as otherwise instructed by the owner's representative, preserve or create a central leader.

3.3.17 Remove and replace excessively pruned or malformed stock resulting from improper pruning that occurred in the nursery or after.

3.3.18 Pruning shall be done with clean, sharp tools.

3.3.19 No tree paint or sealants shall be used.

3.4 CLEAN - UP

3.4.1 During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

3.4.1.1 Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the contractor from all surfaces within the project or on public right of ways and neighboring property.

3.4.2 Once installation is complete, wash all soil from pavements and other structures. Ensure tha mulch is confined to planting beds and that all tags and flagging are removed from the site. The owner's representative seals are to remain on the trees and removed at the end of the warranty period.

3.4.3 Make all repairs to grades, ruts and damage by the plant installer to the work or other work at the site.

3.4.4 Remove and dispose of all excess planting soil, subsoil, mulch, plants, packaging and other material brought to the site by the contractor.

3.5 MAINTENANCE

3.5.1 Begin maintenance immediately after planting. Maintain all plant material until final acceptance and for an establishment period of ninety (90) days after final acceptance.

3.5.2 Maintenance shall include but is not limited to pruning, cultivating, resetting or straightening, watering, fertilization and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease. Maintenance shall be performed as indicated on the Technical Maintenance Plan in the drawing set.

3.5.2.1 Re set settled plants to proper grade and position. Adjust staking as needed. Restore planting saucer and adjacent material and remove dead material. Correct defective work immediately after deficiencies become apparent and weather permits.

3.5.2.2 In addition to irrigation system or if no system exists, water trees every day saturating the soil to depth of three feet for the first two weeks, then water plant material per the following schedule:

- 1 to 30 days – water every other day, saturating the soil to a depth of 3 feet.
- 31 to 60 days – water three times a week, saturating the soil to a depth of three feet.

- 61 to 90 days – water twice a week, saturating the soil to a depth of three feet.
- (Quantity of water applied should be adjusted in accordance to rainfall.)

3.5.2.3 After 60 days, fertilize all plant material as specified in 2.3.4.

3.6 ACCEPTANCE

3.6.1 Inspection to determine acceptance of planted areas will be made by the City of Tampa representative upon contractor's request. Provide notification at least five working days before requested inspection date.

3.6.2 The City of Tampa representative will prepare a "punch list" of those items which must be corrected before re-inspection for final acceptance. The City of Tampa representative will determine an appropriate time period in which punch list items must be corrected. Provide 48-hour notification of need for re-inspection.

3.6.3 The owner will assume plant maintenance 90 days after final acceptance, at which time, the contractor shall request a final maintenance inspection for acceptance, where requirements as stated in 3.5 apply.

3.7 WARRANTY

3.7.1 Warrant plant material to remain alive and be in healthy, vigorous condition for a period of six months after completion and final acceptance of entire project.

3.7.2 Replace, in accordance with the drawings and specifications, all plants that are dead or as determined by the City of Tampa representative to be in an unhealthy or unsightly condition, and have lost their natural shape due to contractor's negligence. The cost of such replacement(s) is a contractor's expense. Warrant all replacement plants for six months after final inspection.

3.7.3 Warranty shall not include damage or loss of trees caused by fires, floods, rains, lightning storms or winds over seventy-five miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the owner.

3.7.4 Remove and replace immediately all plants found to be dead or in unhealthy condition as determined by the City of Tampa representative at any time during warranty period. Make replacements within four weeks of notification.

3.7.5 An inspection will be conducted at the end of the warranty period. Contractor will replace any plants found to be dead or in poor condition at this time within four weeks of inspection. Contractor will also remove any tree staking determined by the city representative to be unnecessary at this point in the trees' development.

END OF SECTION 32 93 00

SECTION 41 22 14

TRANSFER CART

1.0 GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install and make fully operational the transfer cart system in the location and conditions of service, as shown on the Drawings and as specified in this section.

B. These Specifications shall be considered as minimum requirements. The Contractor shall add such additional features as are necessary for satisfactory operation.

C. All equipment supplied under this Specification shall comply in all respects with the provisions of the Occupational Safety and Health Act of 1970, including all standards promulgated under the authority of such Act, and shall also meet all applicable industrial codes in the State in which the project is located.

D. The manufacturer and ultimately the Contractor shall be totally responsible for structural design of the transfer cart system, for the compatibility of all equipment, and for verification of required operating clearances.

E. All parts of the mechanism furnished shall be amply designed and constructed for the maximum stresses occurring during fabrication, erection and continuous operation.

1.02 CAPACITY AND DESIGN LOADS

A. The cart shall be designed to withstand the dead load (caused by the weight of the components themselves), and the live load during standard operation.

B. Standard capacity ratings shall represent the net rated load.

C. The design load for stress calculations shall be based upon the capacity plus 15% for impact.

D. The rated load transfer cart shall be clearly labeled on the cart

1.03 TRANSFER CART SCHEDULE

A. The unit shall be designed for the following conditions:

Schedule

Location	General
Indoor / Outdoor	Indoor & Outdoor
Capacity, tons	6
Min. Operating Speeds	
Speed, fpm	10

1.04 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

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

1. AISC "Manual of Steel Construction"
2. ASTM A48 Standard Specifications for Gray Iron Castings
3. ANSI B30.13 Storage/Retrieval (S/R) Machinery and associated equipment
4. OSHA 1910-179 Occupation Safety and Health Administration

1.05 SUBMITTALS

A. The following items shall be submitted with the Shop Drawings in accordance with, or in addition to the submittal requirements specified in the General provisions:

B. Certification that the equipment has been field tested and passed.

2.0 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The equipment covered by these Specifications is to be MHS part number MAT066064S or engineer approved equal.

2.02 TRANSFER CART

A. All load carrying parts shall be of steel. The wheels shall have machined and hardened 5 inch end truck wheels, not cast (375 – 420 BHN). Wheels and axles shall be equipped with antifriction bearings which are permanently sealed and lubricated. The gear head of the motor shall have an alloy steel, heat-treated gear train operating in a fully enclosed oil bath. The gear shaft shall have precision, oil lubricated ball bearings.

2.03 ELECTRICAL AND CONTROL REQUIREMENTS

A. Electrical power wiring and connection to the electrical system integral to the equipment shall be provided under Division 26, Electrical.

B. All electrical appurtenances furnished by the equipment manufacturer shall be rated for installation in classified areas as specified herein.

C. All wiring between motor, limit switches and starters shall be short, compact and protected by rigid aluminum conduit or non-metallic flexible conduit.

D. Starting equipment shall be integral with the transfer cart unit and shall be of the full voltage, magnetic-reversing type with three overload elements. Equipment shall be housed in an enclosure suitable to the conditions of service and as specified herein.

E. Control panel shall be UL approved and have a UL508A approval label on the outside of the panel.

F. Electrical Requirements:

Pump Station Building	
Area Classification	Unclassified
NEMA Rating of Components	NEMA 4
Power cable with 20 amp plug	
Electrical System	(NEMA L16-20 male)
Motors	
Rating	460V, 3 ph, 60 Hz
Motor HP	2 X 0.5 HP
Enclosure	TEFC
Insulation	Class F
Inverter Duty	No
Service Factor	1.15
Space Heater	No
Motor Winding Temperature Switches	No

2.04 CONTROLS

A. Pendent control for travel shall be provided complete with heavy-duty push-button station of constant pressure type with silver-to-silver contact elements, and sufficient control cable operator to stand 5 feet from the cart and operate.

B. Control power shall be 120 volt, provided by a control power transformer within the starter units. One side of this transformer shall be grounded; the other side shall be connected via a fuse of adequate rating.

2.05 TRACK

A. Track shall be flush mount track embedded into the concrete with angles on both sides to keep concrete from chipping. Track shall be MHS part number ATT6401U or engineer approved equivalent. The track shall be embedded into the exiting or proposed concrete surface, and shall be designed and installed under the responsibility of the equipment provider.

(END OF SECTION)

SECTION 43 12 00

COMPRESSORS AND VACUUM PUMPS GENERAL

1.0 GENERAL

1.01 SUMMARY

A. The CONTRACTOR shall provide blowers, compressors, and vacuum pumps and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to blowers, compressors, and vacuum pumps, except where otherwise indicated.

C. The CONTRACTOR shall assign to a single manufacturer full responsibility for the furnishing and functional operation of the blower, compressor, or vacuum pump unit, including drives, drive motors, speed control equipment (where variable speed drives are required), and accessories. The designated single manufacturer, however, need not manufacture more than one part of the unit (blower, or motor and drive), but shall coordinate the design, assembly, testing, and erection of the unit.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

1. ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800

2. ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys

3. ASME PTC 9 Performance Test Code -Displacement Compressors, Vacuum Pumps and Blowers

4. ASME PTC 10 Performance Test Code -Compressors and Exhausters

5. ASME B31.1 Power Piping

6. IEEE 112 Test Procedure for Polyphase Induction Motors and Generators

7. ASTM A 48 Gray Iron Castings

1.03 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with General Provisions. Shop Drawings: Shop Drawings shall contain the following information:

1. Equipment name, identification number, and specification number

2. Performance curve and data

B. B. The CONTRACTOR shall require the manufacturer to indicate points on the H/Q curves, and the limits recommended for stable operation between which the blowers may be operated without surge and vibration. The stable operating range shall be as wide as possible based on actual tests, performed at the factory in accordance with the ASME PTC 9 and 10 test codes.

1. Equipment detailed description and specification.

2. Electrical data including control and wiring diagrams

3. Assembly and installation drawings including shaft size, seal, coupling, anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights.

4. Equipment drive and motor in accordance with Section 26 27 19.19, Electric Motors.

C. Certification: The CONTRACTOR shall obtain written certification from the designated single manufacturer, addressed to the OWNER, stating that the equipment will efficiently and thoroughly perform the required functions and that the designated single manufacturer accepts the CONTRACTOR's assignment of full responsibility for coordination of all equipment, including motors, variable speed drives, controls, and services required for proper installation and operation of the completely assembled and installed unit(s). The CONTRACTOR shall submit such certificates to the ENGINEER.

D. O & M Manuals: Prior to start-up, furnish complete operations and maintenance manuals in accordance with the Specific Provisions. Printed instructions relating to proper maintenance, including lubrication, and parts lists indicating the various parts by name, number, and diagram where necessary, shall be furnished in duplicate with each unit or set of identical units in each station. A recommended spare parts list shall be included. Instructions for field procedures for erection, adjustments, inspection, and testing shall be provided prior to installation of each piece of equipment.

1.04 QUALITY ASSURANCE

A. Equipment Testing: The CONTRACTOR shall be responsible for the coordination of the following tests of each blower, compressor, and vacuum pump, drive, and motor:

B. General: Tests shall be performed in accordance with the ASME PTC 9 and 10 Performance Test Codes. Tests shall be performed on the actual assembled unit from surge condition to 25 percent above the required design capacity. Prototype model tests will not be acceptable. Equipment shall be tested, as defined herein.

C. Factory Tests of Blowers and Compressors: Blowers, compressors, and motors of sizes 10 to 125 hp (inclusive) shall be factory-tested in accordance with the above requirements. Seven sets of certified test data shall be submitted to the ENGINEER.

D. Factory Tests of Motors: Motors of size 10 hp and larger shall be assembled, tested, and certified at the factory and the working clearances checked to insure that parts are properly fitted. The tests shall be in accordance with IEEE 112 standards, including heat run and efficiency tests. Computations shall be recorded and 7 certified and dated copies of the test results shall be furnished to the ENGINEER.

E. Factory Tests: Blowers and compressors, variable speed drives, and motors 150 hp and larger, shall be factory-tested as complete, assembled units, as indicated above. Test results in triplicate shall be submitted to the ENGINEER and no equipment shall be shipped until the test data have been approved by the ENGINEER.

F. Acceptance: In the event of failure of any blower or compressor to meet any of the above requirements or efficiencies, the CONTRACTOR shall make necessary modifications, repairs, or replacements to conform to the requirements of the Contract Documents and the equipment shall be re-tested at no additional compensation until found satisfactory.

G. Field Tests: Units shall be field tested after installation, in accordance with the Contract Documents, to demonstrate satisfactory operation, without causing excessive noise, vibration, and overheating of the bearings. The field testing shall be performed by the CONTRACTOR in the presence of a factory-trained, experienced field representative of the manufacturer, who shall supervise the following tasks and shall certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation:

H. Start-up, check, and operate the equipment over the entire speed range. The vibration shall be within acceptable limits.

I. Equipment performance shall be documented by obtaining concurrent readings, showing motor voltage, amperage, and discharge head. Each power lead to the motor shall be checked for proper current balance.

J. Bearing temperatures shall be determined by a contact-type thermometer. A running time of at least 20 minutes shall be maintained for this test.

K. Electrical and instrumentation testing shall conform to other applicable Sections of the Specifications.

L. The field testing will be witnessed by the OWNER and/or ENGINEER. In the event any of the equipment fails to meet the above test requirements, it shall be modified and retested in accordance with the requirements of this Section. The CONTRACTOR shall then certify in writing that the equipment has been satisfactorily tested, and that final adjustments thereto have been made. Certification shall include date of final acceptance test, as well as a listing of persons present during tests, and resulting test data. The costs of work by factory-trained representatives shall be borne by the CONTRACTOR. The OWNER will pay for power costs. When available, the OWNER's operating personnel will provide assistance in the field testing.

1.05 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Erection and Startup Assistance: Service and instruction assistance by the manufacturer's service representative for each blower and compressor unit 10 hp and larger shall be provided by the CONTRACTOR during the following periods:

1. One day (minimum) during installation.

2. One day (minimum) during startup.

B. Instruction of OWNER's Personnel: The CONTRACTOR shall provide for the services of a factory service representative to instruct the OWNER's personnel in the operation and maintenance of the equipment.

1.06 GUARANTEES AND WARRANTIES

A. After completion, the CONTRACTOR shall furnish to the OWNER the manufacturer's written guarantees, that the equipment will operate with the published efficiencies, heads, and flow ranges and meet these specifications. The CONTRACTOR shall also furnish the manufacturer's warranties as published in its literature.

2.0 PRODUCTS

2.01 GENERAL

A. Wherever it is required that a single designated manufacturer shall be responsible for the compatible and successful operation of the various components of any equipment, it shall be understood to mean that the CONTRACTOR shall provide only such equipment as the manufacturer will certify is compatible with its equipment and with the further understanding that this in no way constitutes a waiver of any requirements.

B. Manufactured items provided under this Section shall be new, current models, and the products of reputable companies specializing in the manufacture of such products, with previous experience in such manufacture. The CONTRACTOR shall, upon request of the ENGINEER, furnish the names of not less than 5 successful installations of its equipment of comparable nature to that offered under this Contract.

C. Where 2 or more units of the same type and/or size of equipment are required, such units shall be from the same manufacturer.

2.02 MATERIALS

A. Materials employed in the blower, compressor, and vacuum pump equipment shall be suitable for the intended application; material not indicated shall be high-grade, standard commercial quality, free from any defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended, and shall conform to the following requirements:

1. Cast iron casings shall be of close-grained gray cast iron, conforming to ASTM A 48, or equal.

2. Miscellaneous stainless steel parts shall be Type 316.

3. Anchor bolts, nuts, and washers shall be Type 316 stainless steel.

2.03 APPURTENANCES

A. Nameplates: Each blower, compressor, vacuum pump, and motor shall be equipped with a stainless steel nameplate indicating rated head and capacity, impeller size, speed, and manufacturer's name, serial, and model number.

B. Solenoid Valves: Solenoid valves shall be provided on the water or oil lubrication and cooling lines. Solenoid valve electrical rating shall be compatible with the motor control voltage and shall be provided complete with all necessary conduit and wiring installation from control panel to solenoid.

C. Gauges: Blowers, compressors, and vacuum pumps shall be equipped with pressure or vacuum gauges, respectively, installed in the discharge lines. Pressure gauges shall be located in a representative location, where not subject to shock or vibrations, in order to achieve true and accurate readings. Where subject to shock or vibrations, the pressure gauges shall be wall-mounted or attached to galvanized channel floor stands and connected by means of flexible connectors.

D. Lubrication: Blowers, compressors, vacuum pumps, and motors shall be oil-or-grease-lubricated per individual specifications.

2.04 TOOLS AND SPARE PARTS

A. Tools: Special tools necessary for maintenance and repair of the equipment and one pressure grease gun for each type of grease required for blowers, compressors, and motors shall be furnished as a part of the WORK hereunder; such tools shall be suitably stored in metal tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

B. Spare Parts: The CONTRACTOR shall furnish spare parts subject to wear, such as seals, packing, gaskets, nuts, bolts, washers, wear rings, etc., as well as a set of spare bearings, and one year's supply of filter elements. Furnish parts suitably packaged and labeled in a box as described above for tools.

3.0 EXECUTION

3.01 INSTALLATION

A. General: Blowers, compressors, and vacuum pump equipment shall be installed in accordance with the Shop Drawings and as indicated.

B. Alignment: Equipment shall be field tested to verify proper alignment and operation as indicated, and freedom from binding, scraping, excessive noise, overheating, vibration, shaft run out, or other defects. Drive shafts shall be measured just prior to assembly to ensure correct alignment without forcing. Equipment shall be secure in position and neat in appearance.

C. Piping and Mounting: Piping shall be provided with sufficient expansion joints, guides, and anchors and be supported so as to preclude the possibility of exerting undue forces and moments on the equipment flanges. Suitable flexible connectors shall be provided to isolate the equipment from the piping system. Each unit shall be mounted on a flat and level concrete pad capable of supporting the dead weight of the unit, by means of restrained vibration isolators or resilient pads of suitable design.

D. Lubricants: The installation work shall include furnishing the necessary oil and grease for initial operation and for one year's operation.

(END OF SECTION)

SECTION 43 12 30

COMPRESSED AIR EQUIPMENT

1.0 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for furnishing and installing two air compressors with receivers and a dryer with all accessories and appurtenances necessary for a complete installation. Locate the equipment as shown on the plans. Provide two simplex reciprocating, pressure lubricated, belt driven air compressor unit on an air receiver tank, tank mounted control panel, and all accessories including automatic tank drain, pressure switches, receiver tank pressure relief valve, pressure gauges and all other components needed for a complete system. Provide refrigerated Air Drying unit as shown or specified.

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. AFBMA 9 -Load Ratings and Fatigue Life for Roller Bearings
2. AFBMA 11 -Load Ratings and Fatigue Life for Ball Bearings
3. ASME Boiler and Pressure Vessel Code, Sec. VIII, Div 1 Pressure Vessels
4. ANSI B93.45 (NFPA T3.27.3) -Pneumatic Fluid Power - Compressed Air Dryers -Methods for Rating and Test

1.03 SYSTEM DESCRIPTION

A. Air Compressor Units: Design air compressor unit for intermittent operation under the following conditions with the specified characteristics:

Item	
Inlet air conditions	
Temperature range, degrees F	25 to 120
Relative humidity, percentage	1 to 100
Factory Set Operating Pressure, psig	90 to 130
Mounting	Tank Mounted
Rated discharge pressure, psig	100

Item	
Minimum capacity at rated discharge pressure, scfm	15
Motor horsepower, hp	5
Relief valve setting, psig	135

B. Receivers: Provide air receivers meeting the following requirements:

Item	
Minimum capacity, gallons	120
Position	Vertical
Working pressure, psig	200

C. Refrigerated Air Dryers: Rate air dryers in accordance with the standard rating conditions of the National Fluid Power Association for Class H Dryers ie. 33 to 39 degrees F pressure dew point range at 100 psig and 100 degrees F inlet air, and 100 degrees F ambient air with a maximum pressure drop of 5 psi. Provide air dryers to operate satisfactorily under the following conditions:

Rating Data	
Number Required	1
Minimum ambient air temperature, F	41
Maximum ambient air temperature, F	110
Maximum inlet air temperature, F	120
Maximum air pressure, psig	175
Maximum capacity, scfm	100

1.04 SUBMITTALS

A. General: Provide all submittals, including the following:

B. CONTRACTOR's Drawings: Submit shop drawings, including arrangement and erection drawings of the compressed air equipment and control equipment; installation templates; schematic control diagrams, electrical connection diagrams, and complete description of the control system.

C. Quality Control Submittals: Submit the following:

1. Manufacturer's certified performance and material records as specified.
2. Manufacturer's certified copies of Field Test Reports.

D. Operation and Maintenance: Submit operation and maintenance manuals for the compressed air equipment.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle compressed air equipment in accordance with the Specific Provisions.

1.06 SPARE PARTS

A. Provide one manufacturer's recommended spare parts kit for each air compressor system furnished. Provide the following additional spare parts for the air compressor equipment:

1. Two V-belts for each compressor
2. One set of intake and discharge valves for each compressor

2.0 PRODUCTS

2.01 MANUFACTURER

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

1. Compressor units:
   a. Champion (Champion Model HPL5-80)
   b. Ingersoll-Rand Company

2. Flexible connectors for compressor:
   a. Anaconda
   b. Metraflex
3. Pressure regulators for Pressure Reducing Station:
   a. A.W. Cash Type A31
   b. Fischer Controls Type 67

2.02 AIR COMPRESSOR UNITS

A. General: Assemble each simplex air compressor unit to include a compressor, electric motors, V-belt drives with belt takeup and suitable belt guards, air receiver tank with automatic drain, inlet air filter and silencer, adjustable pressure switches for stop start control, safety relief valve, check valve, pressure gauge, vibration isolators and flexible pipe connection.

B. Design: Provide air compressors of the oil lubricated, reciprocating, air cooled with integral air-cooled after-cooler, horizontal or horizontally inclined, single or two stage, tank mounted type, equipped with an automatic pressure regulator, automatic pressure unloader providing no load starting, and oil level or oil pressure protection. Provide two stage units with an intercooler and interstage safety valve.

C. Tank Mounted: Mount each tank mounted compressor with its motor on a common structural steel base plate which is mounted on an air receiver tank.

D. Relief Valve: Install an ASME safety relief valve as an integral part of the compressor or between the compressor and the discharge check valve.

E. Inlet Filter and Silencer: Provide each inlet air filter and silencer of the dry filter, radially pleated type enclosed in a steel housing, adequately sized for the capacity of the compressor.

F. Vibration Isolators: Set each base mounted air compressor on a minimum of four vibration isolators which are attached to the base plate. Provide each isolator comprising steel springs, steel top and bottom plates, leveling bolts and resilient chocks. Design the isolators to control oscillation and to withstand all lateral forces.

G. Pipe Connections: Provide piping connections to each compressor through corrugated type flexible connectors with 316ss braided protective covering to prevent vibration transmission.

2.03 RECEIVERS

A. General: Construct each air receiver tank of welded steel meeting the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, for unfired pressure vessels and bearing an ASME stamp. Provide each tank with dished ends and with feet or a base for mounting in a horizontal position as specified.

B. Appurtenances: Equip each air receiver with a pressure gauge, plugged inspection openings, an automatic drain valve, an ASME pressure relief valve, and all necessary pipe connections.

1. Fit each air receiver with an automatic moisture eliminator to remove condensate at each starting of the compressor.

2.04 PARTICULATE FILTER

A. General: Install a particulate filter with a manual drain after the coalescing filter with a 0.5 micron rating.

2.05 PRESSURE RELIEF VALVES

A. General: Provide threaded pressure relief valves of the spring-loaded, bronze, pop-safety type designed for compressed air service. Design the valves to “pop” wide open at the specified or scheduled set pressure capable of relieving the specified or scheduled air flow at 10 percent overpressure. Mount the pressure relief valve on the air receiver to relieve the full capacity of the compressors at 10 percent overpressure above the set pressure. Furnish valves meeting the requirements of the ASME Code for unfired pressure vessels and bearing the Code stamp.

2.06 GAUGES

A. Provide pressure gauges of the Bourdon tube type with minimum 2-inch diameter dials, plainly marked. Connect each gauge with red brass pipe, fittings and isolating stopcocks. Equip each gauge with a snubber and threaded protective diaphragm seal. Furnish gauges with a range of 0 to 150 psig, with an accuracy of 0.5% of range.

2.07 BEARINGS

A. General: Manufacture each compressor with bearings of the antifriction ball or roller type of ample size to carry the loads imposed under continuous service without overheating.

B. Radial and Thrust: Equip compressors with radial and thrust bearings. One of the bearings in each case may be combined with the thrust bearing.

C. Life: Design all bearings to be accessible and located for convenient repair or replacement with an average B-10 operating life of not less than 100,000 hours according AFBMA 9 and AFBMA 11.

2.08 LUBRICATION

A. General: Provide oil lubricated compressor bearings.

B. Reservoir: Use a reservoir system or other approved method. Provide all bearings with oil reservoirs to insure a constant supply of clean oil and with suitable gauges to give visual indication that an adequate supply of lubricant is available and is being supplied to the bearings.

C. Drip and Drain: Make provisions to prevent throwing or dripping of lubricant from the bearings and properly drain all oil sumps and pockets.

D. Oil Supply: Supply such oil of the kind and quality specified by the compressor manufacturer, as is necessary to place each compressor unit in regular operation for a period of one year.

2.09 PRESSURE REDUCING STATIONS

A. General: Provide each with a pressure reducing station consisting of a pressure regulating valve, bypass, and pressure gauge. Arrange the pressure reducing station to reduce the supply air pressure to the downstream pressure specified. Provide pressure reducing valve outlet pressures and capacities as shown or scheduled.

B. Pressure Regulating Valves: Provide direct acting, spring loaded, diaphragm operated, single seated pressure regulating valves designed for compressed air service. Design the valves to maintain the selected downstream pressures with inlet pressures up to 125 psig. Provide downstream pressure settings to be field adjustable.

C. Other Requirements: Provide pressure gauges as specified herein.

2.10 ACCESSORIES

A. Simplex Control Panel: Provide a local control panel from the compressor manufacturer located at each compressor station. Manufacture the simplex control panel to include, but not limited to, the following equipment:

1. HAND/OFF/AUTO switch for compressor
2. Running contacts for compressor
3. Low oil level or pressure indicating light for compressor
4. Low system pressure indicating light
5. Discharge pressure gauge
6. Starters

B. Safety Requirements for Control Panels: Provide all accessories and appurtenances required for the safe, proper operation of the air compressor equipment as described herein whether or not such components have been specifically shown or specified. Provide compressor controls, duplex control panel and wiring meeting applicable requirements of Section 26 24 16 Panelboards.

C. Control Panel Components: Equip the control panel with an alarm reset push button and alarm indicating lights for low system pressure, motor overload for the compressor, low oil level or pressure for the compressor. Provide auxiliary dry contacts at the control panel for remote annunciation of low compressed air system pressure alarm based on the adjustable set points.

D. Motors: Design air compressor drive motors for operation at 480 volts, 3 phase, 60 hertz, in accordance with Section 26 27 19.19 Electric Motors.

2.11 SYSTEM CONTROL

A. Adjustable Pressure Switch: Provide adjustable, heavy duty pressure switches for starting and stopping the compressors and a low pressure alarm switch on the air receiver. Equip the switches with double-pole, double-throw contacts rated at 10 amperes for 120-volt a-c power.

1. Arrange the switches to start the compressor at a falling pressure of 90 psig and stop it at a rising pressure of 130 psig. Set the low system pressure switch to actuate an alarm at a falling pressure of 80 psig.

B. Oil Switches: Equip compressor with a low oil level or low oil pressure switch. Design the switch to shut off the compressor and actuate a compressed air system control panel mounted indicating light. Provide a lubricating oil system switch as recommended by the compressor manufacturer.

3.0 EXECUTION

3.01 INSTALLATION

A. Install all compressed air equipment in accordance with the manufacturer's recommendations and approved shop drawings.

3.02 FIELD QUALITY CONTROL

A. Testing: After the installation of the air compressor and all appurtenances, subject the compressor to a field running test under actual operating conditions. Perform field tests as directed and in the presence of the ENGINEER. Perform the field tests to demonstrate that under all conditions of operation the unit:

1. Has not been damaged by transportation or installation
2. Has been properly installed
3. Has no mechanical defects
4. Has been properly connected
5. Is in proper alignment
6. Is free of overheating of any parts
7. Is free of all objectionable vibration
8. Is free of excessive noise
9. Is free of overloading of any parts
10. Operates as specified with the control system

B. Defects: Promptly correct any defects in the equipment or failure to meet the requirements of the Specifications.

C. Manufacturer's Field Services: Furnish the services of a qualified representative of the compressed air equipment manufacturer to inspect the installation of the compressed air equipment, place it in operation, make any necessary adjustments, and instruct the operating personnel in its operation and maintenance.

3.03 CLEANING AND PAINTING

A. Paint the compressed air equipment as specified in Workmanship and Material Section W-36 headed "Painting".

END OF SECTION

LIMITED LEAD BASED PAINT SCREENING

for

Louisiana Avenue Pump Station
4802 North River Boulevard
Tampa, Hillsborough County, Florida
A&A File Number: 12-54-9806

OFFICES

Orlando, 8008 S. Orange Avenue, Orlando, Florida 32809, Phone (407) 855-3860
Bartow, 1525 Centennial Drive, Bartow, Florida 33830, Phone (863) 533-0858
Cocoa, 1300 N. Cocoa Blvd., Cocoa, Florida 32922, Phone (321) 632-2503
Fort Myers, 9970 Bavaria Road, Fort Myers, Florida 33913, Phone (941) 768-6600
Miami, 2608 W. 84th Street, Hialeah, Florida 33016, Phone (305) 825-2683
Port St. Lucie, 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986, Phone (772) 878-0072
Sarasota, 78 Sarasota Center Blvd, Sarasota, Florida 34240, Phone (941) 922-3526
Tallahassee, 3175 W. Tharpe Street, Tallahassee, Florida 32303, Phone (850) 576-6131
Tampa, 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619, Phone (813) 620-3389
West Palm Beach, 2511 Westgate Avenue, Suite 10, West Palm Beach, Florida 33409. Phone (561) 687-8200

Ardaman & Associates, Inc.
Geotechnical, Environmental and
Materials Consultants

December 21, 2012
File Number 12-54-9806

Woodroffe Corporation Architects
5005 West Laurel Street, Suite 215
Tampa, Florida 33607

Attention: Ms. Erin Schultz

Subject: **Limited Lead Based Paint Screening**
Louisiana Avenue Pump Station
4802 North River Blvd.
Tampa, Hillsborough County, Florida

Dear Ms. Schultz:

Ardaman & Associates, Inc. is pleased to submit this limited lead based paint screening report of the Louisiana Avenue Pump Station building at the above referenced property. The purpose of our services was to perform a limited lead based paint screening of the building materials for upcoming demolition activities.

PROJECT INFORMATION

Project information was provided on December 7, 2012. The subject project consists of the Louisiana Avenue Pump Station located at 4802 North River Blvd. in Tampa, Hillsborough County, Florida. The subject property is a concrete block structure listed as being constructed in 1952. It is currently utilized as a waste water station. It is our understanding the pump station building will be renovated to reflect current building standards.

SITE OBSERVATIONS

The building is a concrete frame with wood truss roof, and is approximately 2,800 square feet in size. The building was constructed in 1952 and is utilized as a pump station for Hillsborough County waste water. The building contained several mechanical elements such as pump motors and metal piping that were painted. The concrete floors and steps in the building were also painted.

Twenty-nine samples were collected from painted surfaces throughout the building. Samples were submitted to EMSL Analytical, Inc. for laboratory analysis. The following table shows the sample identification and laboratory results:

Sample No.	Sample ID	Sample Location	Result (%Weight)
1	Concrete Block Walls - Tan	Window East 2nd Floor	0.33
2	Concrete Block Walls - Tan	Window West 2nd Floor	0.047
3	Concrete Block Walls - Tan	Wall East 2nd Floor	0.039
4	Metal Hand Rails - Red/Yellow	Second Floor	6.9
5	Metal Piping – Light Blue	First Floor	0.17
6	Concrete Block Wall – Cream	First Floor Wall	<0.026
7	Concrete Block Wall – Cream	First Floor Wall	0.014
8	Concrete Block Wall – Cream	First Floor Wall	0.069
9	Metal and Concrete – Grayish Blue	Floor on 2nd Floor	0.43
10	Metal and Concrete – Grayish Blue	Door East 2nd Floor	0.18
11	Metal and Concrete – Grayish Blue	Floor on 1st Floor	0.062
12	Metal and Concrete – Grayish Blue	Stairs	0.56
13	Metal and Concrete – Grayish Blue	Door Jam in Bathroom	0.86
14	Metal Piping – Lime Green	Piping on 1st Floor	0.057
15	Metal Piping – Dark Green	Piping on 1st Floor	0.026
16	Ceilings and Concrete Block Walls – White	Bathroom Ceiling	0.14
17	Ceilings and Concrete Block Walls – White	Office Ceiling	0.19
18	Ceilings and Concrete Block Walls – White	Bathroom Ceiling	0.12
19	Metal Door – Light Blue	2nd Floor Door	0.16
20	Concrete Floor – Light Blue	Bathroom	0.40
21	Wood Stall Door – Lime Green/ Dark Grey	Bathroom Stall Door	0.054
22	Metal – Light Green/ Dark Green	Pump Motor	3.0
23	Metal – Blue	Pump Motor	0.18
24	Metal – Dark Gray	Pump Motor	0.030
25	Metal – Light Gray	Pump Motor	0.29
26	Metal – Red	Metal Pump	<0.010
27	Metal – Beige	Window Frame	0.23
28	Metal – Cream	Stairs	0.15
29	Metal Piping – Dark Gray	Piping 1st Floor	3.0

According to the Environmental Protection Agency 40 CFR Part 745 Lead: Identification of Dangerous Levels of Lead; Final Rule: lead-based paint is as defined paint with lead levels equal to or exceeding 0.5% by weight.

OPINIONS AND RECOMMENDATIONS

Based on the laboratory testing, the following areas contained lead levels at or greater than 0.50% by weight.

Sample No.	Sample ID	Material Location	Result (%Weight)
4	Metal Hand Rails - Red/Yellow	Second Floor	6.9
12	Metal and Concrete – Grayish Blue	Stairs	0.56
13	Metal and Concrete – Grayish Blue	Door Jam in Bathroom	0.86
22	Metal – Light Green/ Dark Green	Pump Motor	3.0
29	Metal Piping – Dark Gray	Piping 1st Floor	3.0

Based on the laboratory testing, the above surfaces sampled contained lead levels at or greater than 0.50% by weight. Any demolition activities should be performed in accordance with industry standards and the materials properly disposed of for lead paint containing materials. If any of the surfaces are to remain in building, the lead-based paint should be abated. Lead-based paints should be removed by a qualified contractor and disposed of in accordance with EPA rules at a facility approved to accept lead paint. County workers should be advised of the surfaces containing lead-based paint so they can incorporate safety procedures for working on or around materials containing lead.

CLOSURE

This report was prepared based upon our judgment, related work experience and industry standards. Should any additional data become available, please provide the information for our review. We appreciate the opportunity to be of service on this project. Should you have any questions in regards to this report, or if we can be of any further assistance, please contact this office

Very truly yours,

ARDAMAN & ASSOCIATES, INC.
Florida Certificate of Authorization No. 00005950

Brack Brackner
Environmental Scientist

Joseph A. Amon, P.E.
Senior Consultant
Florida License No. 43576

G:\Projects\2012\12-9806 Louisiana Ave. Pump Station\01-Lead Screening.doc

Distribution: 2 - Addressee
1 - File

Attachments: Photographs (5)
Laboratory Results

ATTACHMENTS

PHOTOGRAPHS

Photograph 1- General view of the building,

Photograph 2- General view of pump motors and inside of building.

Photograph 3- General view of grayish blue door jams and green bathroom stall.

Photograph 4- General view of small sheds behind building

Photograph 5- General view of south side of building.

LABORATORY RESULTS

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 786-5974 Email: cinnaminsonleadlab@emsl.com

Attn: Brack Brackner
Ardaman & Associates
3925 Coconut Palm Drive
Suite 115
Tampa, FL 33619
Fax: (813) 628-4008 Phone: (813) 620-3389
Project: **Louisiana Pump Station**

Customer ID: ARDA25
Customer PO:
Received: 12/14/12 9:42 AM

EMSL Order: 201212801
EMSL Proj ID:
Cust COC ID

Confirmation of Samples Received

Cust Sample	EMSL Order ID	Test	Received Date	TAT	Due Date
1	201212801-0001	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
2	201212801-0002	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
3	201212801-0003	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
4	201212801-0004	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
5	201212801-0005	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
6	201212801-0006	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
7	201212801-0007	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
8	201212801-0008	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
9	201212801-0009	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
10	201212801-0010	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
11	201212801-0011	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
12	201212801-0012	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
13	201212801-0013	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 786-5974 Email: cinnaminsonleadlab@emsl.com

Attn: Brack Brackner
Ardaman & Associates
3925 Coconut Palm Drive
Suite 115
Tampa, FL 33619
Fax: (813) 628-4008 Phone: (813) 620-3389
Project: **Louisiana Pump Station**

Customer ID: ARDA25
Customer PO:
Received: 12/14/12 9:42 AM

EMSL Order: 201212801
EMSL Proj ID:
Cust COC ID

Confirmation of Samples Received

Cust Sample	EMSL Order ID	Test	Received Date	TAT	Due Date
14	201212801-0014	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
15	201212801-0015	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
16	201212801-0016	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
17	201212801-0017	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
18	201212801-0018	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
19	201212801-0019	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
20	201212801-0020	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
21	201212801-0021	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
22	201212801-0022	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
23	201212801-0023	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
24	201212801-0024	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
25	201212801-0025	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
26	201212801-0026	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 786-5974 Email: cinnaminsonleadlab@emsl.com

Attn:	Brack Brackner Ardaman & Associates 3925 Coconut Palm Drive Suite 115 Tampa, FL 33619	Customer ID:	ARDA25
		Customer PO:	
		Received:	12/14/12 9:42 AM
Fax:	(813) 628-4008 Phone: (813) 620-3389		
Project:	**Louisiana Pump Station**	EMSL Order:	201212801
		EMSL Proj ID:	
		Cust COC ID	

Confirmation of Samples Received

Cust Sample	EMSL Order ID	Test	Received Date	TAT	Due Date
27	201212801-0027	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
28	201212801-0028	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM
29	201212801-0029	Pb-FLAA	12/14/2012 9:42:00 AM	48 Hour	12/17/2012 9:42:00 AM

201212801

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Lead (Pb) Chain of Custody

EMSL Order ID *(Lab Use Only)*: 201212801

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (856) 303-2533
FAX: (856) 786-5974

Company: Aidaman & Associates	**EMSL-Bill to:** ☒ Same ☐ Different If Bill to is Different note instructions in Comments**
Street: 3925 Coconut Palm Dr. Suite 115	*Third Party Billing requires written authorization from third party*
City: Tampa **State/Province:** FL	**Zip/Postal Code:** 33544 **Country:** US
Report To (Name): Brack Brackner	**Telephone #:** 813-620-3389
Email Address: Bbrackner@ardaman.com	**Fax #:** 813-628-4008 **Purchase Order:**
Project Name/Number: Louisana Pump Station	**Please Provide Results:** ☐ Fax ☒ Email
U.S. State Samples Taken: FL	**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour | ☐ 6 Hour | ☐ 24 Hour | ☒ 48 Hour | ☐ 72 Hour | ☐ 96 Hour | ☐ 1 Week | ☐ 2 Week

**Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide*

Matrix	Method	Instrument	Reporting Limit	Check
Chips ☐ % by wt. ☐ mg/cm² ☐ ppm	SW846-7000B	Flame Atomic Absorption	0.01%	☑
Air	NIOSH 7082	Flame Atomic Absorption	4 µg/filter	☐
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter	☐
	NIOSH 7300 modified	ICP-AES/ICP-MS	0.5 µg/filter	☐
Wipe* ASTM ☐ non ASTM ☐ *If no box is checked, non-ASTM Wipe is assumed	SW846-7000B	Flame Atomic Absorption	10 µg/wipe	☐
	SW846-6010B or C	ICP-AES	1.0 µg/wipe	☐
	SW846-7000B/7010	Graphite Furnace AA	0.075 µg/wipe	☐
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW846-1131/SW846-6010B or C	ICP-AES	0.1 mg/L (ppm)	☐
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)	☐
	SW846-7010	Graphite Furnace AA	0.3 mg/kg (ppm)	☐
	SW846-6010B or C	ICP-AES	2 mg/kg (ppm)	☐
Wastewater Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.7	ICP-AES	0.020 mg/L (ppm)	☐
Drinking Water Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-AES	12 µg/filter	☐
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter	☐
Other:				☐

Name of Sampler: Brack Brackner **Signature of Sampler:**

Sample #	Location	Volume/Area	Date/Time Sampled
1	Concret Block Wall - Tan	Second floor Walls and Elevator	12-13-12
2	↓	↓	
3	↓	↓	
4	Hand Rails - Red/yellow	Second floor	
5	Piping - light blue	first floor	

Client Sample #'s **Total # of Samples:** 5

Relinquished (Client):		**Date:**		**Time:**	
Received (Lab):	LVilg	**Date:**	12/14/12	**Time:**	9:42 AM

Comments:

RECEIVED EMSL CINNAMINSON, NJ 2012 DEC 14 A 9:42

201212801

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

LEAD (Pb) CHAIN OF CUSTODY

EMSL ORDER ID *(Lab Use Only)*: 201212801

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 303-2533
FAX: (856) 786-5974

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

	Sample #	Location	Volume/Area	Date/Time Sampled
-6	6	Concrete Block Wall - Cream	first floor	12-13-12
-7	7	↓		↓
-8	8	↓		↓
-9	9	Metal and Concrete - grayish blue	floors / stairs /	↓
-10	10	↓	doors / door jams	↓
-11	11	↓	first and second floors	↓
-12	12	↓	↓	↓
-13	13	↓	↓	↓
-14	14	Piping metal - lime green	first floor	↓
-15	15	Piping metal - dark green	first floor	↓
-16	16	Ceilings / concrete block - white	Ceilings and	↓
-17	17	↓	wet room	↓
-18	18	↓	↓	↓
-19	19	Door - light blue	second floor	↓
-20	20	floor - light blue	bathroom	↓
-21	21	wood - lime green / dark grey	bathroom stall	↓
-22	22	Metal - light green / dark green	Pump motor	↓
-23	23	Metal - blue	Pump motor	↓

Comments/Special Instructions:

RECEIVED
EMSL
CINNAMINSON, NJ
2012 DEC 14 A 8:42

201212801

EMSL ANALYTICAL, INC.
LABORATORY · PRODUCTS · TRAINING

LEAD (Pb) CHAIN OF CUSTODY

EMSL ORDER ID *(Lab Use Only)*:

201212801

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 303-2533
FAX: (856) 786-5974

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Location	Volume/Area	Date/Time Sampled
24	Metal - dark grey	Pump Motor	12-13-12
25	Metal - light grey	Pump Motor	
26	Metal - red	Pump	
27	Metal - Beige	window frame	
28	Metal - cream	stairs	
29	Piping metal - dark grey	first floor	

Comments/Special Instructions:

RECEIVED
EMSL
CINNAMINSON, NJ
2012 DEC 14 A #42

LIMITED ASBESTOS RENOVATION REPORT

Louisiana Avenue Pump Station
4802 North River Boulevard
Tampa, Hillsborough County, Florida
A&A File Number: 12-54-9806

for

Woodroffe Corporation Architects
5005 West Laurel Street, Suite 215
Tampa, Florida 33607

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OFFICES

Orlando, 8008 S. Orange Avenue, Orlando, Florida 32809, Phone (407) 855-3860
Bartow, 1525 Centennial Drive, Bartow, Florida 33830, Phone (863) 533-0858
Cocoa, 1300 N. Cocoa Blvd., Cocoa, Florida 32922, Phone (321) 632-2503
Fort Myers, 9970 Bavaria Road, Fort Myers, Florida 33913, Phone (941) 768-6600
Miami, 2608 W. 84th Street, Hialeah, Florida 33016, Phone (305) 825-2683
Port St. Lucie, 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986, Phone (772) 878-0072
Sarasota, 78 Sarasota Center Blvd, Sarasota, Florida 34240, Phone (941) 922-3526
Tallahassee, 3175 W. Tharpe Street, Tallahassee, Florida 32303, Phone (850) 576-6131
Tampa, 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619, Phone (813) 620-3389
West Palm Beach, 2511 Westgate Avenue, Suite 10, West Palm Beach, Florida 33409. Phone (561) 687-8200

Ardaman & Associates, Inc.
Geotechnical, Environmental and
Materials Consultants

December 20, 2012
File Number 12-54-9806

Woodroffe Corporation Architects
5005 West Laurel Street, Suite 215
Tampa, Florida 33607

Attention: Ms. Erin Schultz

Subject: **Limited Asbestos Renovation Survey Report**
Louisiana Avenue Pump Station
4802 North River Boulevard
Tampa, Hillsborough County, Florida

Dear Ms. Schultz:

This limited asbestos renovation survey report was conducted by a representative of **Ardaman & Associates, Inc.;** Tonya Erbland, AHERA Inspector, Certificate No. 619121 to identify the presence, quantity, and condition of asbestos containing material (ACM) for the renovation/demolition for the above referenced property in accordance with generally accepted practices. No other warranty, expressed or implied, is made.

Ardaman & Associates, Inc.
Asbestos Business License No. ZA0000029

Roxanne Gause
Asbestos Consultant
State License No. 000046

Ardaman & Associates, Inc.
Geotechnical, Environmental and
Materials Consultants

December 20, 2012
File Number 12-54-9806

Woodroffe Corporation Architects
5005 West Laurel Street, Suite 215
Tampa, Florida 33607

Attention: Ms. Erin Schultz

Subject: **Limited Asbestos Renovation Survey Report**
Louisiana Avenue Pump Station
4802 North River Boulevard
Tampa, Hillsborough County, Florida

Dear Ms. Schultz:

Ardaman & Associates, Inc. is pleased to submit this limited asbestos renovation survey report of the building materials suspected of containing asbestos of the at the above referenced property. It is **Ardaman & Associates'** understanding the buildings will be renovated. This report will present the results of the limited asbestos renovation survey as well as conclusions and recommendations

This limited asbestos renovation survey report was prepared for the exclusive use of **Woodroffe Corporation Architects**, and their consultants to identify the presence of asbestos containing materials (ACM) at the above referenced properties in accordance with generally accepted practices. No other warranty, expressed or implied, is made.

It is a pleasure being of assistance to you. Please contact our Tampa office if we may be of further service or should you have any questions concerning this report.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Florida Certificate of Authorization No. 00005950

Tonya Erbland, CIAQP
Senior Environmental Scientist

G:\Projects\2012\12-9806 Louisiana Ave. Pump Station\01-Asbestos Renovation Report.doc

Distribution: 2 – Client
1 – File

TABLE OF CONTENTS

Page No.

APPENDICES

EXECUTIVE SUMMARY

Ardaman & Associates has completed the limited asbestos renovation survey of building materials suspected of containing asbestos at the Louisiana Pump Station located at 4802 North River Boulevard in Tampa, Hillsborough County, Florida. On December 13, 2012, an asbestos renovation survey was conducted by **Ardaman & Associates**. The limited asbestos renovation survey was performed to identify the presence, quantity and condition of asbestos containing materials (ACM) in this project location. The survey did not include entry into unsafe areas of the building or a significantly destructive search behind walls, behind mirrors, or below existing floors. Therefore any additional materials observed are assumed to be asbestos-containing until sampling and laboratory analysis proves otherwise. It is **Ardaman & Associates'** understanding the building will be renovated.

The results of the bulk sample analysis indicate that the following materials contain asbestos:

HA No.	Material Description	Location	Asbestos Type	Category	Estimated Quantity*
*No Asbestos Containing Materials Detected**					

*The window glazing contained trace percent of Chrysotile. Trace percent is a quantity of asbestos that is above the laboratory's detection limit, but is below their limit of quantification. Trace is a quantity less than one percent.

1.0 INTRODUCTION

Ardaman & Associates performed a limited asbestos renovation survey at the Louisiana Pump Station located at 4802 North River Boulevard in Tampa, Hillsborough County, Florida, to identify Asbestos Containing Materials (ACM) associated with the building. It is our understanding the building will be renovated. On December 13, 2012, the asbestos renovation survey was conducted by Ms. Tonya Erbland, AHERA Inspector for **Ardaman & Associates**, Certificate No. 619121. Applicable EPA and State of Florida certifications can be found in Appendix A. The purpose of this survey is to identify the locations and asbestos content of friable and/or non-friable ACM, and provide an assessment of the ACM in relation to the material's hazard potential to building occupants if disturbed.

The Pump Station building was constructed in 1952, and is approximately 2,800 square feet in size. The subject property is a concrete block structure listed as being constructed in 1952. It is currently utilized as a sewage pump station. It is our understanding the pump station building will be renovated to reflect current building standards.

2.0 SURVEY PROCEDURES

A visual survey was initially conducted to identify homogeneous areas (HA) of suspect materials, establish the estimated quantities of these materials, and obtain representative samples. Homogeneous materials are defined by being like in color, size, texture, and date of application. Only accessible and/or exposed materials, and materials suspected to contain asbestos, were identified. EPA and NESHAP guidelines were used to determine the sampling protocol and sampling locations were chosen to be representative of the homogeneous material. Samples were taken as randomly as possible, while attempting to sample already damaged areas so as to minimize disturbance of the material.

The survey did not include entry into unsafe areas of the building or a significantly destructive search behind walls, behind mirrors, or below existing floors. Any potential additional materials should be assumed to be asbestos-containing until sampling and laboratory analysis proves otherwise.

A total of 15 samples were obtained during this survey from the following suspect materials including additional samples of tar and felt paper associated with roofing samples which were also analyzed in the laboratory (see Appendix B):

HA No.	Sample No.	Material Description	Material Location	Sample Location
1	1	Caulking Material #1	East door	2nd Floor
2	2	Caulking Material #2	Patch on Walls	2nd Floor
3	3	Caulking Material #3	All Main Building	All Main Building
4	4	Windows Caulking – White	Exterior	Exterior
5	5	Window Glazing	Exterior	Exterior
6	6	Silver Flashing	North Roof	North Roof
7	7	Coal Tar Roof	North Roof	North Roof
	8	Coal Tar Roof	North Roof	North Roof
	9	Coal Tar Roof	South Roof	South Roof
8	10	Flashing	South Roof	South Roof
9	11	Felt Paper	Under Tiles	Roof
10	12	Caulking #4	Small Sheds	Small Sheds
11	13	Stucco	Exterior	Exterior
	14	Stucco	Exterior	Exterior
	15	Stucco	Exterior	Exterior

3.0 BULK SAMPLE RESULTS

3.1 Asbestos Containing Materials

Based upon results of the laboratory analysis of the bulk samples, the following materials were found to be asbestos-containing:

HA No.	Material Description	Location	Asbestos Type	Category	Estimated Quantity*
*No Asbestos Containing Materials Detected**					

* The window glazing contained trace percent of Chrysotile. Trace percent is a quantity of asbestos that is above the laboratory's detection limit, but is below their limit of quantification. Trace is a quantity less than one percent.

Bulk samples were analyzed by Polarized Light Microscopy in accordance with EPA Method 600/R-93/116. Polarized Light Microscopy is an analytical method recommended by the EPA for asbestos identification based on analysis of the unique optical properties of mineral forms in the samples. All samples collected during this survey were submitted to and analyzed at Arrowhead Technologies, LLC in Tampa, Florida who is accredited under the National Institute of Standards and Technology's (NIST) certification program. The National Voluntary Laboratory Accreditation (NVLAP) replaces the EPA's interim program for Bulk Sample Quality Assurance. Arrowhead Technologies, LLC NVLAP Laboratory Number is 200703-0.

3.2 Material Category

Friable Materials - Materials containing more than 1% asbestos that can be crumbled, pulverized or reduced to powder, when dry by hand pressure, such as spray applied fireproofing on structural steel members, spray applied acoustical ceiling materials or damaged thermal systems insulations are considered Regulated Asbestos Containing Materials (RACM). RACM must be removed prior to a building renovation or demolition activities that impact the material and be disposed of as an asbestos containing material. Unaffected areas should be managed in place by including them in an Operations and Maintenance program designed to protect them from disturbance and periodically reassess their condition.

There were no Friable Asbestos Containing Materials discovered during this survey.

Non-Friable Materials - Non-friable materials are materials in which the asbestos is bound tightly in a matrix or sealed by a protective layer. Non-friable materials can become friable by being rendered to a crumbled, pulverized or powdered state, when dry, by crushing, sanding, sawing, shot-blasting, severe weathering or by other mechanically induced means. As outlined in the NESHAPS regulation by EPA, non-friable materials are listed in two categories.

Category I Non-Friable Materials

Category I materials are non-friable and contain more than 1% asbestos. These materials become RACM and require removal when subject to grinding, cutting, sanding or abrading. Category I non-friable material may be removed, where affected by the renovation, by any contractor knowledgeable of the contents of EPA 40 CFR 61 NESHAPS final rule dated November 1990, and in accordance with OSHA 1926. All persons removing asbestos containing resilient floor covering or its adhesive are required by the State of Florida to have received eight (8) hours of training in recommended work practices and asbestos awareness. This material may be disposed of as a construction waste.

There were no Category I Non-Friable Asbestos Containing Materials discovered during this survey.

Category II Non-Friable Materials

Category II materials are non-friable and contain more than 1% asbestos that will have a high probability of being crumbled, pulverized or reduced to a powder by the demolition or renovation activity. These materials should be evaluated on a case-by-case basis. If Category II Non-Friable materials are likely to become crushed, pulverized, or reduced to powder during demolition or renovation, they should be removed before demolition or renovation begin by a state licensed asbestos abatement contractor.

There were no Category II Non-friable Asbestos Containing Materials discovered during this survey.

3.3 Removal Notification Requirement

There is a 10-day notification requirement to the Department of Environmental Protection before a renovation involving the removal of 160 square feet or 260 linear feet of a Regulated Asbestos Containing Material or demolition of a building. A copy of this form is included in **Appendix III** for your convenience. All EPA, OSHA, State of Florida, local government and landfill policies regarding employee exposure and handling of asbestos will have to be followed. A copy of the asbestos survey shall be kept on site where the demolition/renovation is taking place until the demolition/renovation is completed.

4.0 DISCUSSION

Various lung diseases and some forms of cancer have been attributed to exposure to asbestos. The potential health threat from asbestos exposure is related to the physical and chemical characteristics of asbestos fibers, the building materials containing the fibers, and the concentration of airborne fibers. The greater the concentration of airborne fibers, the greater the likelihood of developing an asbestos related disease. There are four recognized courses of action to control (reduce exposure to airborne fibers) asbestos containing materials in buildings. These four methods are (1) removal and disposal, (2) enclosure, (3) encapsulation, and (4) including the materials in an operations and maintenance (O&M) program. The EPA has indicated that once ACM has been identified in a building there are no longer any grounds for deferring action and minimum response is to establish an O&M program designed to protect the ACM from disturbances and maintain it in good condition.

Once the potential for disturbance and likelihood of airborne fiber exposure has been ascertained the four primary abatement options are considered as follows:

1. Remove the ACM as soon as possible;
2. Develop an Operations and Maintenance program and delay removal until convenient time;
3. Continue the O&M program for the life of the building and remove the ACM prior to demolition;
4. Encapsulate or enclose the ACM.

4.1 Operations and Maintenance

An O&M plan establishes procedures to maintain ACM in good condition during renovation, maintenance, and cleaning operations. The O&M plan provides procedures for informing occupants and trains workers in appropriate work practices. The O&M plan includes the OSHA and State required notification procedures and establishes a periodic reinspection program to ensure that the condition of the ACM has not deteriorated. An O&M program is required to be in effect as long as any type of ACM remains in the building even if it is enclosed or encapsulated.

As a part of the O&M program, an air-monitoring program is initially conducted to document that airborne fibers are within OSHA permissible exposure limits and to establish a baseline of data from which to compare periodically scheduled reassessments. Re-inspection is scheduled periodically to identify deterioration of the material and to document any increase in airborne fiber asbestos levels relative to baseline measurements. Baseline measurements are those taken shortly after the O&M plan is implemented.

Other than complete removal, the O&M plan is the only way to manage ACM in place to reduce fiber release during maintenance or cleaning activities. The O&M program requires a substantial ongoing commitment from the building owner and management staff to ensure its implementation and effectiveness. If all procedures in the O&M plan are not followed, ACM may be disturbed which would release fibers and endanger occupants throughout the building.

4.2 Removal and Disposal

Complete removal of the ACM eliminates the source of asbestos fibers and therefore, the need to continue an O&M program. The National Emission Standards for Hazardous Air Pollutants (NESHAPS) requires all significant quantities of friable ACM be removed prior to building renovation or demolition.

Removal may cause substantial disruption to the building if not properly executed. Containment of the work site and proper work practices, including careful post removal cleaning, is required. If these procedures are not followed, fibers may escape from the work area and elevated levels of airborne asbestos may persist after removal is complete.

4.3 Encapsulation

Encapsulation involves coating the ACM with a sealant or penetrating epoxy to bind the fibers and other material components or covering the ACM with a durable membrane material. The objective is to reduce the rate of deterioration and provide resistance to physical damage. Encapsulation requires containment of the work site and proper worker's protection. The potential for disruption of building activities is high. Encapsulation might be appropriate for undamaged granular cementitious material such as acoustical plaster or floor tile and linoleum.

Encapsulation may make the eventual removal of ACM more costly and difficult. The O&M plan is critically important for encapsulated ACM to ensure that fibers are not released.

4.4 Enclosure

Enclosure involves the construction of airtight structural walls and/or ceilings around the ACM to prevent fiber release into the rest of the building. Enclosure can also reduce accessibility of ACM to building occupants and thereby reduce the risk of future fiber release caused by damage of disturbance. If the enclosure requires drilling into or otherwise disturbing the ACM, work site containment and proper asbestos work practices are required. This suggests the possibility of building disruption, which highlights the importance of the O&M plan.

The choice of abatement method is determined mainly be the condition of the ACM and its potential for disturbance. Surface materials can be removed, encapsulated with a sealant, or enclosed within an airtight barrier. Worker protection and the construction of sealed containment barriers around the work site are required for all three methods. Encapsulation and Enclosure are considered temporary alternatives to removal and may be appropriate for certain limited circumstances.

Removal has the widest applicability. It also is the only truly permanent solution since no building containing asbestos can be demolished without first removing the ACM. If ACM has only minor isolated damage, removal of selected areas may be sufficient.

The initial cost of removal may be higher than for other abatement methods. However, removal may be less expensive over the long term since the continued presence of ACM requires continuance of an O&M program with periodic re-inspection, air monitoring and repairs.

5.0 RECOMMENDATIONS

The objectives of the recommendations made herein, are to protect the health and safety of the building occupants, promote compliance with government regulations, and limit the building owner's liability. A legal council and your insurance representatives should be consulted to review and identify the building owner's legal liabilities and responsibilities.

We recommend the following actions:

1. A copy of the limited asbestos renovation survey must be kept on site where the renovation/demolition is taking place until the renovation is completed.

2. All employees, vendors or contractors who may come in contact with any of the asbestos materials should be informed of the presence of these materials and instructed how to minimize contact with the asbestos containing materials as required by State and OSHA required "Right-to-Know" statutes.

3. Although no asbestos-containing materials were detected, a courtesy notification to the local regulatory agency is recommended. A copy of this form is included in **Appendix III** for your convenience.

6.0 OTHER SERVICES

Should any of the following services be required, complete references will be supplied upon request.

- Industrial Hygiene Consultation
- Project Cost Estimating
- Operations and Maintenance Plans
- Bid Qualification and Evaluations
- Operations and Maintenance Program Management
- Ambient Air Monitoring
- Project Compliance Monitoring
- Complete Clearance Testing
- Required Communications
- Development of Plans and Specifications
- Microbial Evaluations
- Water Intrusion Investigations

7.0 CLOSURE

The survey was a function of the building plan made available for our review and/ or our relatively non-destructive visual inspection. In general, non-destructive inspection and sampling procedures were incorporated which allow assessment of reasonably accessible building materials as the building is still being utilized. Any suspect asbestos containing materials in the inaccessible areas of the structures (inside partitions or other sealed areas), if identified at a later date should be assumed to contain asbestos until sampling and analysis prove otherwise. Should additional suspect building materials that were not identified in this report be discovered during the course of future renovation/demolition activities, immediately cease all work activity and secure the area until such time as these materials can be analyzed to determine asbestos content prior to their disturbance. In the event these materials are determined to contain regulated levels of asbestos, contact **Ardaman & Associates** for an appropriate response.

The procedures and methodologies employed in this study were "generally" and "partially" according to the requirements outlined under AHERA, 40 CFR, and Part 763. Although the requirements under this federal statute are not applicable for private buildings, this document is "generally" accepted as the prevailing standard of care with respect to asbestos surveys or inspections. The bulk samples were submitted to an NVLAP approved laboratory for analysis using EPA approved methods or industry accepted standards. No other warranty is expressed or implied.

This limited asbestos renovation survey report is the property of **Ardaman & Associates** and is provided to the Client as an Instrument reflecting the services provided. **Ardaman & Associates** disclaims all liability for the unauthorized use of this survey report by the client or third parties and any such unauthorized use will be at the user's own risk.

APPENDIX I

CERTIFICATES

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

ASBESTOS LICENSING UNIT
1940 NORTH MONROE STREET
TALLAHASSEE FL 32399-0783

(850) 487-1395

ARDAMAN & ASSOCIATES INC
ROXANNE LEWIS GAUSE
3925 COCONUT PALM DRIVE
SUITE 115
TAMPA FL 33619

Congratulations! With this license you become one of the nearly one million Floridians licensed by the Department of Business and Professional Regulation. Our professionals and businesses range from architects to yacht brokers, from boxers to barbeque restaurants, and they keep Florida's economy strong.

Every day we work to improve the way we do business in order to serve you better For information about our services, please log onto **www.myfloridalicense.com**. There you can find more information about our divisions and the regulations that impact you, subscribe to department newsletters and learn more about the Department's initiatives.

Our mission at the Department is: License Efficiently, Regulate Fairly. We constantly strive to serve you better so that you can serve your customers. Thank you for doing business in Florida, and congratulations on your new license!

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

ZA0000029 09/19/11 11010627!

ASBESTOS BUSINESS ORGANIZATION
ARDAMAN & ASSOCIATES INC
ROXANNE LEWIS GAUSE

IS LICENSED under the provisions of Ch.469 FS
Expiration date: NOV 30, 2013 L11091902701

DETACH HERE

THIS DOCUMENT HAS A COLORED BACKGROUND • MICROPRINTING • LINEMARK™ PATENTED PAPER

AC# 5758921

STATE OF FLORIDA

DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION
ASBESTOS LICENSING UNIT

SEQ# L11091902701

DATE	BATCH NUMBER	LICENSE NBR
09/19/2011	110106275	ZA0000029

The ASBESTOS BUSINESS ORGANIZATION
Named below IS LICENSED
Under the provisions of Chapter 469 FS.
Expiration date: NOV 30, 2013

ARDAMAN & ASSOCIATES INC
ROXANNE LEWIS GAUSE
8008 SOUTH ORANGE AVENUE
ORLANDO FL 32801

RICK SCOTT
GOVERNOR

KEN LAWSON
SECRETARY

DISPLAY AS REQUIRED BY LAW

AC# 5325745

STATE OF FLORIDA

DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION
ASBESTOS LICENSING UNIT

SEQ# L10110202840

DATE	BATCH NUMBER	LICENSE NBR
11/02/2010	100208275	AX0000046

The ASBESTOS CONSULTANT
Named below IS LICENSED
Under the provisions of Chapter 469 FS.
Expiration date: NOV 30, 2012

CAUSE, ROXANNE LEWIS
1921 GOODE AVENUE
ALVA FL 33920

CHARLIE CRIST
GOVERNOR

DISPLAY AS REQUIRED BY LAW

CHARLIE LIEM
SECRETARY

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200703-0

Arrowhead Technologies, L.L.C.

Clearwater, FL

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

BULK ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2012-01-01 through 2012-12-31

Effective dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

David F. Alderman

For the National Institute of Standards and Technology

Vern Roberts Environmental Training, Inc.

13987 94th Avenue N Seminole, FL 33776

727-593-3067

Asbestos Survey & Mechanical (inspector) Refresher Training

Tonya Erbland

Has completed the requisite training for asbestos accreditation under TSCA TITLE II

Date of Examination 06/19/12

Date of Course: 006/19/2012 Expiration Date 06/19/2013

Certificate # 619121

Course # FL49-0006326322 Provider # FL49-0003810

Vernon H. Roberts

Instructor

APPENDIX II

BULK SAMPLE RESULTS

ARROWHEAD TECHNOLOGIES, LLC
9232 Rhea Drive
Odessa, Florida 33556
813-926-2997

PLM REPORT SUMMARY

NVLAP Lab No. 200703-0

Client :	Ardaman & Associates, Inc.	Lab Set No. :	003164
Project :	Louisiana Pump Station	AT Job No. :	12-3164
Client Project No.:	12-54-9806	Report Date :	12/18/2012
Identification :	Asbestos, Bulk Sample Analysis	Sample Date :	12/14/2012
Test Method :	Polarized Light Microscopy / Dispersion Staining (PLM/DS) EPA Method 600/R-93/116		

On 12/14/2012, fifteen (15) bulk material samples were submitted by Tonya Erbland for asbestos analysis by PLM/DS.
Copies of Bulk Sample Analysis sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Sample Description / Location	Asbestos Content
003164-001	Caulking Material #1 East Door	None Detected-Caulking
003164-002	Caulking Material #2 Patch on Walls	None Detected-Caulking
003164-003	Caulking Material #3 All main Bldg	None Detected-Caulking
003164-004	Windows Caulk White Exterior	None Detected-Caulking
003164-005	Window Glaze Exterior	tr% Chrysotile-Window Glazing
003164-006	Silver Flashing North Roof	None Detected-Aluminum Coating None Detected-Bitumen Roof Mastic
003164-007	Coal Tar Roof North Roof	None Detected-Coal Tar Roof Material
003164-008	Coal Tar Roof	None Detected-Coal Tar Roof Material
003164-009	Coal Tar Roof South Roof	None Detected-Coal Tar Roof Material
003164-010	Flashing South	None Detected-Flahing Material
003164-011	Felt Paper Under Tiles	None Detected-Roofing Felt
003164-012	Caulking #4 Small Sheds	None Detected-Caulking

These samples were analyzed by layers. Specific layer or component asbestos content is indicated when relevant. The EPA considers a material to be asbestos containing only if it contains more than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) -- materials which are friable or may become friable -- be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. Arrowhead utilizes CVAE on a routine basis and does not include point counting unless specifically requested.

ARROWHEAD TECHNOLOGIES, LLC
9232 Rhea Drive
Odessa, Florida 33556
813-926-2997

PLM REPORT SUMMARY

NVLAP Lab No. 200703-0

Client :	Ardaman & Associates, Inc.	Lab Set No. :	003164
Project :	Louisiana Pump Station	AT Job No. :	12-3164
Client Project No.:	12-54-9806	Report Date :	12/18/2012
Identification :	Asbestos, Bulk Sample Analysis	Sample Date :	12/14/2012
Test Method :	Polarized Light Microscopy / Dispersion Staining (PLM/DS) EPA Method 600/R-93/116		

On 12/14/2012, fifteen (15) bulk material samples were submitted by Tonya Erbland for asbestos analysis by PLM/DS.
Copies of Bulk Sample Analysis sheets are attached; additional information may be found therein. The results are summarized below:

Lab Sample No.	Sample Description / Location	Asbestos Content
003164-013	Stucco Exterior	None Detected-Stucco w/ Paint
003164-014	Stucco	None Detected-Stucco w/ Paint
003164-015	Stucco	None Detected-Stucco w/ Paint

These samples were analyzed by layers. Specific layer or component asbestos content is indicated when relevant. The EPA considers a material to be asbestos containing only if it contains more than one percent asbestos by Calibrated Visual Area Estimation (CVAE). EPA regulations also indicate that Regulated Asbestos Containing Materials (RACM) -- materials which are friable or may become friable -- be further analyzed by point counting when the results indicate less than ten percent asbestos by CVAE. Arrowhead utilizes CVAE on a routine basis and does not include point counting unless specifically requested.

ARROWHEAD TECHNOLOGIES, LLC
9232 Rhea Drive
Odessa, Florida 33556
813-926-2997

PLM REPORT SUMMARY

NVLAP Lab No. 200703-0

Client :	Ardaman & Associates, Inc.	Lab Set No. :	003164
Project :	Louisiana Pump Station	AT Job No. :	12-3164
Client Project No.:	12-54-9806	Report Date :	12/18/2012
Identification :	Asbestos, Bulk Sample Analysis	Sample Date :	12/14/2012
Test Method :	Polarized Light Microscopy / Dispersion Staining (PLM/DS) EPA Method 600/R-93/116		

SCOPE OF THIS REPORT

These samples were obtained as a part of a building survey; this report is only intended to be used as a part of the survey report issued by the surveyor. This report explains the laboratory analysis and results. The surveyor's report explains the sampling protocol used, when the samples were obtained, the location(s) of the samples, where the materials were observed in the building, quantities of materials observed, condition of the materials and the extent of his/her survey. Sample locations and material descriptions are given by the surveyor on the chain of custody but included here (possibly abbreviated) only as a convenience for the reader.

STATEMENT OF LABORATORY ACCREDITATION

The samples were analyzed in general accordance with the procedures outlined in the Method for the Determination of Asbestos in Bulk Building Materials, EPA/600/R-93/116 or the U.S. Environmental Protection Agency method, under AHERA, for the analysis of asbestos in building materials by polarized light microscopy. The results of each bulk sample relate only to the material tested and the results shall not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Floor tile and other resinously bound materials, when analyzed by the EPA method, may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. When a definitive result is required, Arrowhead recommends utilizing alternative methods of identification, including Transmission Electron Microscopy.

Specific questions concerning bulk sample results shall be directed to the Laboratory Director.

Analyst : Monte Hall, P.G.

Laboratory Director : Monte Hall, P.G.
Florida Registration No. 1658

Approved Signatory : Monte Hall

Please Note our New Address:

Monte Hall, P.G.
Arrowhead Technologies, LLC
3151 San Bernadino St.
CLEARWATER FL 33759-3512

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

Lab 3164

Date: 12-13-12
Inspector: Lee / bb
Project Name: louisana pump Statio.
Project No.: 12-54-9806

HA #	Sample #	Material Description	Material Location	Sample Location	Approx Quantity	% Asbestos
1	1	Caulking Material #1	East Door			
2	2	Caulking Material #2	Patch on Walls			
3	3	Caulking Material #3	All main Bldg			
4	4	Windows Caulk white	Exterior			
5	5	Window glaze	Exterior			
6	6	Silver flashing	North Roof			
7	7	Coal Tar Roof	North Roof			
	8	↓				
	9	↓	South Roof			
8	10	flashing	South			
9	11	felt Paper	under tiles			
10	12	Caulking #4	small sheds			
11	13	Stucco	Exterior			
	14	↓				
	15	↓				

ASBESTOS Lab 3164

Client: ARDAMAN & ASSOCIATES, INC	ATTN: TONYA - ERBLAND
Address: 3925 COCONUT PALM DRIVE	Phone: 813-620-3389
SUITE 115 TAMPA, FL 33619	Fax: 813-628-4008
EMail:	
PO #: tee-	

PROJECT	PROJECT #	PLM Bulk	PLM Point Count	PLM Gravimetric	PCM Air	TEM Bulk	TEM Air
Louisana Pump Station	12-54-9806	15					

TURN-AROUND TIME

- ◯ 5 DAYS
- 3 DAYS
- _ 48 HOURS
- _ 24 HOURS
- _ 4 HOURS

REMARKS:

Relinquished By: [signature]	Date / Time: 12-13-12 2:15	Received By: [signature]	Date / Time: 12-14-12
Relinquished By:	Date / Time: 12	Received By:	Date / Time:

APPENDIX III

ASBESTOS REMOVAL FORM AND FEE SCHEDULE

Florida Department of
Environmental Protection
Division of Air Resources Management

DEP Form 62-257.900(1)
Effective 2-9-99
Page 1 of 2

NOTICE OF ASBESTOS RENOVATION OR DEMOLITION

TYPE OF NOTICE (CHECK ONE ONLY): ☐ ORIGINAL ☐ REVISED ☐ CANCELLATION ☐ COURTESY

TYPE OF PROJECT (CHECK ONE ONLY): ☐ DEMOLITION ☐ RENOVATION
IF DEMOLITION, IS IT AN ORDERED DEMOLITION? ☐ YES ☐ NO
IF RENOVATION:
IS IT AN EMERGENCY RENOVATION OPERATION? ☐ YES ☐ NO
IS IT A PLANNED RENOVATION OPERATION? ☐ YES ☐ NO

I Facility Name _____
Address _____
City _____ State _____ Zip _____ County _____
Site _____ Consultant Inspecting Site _____
Building Size _____ (Square Feet) # of Floors _____ Age in Years _____
Prior Use: ☐ School/College/University ☐ Residence ☐ Small Business ☐ Other _____
Present Use: ☐ School/College/University ☐ Residence ☐ Small Business ☐ Other _____

II. Facility Owner _____ Phone (_____) _____
Address _____
City _____ State _____ Zip _____

III Contractor's Name _____ Phone (_____) _____
Address _____
City _____ State _____ Zip _____
Florida License No. _____ Is the contractor exempt from licensure under section 469.004(7), F.S.? ☐ YES ☐ NO

IV Scheduled Dates: (Notice must be postmarked 10 working days before the project start date)
Asbestos Removal (mm/dd/yy) Start: _____ Finish: _____
Demo/Renovation (mm/dd/yy) Start. _____ Finish: _____

V. Procedures to be Used (Check All That Apply):

☐	Strip and Removal	☐	Glove Bag	☐	Bulldozer	☐	Wrecking Ball
☐	Wet Method	☐	*Dry Method	☐	Explode	☐	Burn Down
OTHER:							

*MUST OBTAIN PRIOR DEP APPROVAL BEFORE USING A DRY METHOD

VI Procedures for Unexpected RACM: _____

VII. Asbestos Waste Transporter: Name _____ Phone (_____) _____
Address _____
City _____ State _____ Zip _____

VIII Waste Disposal Site: Name _____ Class _____
Address _____
City _____ State _____ Zip _____

IX Amount of RACM or ACM
_____ square feet surfacing material
_____ linear feet pipe
_____ cubic feet of RACM off facility components
_____ square feet cementitious material
_____ square feet resilient flooring
_____ square feet asphalt roofing

X Fee Invoice Will Be Sent to Address in Block Below (Print or Type)

I certify that the above information is correct and that an individual trained in the provisions of this regulation (40 CFR Part 61, Subpart M) will be on-site during the demolition or renovation and evidence that the required training has been accomplished by this person will be available for inspection during normal business hours.

_____ _____
(Signature of Owner/Operator) (Date)

DEP USE ONLY Postmark/Date Received ID#

Instructions

The state asbestos removal program requirements of s. 376.60, F.S., and the renovation or demolition notice requirements of the National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 61, Subpart M, as embodied in Rule 62-257, F.A.C., are included on this form.

Check to indicate whether this notice is an original, a revision, a cancellation, or a courtesy notice (i.e., not required by law). If the notice is a revision, please indicate which entries have been changed or added.

Check to indicate whether the project is a demolition or a renovation.

If you checked demolition, was it **ordered** by the State or a local government agency? If so, in addition to the information required on the form, the owner/operator must provide the name of the agency ordering the demolition, the title of the person acting on behalf of the agency, the authority for the agency to order the demolition, the date of the order, and the date ordered to begin. A copy of the order must also be attached to the notification.

If you checked renovation, is it an **emergency renovation operation**? If so, in addition to the information required on the form, the owner/operator must provide the date and hour the emergency occurred, the description of the sudden, unexpected event, and an explanation of how the event caused unsafe conditions or would cause equipment damage or an unreasonable financial burden. If you checked renovation and it is a **planned renovation operation**, please note that the notice is effective for a period not to exceed a calendar year of January 1 through December 31.

I. Complete the facility information. This section describes the facility where the renovation or demolition is scheduled. This address will be used by the Department inspector to locate the project site. Provide the name of the consultant or firm that conducted the asbestos site survey/inspection. For "prior use" check the appropriate box to indicate whether the prior use of the facility is that of a school, college, or university; residence, as "residential dwelling" is defined in Rule 62-257.200, F.A.C.; small business, as defined in s. 288.703(1), F.S.; or other. If "other" is checked, identify the use. Please follow the same instructions for "present use."

II. Complete the facility owner information.

III. Complete the contractor information; however, a Florida license number or disclosure of that number is not required to comply with the notice requirements.

IV. List separately the scheduled start and finish dates (month/day/year) for both the asbestos removal portion of the project and the renovation or demolition portion of the project.

V. Check the methods and procedures to be used. (Note: The NESHAP for asbestos, which is adopted and incorporated by reference in Rule 62-204.800, F.A.C., requires obtaining Department approval prior to using a dry removal method.)

VI. Describe the procedures to be used in the event unexpected RACM is found or previously nonfriable asbestos material becomes crumbled, pulverized, or reduced to powder after start of the project.

VII. Complete the asbestos waste transporter information.

VIII. Complete the waste disposal site information.

IX. List the amount of RACM or ACM of each type of asbestos to be removed. (Note: A volume measurement of RACM off facility components is **only** permissible if the length or area could not be measured previously.)

X. Provide the address where the Department is to send the invoice for any fee due. Do not send a fee with the notification. The fee will be calculated by the Department pursuant to Rule 62-257.400, F.A.C.

Sign the form and mail the original to the district or local air program having jurisdiction in the county where the project is scheduled **(DO NOT FAX)**. The correct address can be obtained by contacting the State Asbestos Coordinator at: Department of Environmental Protection, Division of Air Resources Management, 2600 Blair Stone Road, Tallahassee, FL 32399-2400.

CHAPTER 62-257 ASBESTOS PROGRAM, EFFECTIVE 2/02/99

62-257.100 Purpose and Scope.

(1) This chapter implements Section 376.60, F.S., by establishing a fee schedule for asbestos removal projects.

(2) The purpose of the Department's asbestos removal program is to prevent the release of significant amounts of asbestos fibers to the outside air during demolition or renovation activities. Asbestos fibers in the outside air present a risk to human health.

(3) The purpose of the fee is to fund the implementation of the Department's asbestos removal program as prescribed in this chapter and in 40 CFR Part 61, Subpart M – National Emission Standards for Hazardous Air Pollutants (NESHAP) for Asbestos, adopted and incorporated by reference in Rule 62-204.800, F.A.C.

(4) This chapter requires prior notification to the Department in accordance with 40 CFR Part 61, Subpart M.

Specific Authority 376.60, 403.061 FS. Law Implemented 376.60, 403.061 FS. History New 3-31-94, Formerly 17-257.100, Amended 11-23-94, 3-24-96, 2-9-99.

62-257.200 Definitions.

(1) "Asbestos" means the asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite and includes trade acronyms products such as amosite.

(2) "Asbestos-containing materials", ACM, means any materials which contain more than one percent asbestos as determined by Polarized Light Microscopy.

(3) "Asbestos removal project" means a renovation or demolition operation in a facility that involves the removal of a threshold amount of regulated asbestos-containing material.

(4) "Category I Nonfriable Asbestos-Containing Material (ACM)" means asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy.

(5) "Category II Nonfriable ACM" means any material, excluding Category I Nonfriable ACM, containing more than 1 percent asbestos as determined using the methods specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

(6) "Department" means the Florida Department of Environmental Protection.

(7) "Demolition" means the wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

(8) "Emergency renovation operation" means a renovation operation that was not planned but results from a sudden, unexpected event that, if not immediately attended to, presents a safety or public health hazard, is necessary to protect equipment from damage, or is necessary to avoid imposing an unreasonable financial burden. This term includes operations necessitated by nonroutine failures of equipment.

(9) "Facility" is as defined in 40 CFR 61.141, adopted and incorporated by reference in Rule 62-204.800, F.A.C.

(10) "Friable Asbestos Material" means any material containing more than 1 percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763 Section 1, Polarized Light Microscopy that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by Polarized Light Microscopy (PLM), verify the asbestos content by point counting using PLM.

(11) "Local Air Program," for purposes of Chapter 62-257, F.A.C., only, means a county air pollution control program which meets the criteria of s. 403.182(1), F.S.

(12) "Nonscheduled renovation operation" means a renovation operation necessitated by the routine failure of equipment, which is expected to occur within a given period based on past operating experience, but for which an exact date cannot be predicted.

(13) "Ordered demolition" means a demolition under an order of a State or local government agency, issued because the facility is structurally unsound and in danger of imminent collapse.

(14) "Owner or operator" means any person or entity who owns, leases, operates, controls, or supervises either the renovation or demolition operation or the site of the renovation or demolition operation.

(15) "Planned renovation operation" means a renovation operation, or a number of such operations, in which regulated asbestos-containing material will be removed or stripped within a given period of time and that can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.

(16) "Renovation" means the alteration in any way of a facility or of one or more facility components. Operations in which load-supporting structural members are wrecked or taken out are demolitions.

(17) "Regulated Asbestos-Containing Material (RACM)" means:

(a) Friable asbestos material;

(b) Category I nonfriable ACM that has become friable;

(c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; or

(d) Category II nonfriable ACM that has become crumbled, pulverized, or reduced to powder or has a high probability of becoming crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated by 40 CFR Part 61, Subpart M, as adopted in this chapter.

(18) "Residential dwelling" means any structure or building intended to house a single family, or a residential building having no more than four dwelling units. This term is not intended to include any institutional, commercial, public, or industrial structure, installation or building, any structure or building being demolished as part of a public project, regardless of its previous use, function or ownership, or any building, structure or installation being used partly for residential purposes and partly for commercial, public or industrial use.

(19) "State Asbestos Coordinator" means the person designated by the Director of the Department's Division of Air Resources Management to serve as the statewide coordinator for the asbestos program.

(20) "Threshold amount of regulated asbestos-containing material" means at least 260 linear feet on pipes, or at least 160 square feet on other facility components, or at least 35 cubic feet off facility components where the length or area could not be measured previously.

(21) "Working day" means Monday through Friday and includes holidays that fall on any of the days Monday through Friday.

Specific Authority 376.60, 403.061 FS. Law Implemented 376.60, 403.061 FS. History–New 3-31-94, Formerly 17-257.200, Amended 11-23-94, 2-9-99.

62-257.301 Notification Procedure and Fee.

(1) The notice requirements of Chapter 62-257, F.A.C., Asbestos Program, apply to each owner or operator of a renovation of a facility involving the removal of a threshold amount of regulated ACM or any demolition of a facility regardless of whether or not asbestos is present and to each owner or operator of the site for a renovation of a facility involving the removal of a threshold amount of regulated ACM or any demolition of a facility regardless of whether or not asbestos is present.

(2) If a notice is required per Rule 62-257.301(1), F.A.C., the timely submittal of a completed "Notice of Asbestos Renovation or Demolition" form, as promulgated under Rule 62-257.900(1), F.A.C., or an electronically generated facsimile thereof, is required.

(a) The notice will be complete when the owner or operator legibly provides all the information requested on the Department's form, and, if applicable, the additional information required by 40 CFR 61.145(b), adopted and incorporated by reference in Rule 62-204.800, F.A.C., for ordered demolitions or emergency renovation operations.

(b) The notice will be timely when the owner or operator mails it or delivers it to the Local Air Program or, where there is no Local Air Program, to the Department's District Office having jurisdiction over the site of the renovation or demolition operation, so that it is postmarked or received:

1. At least 10 working days prior to the start of the renovation or demolition operation; or

2. No later than the following working day after an emergency renovation operation or ordered demolition; or

3. At least 10 working days prior to the end of the calendar year preceding the year for which a planned renovation operation notice is being given.

(3) The owner or operator who submits a single planned renovation operation notification involving small individual nonscheduled operations shall indicate on the notice form the total amount of regulated asbestos-containing material predicted to be removed during the calendar year based on operating experience.

(4) If after the start of the project it is determined that at least 20 percent more regulated asbestos-containing material than originally reported to the Department is to be removed, the owner or operator shall submit a revised notification according to Rule 62-257.301, F.A.C.

(5) This notification form, when complete and timely submitted, will satisfy the notification requirements of the EPA's National Emission Standards for Asbestos, 40 CFR 61.145(b).

(6) Except in the following situations, the owner or operator of an asbestos removal project shall pay a fee calculated pursuant to Rule 62-257.400, F.A.C., Fee Schedule.

(a) The Department's fee requirements are not applicable when the asbestos removal project is in a school, college, university, or a residential dwelling, as residential dwelling is defined in Rule 62-257.200, F.A.C.