The Enclosed Document Is Provided For Your Convenience.

Please Email ALL Questions:

MailTo:ContractAdministration@TampaGov.net

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 18-C-00017

Howard F. Curren AWTP Screen and Grit Washers Replacements

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

DECEMBER 2018

Revised 2016-08-29

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

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BID NOTICE MEMO

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

CONTRACT NO.: 18-C-00017; Howard F. Curren AWTP Screen and Grit Washers Replacements
BID OPENING: 1:30PM, Tuesday, January 29, 2019 ESTIMATE: $4,900,000 SCOPE: The project comprises furnishing all labor, materials and equipment to remove and replace existing grit washers at the Screen and Grit Building No. 1 (West Building) and Building No. 2 (East Building), associated piping and appurtenances including installing discharge chute and hopper cover; pipe supports, flow meters; all associated electrical conduits, junction boxes, wiring, panels, stations, MCC modifications, with all associated work required for a complete project in accordance with the Contract Documents. PRE-BID CONFERENCE: 10:30AM, Tuesday, January 8, 2019. At AWTP Maintenance Building Training Room, 2700 Maritime Blvd., Tampa, FL 33619
Firms must email names and companies represented for all attendees a minimum of 24 hours in advance to Richard.Birchmire@tampagov.net and John.Julian@tampagov.net to obtain security clearance. Please include in the email the Contract Number and Name along with the Pre-bid conference date. Attendance is not mandatory, but recommended.

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Bids will be opened in the 4th Floor Conference Room, Tampa Municipal Office Building, 306 E. Jackson Street, Tampa, Florida 33602. Pre-Bid Conference is held at the same location unless otherwise indicated. Plans and Specifications and Addenda for this work may be examined at, and downloaded from, www.demandstar.com. Backup files are available at http://www.tampagov.net/contract-administration/programs/construction-project-bidding. Email Questions to: contractadministration@tampagov.net .

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NOTICE TO BIDDERS
CITY OF TAMPA, FLORIDA
18-C-00017 Howard F. Curren AWTP Screen and Grit Washers Replacements

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., January 29, 2019, 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, furnishing all labor, materials and equipment to remove and replace existing grit washers at the Screen and Grit Building No. 1 (West Building) and Building No. 2 (East Building), associated piping and appurtenances. Work also includes installing discharge chute and hopper cover; pipe supports, flow meters; all associated electrical conduits, junction boxes, wiring, panels, stations, MCC modifications 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 «PROJECTLOWER» 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. 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

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 480 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.

[X] 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):
_____% 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*
__26__% 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

Procurement Guidelines To Implement Minority & Small Business Participation

Underutilized WMBE Primes by Industry Category

FORMAL PROCUREMENT

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

Underutilized WMBE Sub-Contractors / Sub-Consultants

SUB WORK

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

Policy

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

Index

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

Industry Categories

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

MBD Form-70

Howard F. Curren AWTP Screen and Grit Building-Grit Washer Replacements
Project #18-C-00017
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
1	DRD Enterprises LLC	813-476-9933	866-850-1332	ddeenah@drdenterprise.com	4104 Yellowwood Dr.,	Valrico	FL	33594	Pipe Supply	204675317	MBE	African American
1	MANZI METALS INC	352-799-8211	352-754-9735	bmanzi@manzimetals.com	15293 FLIGHT PATH DR	BROOKSVILLE	FL	34604	Pipe Supply	593245008	MBE	African American
1	Suca Pipe Supply, Inc.	813-249-7902	813-249-7384	slmau44@yahoo.com	4910 Lowell Rd	Tampa	FL	33624	Pipe Supply	592499571	MBE	African American
1	Suca Pipe Supply, Inc. Or	813-249-7902	813-249-7384	sucapipesupply1@yahoo.com	4910 Lowell Road	Tampa	FL	33624	Pipe Supply	263669556	MBE	African American
1	Terrell Industries, Inc.	727-823-4424	727-823-3977	gradyterrell@terrellindustries.com	2067 1ST AVENUE NORTH	ST PETERSBURG	FL	33713	Pipe Supply	650530148	MBE	African American
2	All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATERS AVENUE	TAMPA	FL	33604	ELECTRICAL	043689273	MBE	African American
2	Brown & Brown Electric,	954-938-8986	954-938-9272	Hermine.Brown@brownandbrownelectric.com	1150 SW 30th Avenue	Pompano Beach	FL	33069	ELECTRICAL	592283934	MBE	African American
2	Fennell Electric, Inc.	407-466-9408	866-514-3716	fennellelectric@yahoo.com	604 Glenfield Ct	Apopka	FL	32712	ELECTRICAL	810557754	MBE	African American
2	MDH Enterprises, Inc.	386-789-2672	866-681-5026	matize@my-es.com	281 East C Street	Orange City	FL	32763	ELECTRICAL	550849332	MBE	African American
3	Fletcher Painting, Inc.	407-290-1188	407-290-9309	fletcherjunior@cs.com	4355 Fairmont Street Suite 8	Orlando	FL	32808	Painting	593587717	MBE	African American
3	Obi Global, LLC	813-400-8562		obigloballlc@gmail.com	11507 Dr. MLK Blvd	Mango	FL	33550	Painting	471881723	MBE	African American
4	All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATERS AVENUE	TAMPA	FL	33604	Instrument & Controls	043689273	MBE	African American
4	Information Systems Co	317-525-8380	317-481-8212	brownt@isciconsult.com	4184 Parliament Way	Indianapolis	IN	46124	Instrument & Controls	113657958	MBE	African American

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

Howard F. Curren AWTP Screen and Grit Building-Grit Washer Replacements
Project #18-C-00017
SLBE Availability Contact List

#'s	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
1	2 Meyer Corp.	813-210-4864	813-645-5634	Renatonjr@aol.com	6308 Lake Sunrise Dr.	Apollo Beach	FL	33572	Pipe Supply	562384669	SLBE	Caucasian
1	DRD Enterprises LLC	813-476-9933	866-850-1332	ddeenah@drdenterprise.com	4104 Yellowwood Dr.,	Valrico	FL	33594	Pipe Supply	204675317	SLBE	African American
1	Mar Supply Co.	941-286-3240	941-761-6500	info@marsupplyco.com	1660 63rd Avenue East	Bradenton	FL	34203	Pipe Supply	270206845	SLBE	Hispanic American
1	MBE Supply of Florida, Inc.	813-781-6583		mbesupplyofflorida@gmail.com	4306 W. Osborne Avenue	Tampa	FL	33613	Pipe Supply	463284565	SLBE	Caucasian
1	Suca Pipe Supply, Inc.	813-249-7902	813-249-7384	slmau44@yahoo.com	4910 Lowell Rd	Tampa	FL	33624	Pipe Supply	592499571	SLBE	African American
1	Suca Pipe Supply, Inc. One	813-249-7902	813-249-7384	sucapipesupply1@yahoo.com	4910 Lowell Road	Tampa	FL	33624	Pipe Supply	263669556	SLBE	African American
2	Above Electric LLC	727-726-5484	801-894-3084	aboveelec@gmail.com	13529 Prestige Pl #105	Tampa	FL	33635	Electrical	453611228	SLBE	Hispanic American
2	Aguila Electrical Services, Inc.	813-515-6999	813-884-4092	sales@aguilaelectrical.com	5708 N 56TH ST	Tampa	FL	33610	Electrical	200818128	SLBE	Hispanic American
2	All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATERS AVENUE	TAMPA	FL	33604	Electrical	043689273	SLBE	African American
2	Crevello Electric, Inc.	813-986-6106	813-986-9633	crevelloelectric@gmail.com	3305 N. Stanley Rd.	Plant City	FL	33565	Electrical	593559003	SLBE	Caucasian
2	Dolphin Constructors LLC	813-925-9609	813-510-4946	matt@dolphinllc.com	13966 W Hillsborough Ave.	Tampa	FL	33635	Electrical	912193468	SLBE	Caucasian
2	Electric World Corp	813-785-5265	866-593-5921	Electricworldcorp@gmail.com	5708 N 56th St	tampa	FL	33610	Electrical	331112415	SLBE	Hispanic American
2	ELECTRICAL HANDYMAN SERVICES INC	813-901-8185	813-884-5060	ehs915@aol.com	7046-B West Hillsborough Ave	Tampa	FL	33634	Electrical	272406369	SLBE	Hispanic American
2	Manatee Electric, Inc.	813-645-7000	813-654-7568	john@reliableelectricusa.com	845 Thompson Rd.	Lithia	FL	33547	Electrical	593454485	SLBE	Caucasian
2	Reliability Consulting Services, Inc.	813-298-2617	813-645-2272	bwoolbright@reliabilityconsulting.net	748 Kingston Ct.	Apollo Beach	FL	33572	Electrical	201126584	SLBE	Caucasian
2	ROB MICHAEL INC	813-323-0304	813-968-1036	RJMICHAEL74@AOL.COM	16204 SAGEBRUSH RD	TAMPA	FL	33618	Electrical	264389755	SLBE	Caucasian
2	TAMCO Electric, Inc.	813-986-3472	813-986-5979	atrujill@tampabay.rr.com	4022 W South Avenue	Tampa	FL	33614	Electrical	591396630	SLBE	Hispanic American
3	C&C Painting Contractors Inc.	813-886-7100	813-886-7102	carlos@ccpainting.com	8372 Standish Bend Dr.	Tampa	FL	33615	Painting	593617521	SLBE	Hispanic American
3	COLORS PAINTING CONTRACTORS LLC	813-855-7424		JimmyG@colorspaintingcontractors.com	12036 ABBYWOOD LANE	TAMPA	FL	33626	Painting	462331210	SLBE	Hispanic American
3	Diversified Coatings & Finishes, Inc.	813-494-5543	352-567-1718	bobcookdcf@gmail.com	12540 Green Oak Lane	Dade City	FL	33525	Painting	593460053	SLBE	Caucasian
3	Elite Industrial Painting, Inc.	727-940-6001	727-279-2827	Tula@eipainting.com	621 Hibiscus St #3	Tarpon Springs	FL	34689	Painting	900658000	SLBE	Caucasian
3	Federico's Painting Corp	813-908-1404	813-908-1404	federico_de_la_pava@hotmail.com	6615 Winding Oak Dr.	Tampa	FL	33625	Painting	203279278	SLBE	Hispanic American

Howard F. Curren AWTP Screen and Grit Building-Grit Washer Replacements
Project #18-C-00017
SLBE Availability Contact List

#'s	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
3	Harry's Painting Enterprises, Inc.	727-848-1950	727-847-3474	kathryn@harryspainting.com	5250 Avery Road	New Port Richey	FL	34652	Painting	592820441	SLBE	Caucasian
3	Obi Global, LLC	813-400-8562		obigloballlc@gmail.com	11507 Dr. MLK Blvd	Mango	FL	33550	Painting	471881723	SLBE	African American
3	P&H STUCCO & CONSTRUCTION INC	727-934-9049	727-934-9049	olgaangel7@msn.com	1705 Sunset Drive	TARPON SPRINGS	FL	34689	Painting	593220391	SLBE	Caucasian
3	Shepard Contractors Inc	813-855-1115	813-513-3281	shepardcontractors@hotmail.com	Piney Lane Dr	Tampa	FL	33625	Painting	593708146	SLBE	Caucasian
3	Island Painting & Waterproofing Inc.	813-500-3869	813-500-4001	info@islandpaintingtb.com	5608 N Church Avenue	Tampa	FL	33614	Painting	204840500	SLBE	Hispanic American
4	All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATERS AVENUE	TAMPA	FL	33604	ELECTRICAL	043689273	SLBE	African American

Instructions Regarding Use of the WMBE/SLBE Availability Contact List

Bidders must solicit a subcontracting bid from ALL of the firms listed on the WMBE/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 WMBE/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 WMBE/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 for the furnishing all labor, materials and equipment to remove and replace existing grit washers at the Screen and Grit Building No. 1 (West Building) and Building No. 2 (East Building), associated piping and appurtenances. Work also includes installing discharge chute and hopper cover; pipe supports, flow meters; all associated electrical conduits, junction boxes, wiring, panels, stations, MCC modifications, any allowances that may be listed in SP 60, and with all associated work required for a complete project in accordance with the Contract Documents. _____ _____ dollars and _____ cents (BASE BID) LS	$_____

Computed Total Price in Words: _____

_____ dollars and _____ cents.

Computed Total Price in Figures: $_____

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
18-C-00017 Howard F. Curren AWTP Screen and Grit Washers Replacements

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 18-C-00017 Howard F. Curren AWTP Screen and Grit Washers Replacements.

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 18-C-00017 in accordance with your Proposal dated _____, amounting to a total of $_____ as completed in accordance with subsections I-2.09 and I-2.10 of the Instruction to Bidders.

THIS AGREEMENT, made and entered into in triplicate, this ____ day of _____, 20___, between the City of Tampa, Florida, hereinafter called the City, and _____ hereinafter called the Contractor.

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

Contract 18-C-00017; Howard F. Curren AWTP Screen and Grit Washers Replacements, shall include, but not be limited to, furnishing all labor, materials and equipment to remove and replace existing grit washers at the Screen and Grit Building No. 1 (West Building) and Building No. 2 (East Building), associated piping and appurtenances including installing discharge chute and hopper cover; pipe supports, flow meters; all associated electrical conduits, junction boxes, wiring, panels, stations, MCC modifications; all associated programming to main and local panels 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, <u>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.</u>

(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

«CONTRACTORUPPER»
Contractor

By:_____
«CONTACT»
(SEAL)

Title: «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.

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SPECIFIC PROVISIONS

SP-1. Scope

The work shall be completed at the Howard F. Curren Advanced Wastewater Treatment Plant (AWTP). The work included under these Contract Documents comprises the replacement of grit washing / dewatering mechanisms, in their entirety, and other components as listed in the Specifications; and replacement of all electrical conduit and devices in and around the grit washing mechanisms as indicated on the Drawings.

The existing grit washers located within the two separate buildings, Grit and Screen Building 1 and Grit and Screen Building 2, are to be replaced, one building at a time. The equipment in Building 2 shall have the equipment replaced and successfully placed in service, in its entirety, before work on replacing equipment in Building 1 can begin. A minimum of 14 consecutive days of un-interrupted service for the replacement system in Building 2 shall occur before work within Building 1 can start unless otherwise authorized by the City. The work in Building 2 also includes additions of non-potable water piping to match that which exists in Building 1. Contractor shall phase all work to sequence construction around this two-phase approach.

The work consists of furnishing, constructing, installing, testing, general cleanup, and maintaining the said replacement equipment and components complete and in place for a complete and functional system that allows the City to meet all permit and operational conditions.

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

SP-2.TP Permits

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

City permit fees will be paid by the City.

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

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

The Contractor is encouraged to contact the City's Construction Services Division prior to commencement of work to ascertain their respective requirements.

SP-5 Working Drawings

Prior to performing any work requiring working drawings, as specified on the Plans and in the

Workmanship and Materials Sections, the Contractor shall submit the working drawings in accordance with the General Provisions section headed "Working Drawings."

SP-8 Construction Start

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

SP-9 Coordination and Cooperation

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

SP-12 Releasing Facilities for Use

It is the intent of these Specifications that at least one of the grit washer be left in service at all times. Replacement work shall be on only one system at a time with work on the second system beginning only after successful startup and acceptance of the first system by the City. Acceptance or use by the City of any portion of the facilities prior to final acceptance shall not relieve the Contractor of any responsibilities, regarding such facilities, included in the Contract.

SP-13 Material and Equipment Approval

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

SP-14 Contractor Emergency Response Time

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

SP-15 Contractor's Field Office

Delete Article G-6.03 Contractor's Field Office 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 equipment, pipe, materials, and appurtenances removed by the Contractor and which are not designated to be salvaged shall become the property of the Contractor and shall be removed from the site of the work to the Contractor's own place of disposal.

Items which the City designates as items to be retained by the City shall be removed by the Contractor, delivered, and unloaded at a location within the Department’s service area, as directed by the City. In general, the City does not expect to salvage and retain any items that are to be removed but does retain the right of first refusal before disposing of any materials. The cost of removing, disposing, delivering, and unloading as salvage items of pipe and appurtenances shall be included in the Contract

Lump Sum Price, and no separate payment will be made therefor.

SP-17 Sequence of Operations

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

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

Starting with equipment in Building 2, work to replace the three (3) existing grit washing / dewatering units with two (2) new units shall be sequential as at least one grit washing process must remain in service at all times. The Contractor's proposed sequence of operations must include a plan for the sequence of construction. Construction activities cannot threaten the City's ability to meet permit conditions. The overall concept for the sequence of construction is to keep one grit washer in operation at all times within the building being worked on while maintaining full operations within the other building as construction activities are completed on the out-of-service grit washers and appurtenances in the building being worked on. A recommended sequence of construction is as follows.

1. Isolate the center and one of the other grit washers from service after isolating from the system with existing valves (City to select which system is to be worked on first).
2. Perform preliminary investigations as detailed on the electrical drawings to document all existing wiring that is to be pulled back for replacement of conduit. Disconnect and pull back all wires as needed.
3. Remove the two complete grit washing mechanisms, the belt conveyor, piping and one knife gate as shown on the drawings.
4. Remove the electrical conduits, control stations, and supports, and fixtures to be replaced.
5. Install one new grit washing mechanism, piping to the grit washer, and effluent flush water piping to the.
6. Install all new effluent piping and valves for the associated grit pumps for the grit washers that are out of service.
7. Replace electrical conduits, control station, and supports.
8. Test the newly installed grit washing / dewatering unit.
9. Place the grit washer into service and operate successfully without interruption or incidence for 7 consecutive days to obtain City's acceptance and transfer of operation.
10. Once accepted by the City, repeat the above for the remaining grit washing / dewatering system.
11. Once both grit washing / dewatering systems in Building 2 have demonstrated successful operation for a minimum of 3 consecutive weeks, work may start on the units in Building 1 with the approval of the City.
12. Repeat steps 1 through 10 for the equipment in Building 1 (note that step 6 is not required for Building 1 as the piping already exists).

SP-23 Project Cleanup

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

SP-26 Surface Restoration

Where construction activities are conducted in existing grassed areas, the grassed areas shall be restored to original conditions by sodding or grassing.

The Contractor shall replace or repair all ground surfaces damaged during construction. Any paving, utilities, landscaping, and irrigation systems disturbed or damaged 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, as applicable, and no separate payment will be made therefor.

SP-60 Contingency

The Contractor shall include a One Hundred Thousand Dollar ($100,000) 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 One Hundred Thousand Dollar ($100,000) contingency sum is an upset limit. Any amount of the contingency shall be paid only after negotiation.

SP-68 Water, Light and Power

Delete Article G-7.01 Water and G-7.02 Light and Power from GENERAL PROVISIONS. The City currently provides water and electrical power facilities to the sites. The Contractor may use the electrical and water sources as presently configured. If necessary to modify, extend, or relocate either the electrical or water facilities to facilitate construction, all costs shall be the responsibility of the Contractor.

SP-70 Electrical Equipment Certification

All equipment and materials shall be UL listed or listed and labeled as complying with the requirements of a Southern Building Code Congress International, Inc. (SBCCI) recognized testing laboratory, for the particular application, whenever available.

An electrical/mechanical system that is not available as a standard UL listed assembly (e.g. industrial equipment of unique configuration or custom design) shall be composed of listed components, whenever they are available, and constructed in accordance with the design documents, and the latest nationally recognized industry standards. The Contractor shall certify in writing that the equipment satisfies the above requirements and that it has been installed in compliance with the latest edition of the National Electrical Code (NEC) and Chapter 5 of the City of Tampa Code.

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

SP-71 Electrical Work

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

recognized testing laboratory for the particular applications wherever available.

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

Operation and Maintenance Manuals

The Contractor shall prepare and submit to the Engineer four (4) hardcopies and one (1) high resolution color, bookmarked, searchable, 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 for the work in Building 2, 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) hard copies of the manual, which also must be on site and available for training of equipment at time of startup for the first unit installed in Building 2. 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 approval to start work on Building 1.

Also, along with any missing material submitted for the initial submittal, one electronic copy (in pdf format), complete with all the missing material, 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.

It is assumed that the equipment for all systems in both Building 2 and Building 1 are of the same nature and applicable to all equipment furnished. If during the course of installation for the second unit in Building 2 and/or the units in Building 1, additional information or updated versions of the material are identified and required, furnish these additional or revised materials and insert and/or replace such pages in all four hard copies and submit an updated electronic pdf file of the revised document(s).

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 for the first unit installed with second ATF submission made with successful startup of the remaining three units. Information included during this submission will include specific information on the equipment such as, but not limited to, serial numbers, equipment number, location, runtime hours, etc.

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

SP-73 Work Directive Change

A Work Directive Change is a written directive to the Contractor, issued on or after the date of the execution of the Agreement, and signed by the Engineer on behalf of the City, ordering an addition,

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

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

SP-75 Programmed Controls Equipment

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

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

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

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

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

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

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

SP-80 Vibration Requirements for Rotating Equipment

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

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

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

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

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

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

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

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

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

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

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

TIR.

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

   a. All mounting bolts shall be tight before proceeding.

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

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

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

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

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

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

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

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

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

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

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

or lower) in the Chart.

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

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

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

SP-81 Services of Manufacturers' Representatives

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

Such manufacturers' services shall be of sufficient time and include a minimum period of one 8-hour day for checkout of the installation and startup of the first unit installed followed by another 8-hour day for instruction of City personnel in two separate training sessions on site. Additional time shall be provided if necessary. One 8-hour day for checkout of the installation and startup for each of the remaining three units shall then be provided in separate trips after each system is installed. One final 8-hour day shall be provided after all four units are placed in successful service, and prior to final completion, for follow-up training of City personnel to answer any questions that may have come up in the interim.

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

SP-82 Access

GENERAL

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

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

Access to existing plant roads by the Contractor will be restricted to those roads so designated. The Contractor will not be permitted to use any existing plant roads not designated for such use. All existing plant roads which are designated for use by the Contractor shall be maintained in serviceable

condition by the Contractor during construction. Any damage to such roads caused by construction operations shall be promptly repaired to keep the road in serviceable condition. Any accumulations of soil, gravel or any other debris deposited on such plant roads as a result of construction operations shall be promptly removed by the Contractor to his own place of disposal.

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

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

PARKING

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

IDENTIFICATION

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

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

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

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

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

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

SP-84 Piping and Equipment Identification

All piping and equipment shall be identified as follows:

1. All painted piping and equipment shall be color coded. Such coding on pipelines shall include painted or plastic tape banding at 10-foot intervals. Stainless steel pipe shall not be painted. Plastic tape banding at 10-foor intervals shall be used on stainless steel pipe. Pipe color or plastic tape banding shall be as listed in the Color Coding Schedule shown below unless otherwise directed by the Engineer. Pipelines, equipment, or other items which are not listed shall be assigned a color by the City and shall be treated as an integral part of the Contract. All hangers and pipe supports shall be painted to match their piping. The system shall be painted up to, but not including, the face of flanges or the flexible conduit connected to electrical equipment.

Underground pipelines with plastic tape wrapping shall be wrapped with colored tape and include additional colored bands as directed. Polyethylene or hot bituminous wrapped underground pipelines shall have plastic tape bands. Polyethylene wrapping for ductile iron sewage or force main piping shall be green. Tape bands shall be placed at 10-foot intervals and all colors shall be selected by the Engineer.

COLOR COATING SCHEDULE			
Service	**Title**	**Color Code**	**Letter and Flow Arrow Color**
Potable Water	PW	Dark Blue	White
Drain, Plant Drain	DR, PD	Dark Grey	White
Process Air	PA	Green	Black
Non-potable Water	NPW	Purple	White
Waste Activated Sludge	WAS	Brown	White
Thickened Sludge	TS	Light Brown	Black
Sample	SA	Grey	Black
Sanitary Drain	SD	Grey	Black
Polymer	PO	Light Green	Black

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

Grit Washer	(Name of item)
SC-GW-1	(General type of designation, final list furnished by Engineer)
(12 digit number)	(Furnished by Engineer)

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

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

Diameter of Pipe or Pipe Covering	Height of Lettering	Size of Arrows
3/4 to 1-1/4 inches	1/2 inch	5/8” x 2”
1-1/2 to 2 inches	3/4 inch	1 1/8” x 3”
2-1/2 to 6 inches	1-1/4 inches	2 1/4” x 6”

8 to 10 inches	2-1/2 inches	4” x 10”
Over 10 inches	3-1/2 inches	4” x 10”

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

SP-85 Storage of Materials

The Contractor may use that portion of the plant site immediately adjacent to the work being done under this project for storage of materials and equipment to be installed provided that this use does not obstruct plant operations. If those areas are insufficient in size to accommodate the Contractor's storage needs, the Contractor is required to secure their own off-site property for use as a storage site for the duration of this project. Upon completion of the project, all storage areas within the plant site shall 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 pay items, no separate payment will be made therefor.

SP-87. Use of Site for Field Offices

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

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

SP-91 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 operations or action which will disturb or cover the work until the Engineer has been advised thereof and has had adequate opportunity to perform the desired photography.

SP-92 Project Digital Audio/Video Recording

The Contractor shall submit to the Engineer for approval prior to commencing work a continuous, color, digital audio/video 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. Both interior and exterior areas are to be included in the videotaping record. 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 along with high quality and discernable audio sound recording. A separate video record shall be first taken of Building 2 prior to any work in that building followed by a second video record prior to work starting in Building 1 with the understanding that the Contractor’s personnel nor equipment are to enter or disturb in any way the building that is not being worked on while work on the other building is underway.

SP-97 Protection of Existing Building

The Contractor shall protect the existing buildings from damage due to construction activities. All costs associated with protection of the facilities shall be included in the price of the work to which they are incidental.

SP-128 Spare Parts and Special Tools

Spare parts and special tools shall be furnished in accordance with the requirements of the Specifications. All such items shall be boxed and tagged and clearly marked for identification as to description and their location in the equipment.

The Contractor shall provide an enclosed weatherproof and lighted facility for spare parts and special tools for storage during the construction period. Immediately prior to final inspection of the work, the Contractor shall arrange for delivery of these items to the City. On delivery, the Contractor shall provide the City with an itemized list of each spare part or special tool and the list shall match the identification tag attached to each item. At this time, the City shall inventory the spare parts and special tools. If the inventory is not complete or some items are damaged, the Contractor shall provide the missing items and replace damaged items. No spare parts or special tools will be accepted by the City until notice of final inspection unless the City expressly requests the advance delivery of items. When so requested, the Contractor shall deliver such items to the City. Items delivered in advance shall be deducted from the inventory and the Contractor shall furnish the City's signed receipts, for items delivered in advance, with the final inventory list. Spare parts and special tools stored by the Contractor shall be and remain his responsibility until acceptance by the City. The Contractor shall deliver all items to a location on the Howard F. Curren Advanced Wastewater Treatment Plant site as directed by the City. The cost of all spare parts and special tools and the storage and delivery thereof shall be included in the various Contract Items, or in the total Lump Sum Price, as applicable, and no separate payment will be made therefor.

SP-129.TP As-Built Plans

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

The Contractor shall provide the City of Tampa with one (1) hardcopy and (1) electronic high resolution color PDF copy of "As-Built" plans. Plan sheets shall have all deviations from original design annotated in red pencil to clearly show as-built conditions. Relocation of existing facilities and utilities must be clearly noted.

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

SP-130 SAFETY:

A. Responsibility: Employees shall immediately report any unsafe work practice or unsafe condition to their supervisor(s). The Contractor is solely responsible for the safety of their workers, and shall comply with all applicable requirements [i.e.: 29 CFR 1910 -Occupational Safety and Health Standards, 29 CFR 1926 - Safety and Health Regulations for Construction, etc] and industry safety standards while at the work site. The fact that City personnel may bring un-safe conditions to the

attention of any member of the Contractors work force does not relieve the Contractor of this responsibility.

Suggest, all Contractors employees and sub-contractors be given a copy of SP-130.

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

At the Pre-Construction meeting, the Contractor will be given pertinent safety related information, necessary forms and instructions (i.e.: AWTP Lockout/Tagout Procedures, AWTP Hot Work Permits, etc) that pertain to any work that might be utilized during the contract. The Contractor shall be responsible to disseminate that information to their employees and sub-contractors. Special care shall be taken by the Contractor to ensure that any new employee or sub-contractor to the work site shall be briefed on these safety instructions.

If warranted by the project and directed by the Engineer, the Contractor shall develop and implement a comprehensive health and safety plan for their employees that will cover all aspects of onsite construction operations and activities associated with the contract. This plan must comply with all applicable health and safety regulations and any project specific requirements that the contract has specified.

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

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

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

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

The Contractor shall take measures [29 CFR 1910.146 (c)(5)] to ensure that atmospheric conditions in confined spaces are not hazardous to occupants. This can be accomplished by forcing a sufficient amount of clean air through the confined space and testing the atmosphere by using a portable certified, calibrated, atmosphere monitor that meets OSHA requirements [29 CFR 1910.146(c)(5)(ii)(C)]. The atmosphere monitor should record oxygen content, flammable gases and

vapors and toxic air contaminants, such as the Industrial Scientific TMX-412.

F. Air-Borne Gases: The AWTP is located in an industrial area and as such there are several different substances, either on or off site, that can escape and become dangerous fumes such as: chlorine, methanol, anhydrous ammonia, etc. The AWTP currently has nine (9) Shelter In Place (SIP) locations that are designated as safe havens in the event of release of hazardous gases. These SIP's are stocked with necessary instructions and supplies to protect City and any Contractor's personnel.

The first day on site, City personnel will show all the Contractor's personnel present where the several closest SIP's are located, explain the alarm signals and provide the current alarm testing schedule. It shall be the Contractor's responsibility to show any future employee and/or sub-contractor that comes on site the location of the SIP's and explain the alarm signals.

In the event of an alarm, the Contractor's personnel shall immediately and hastily proceed to the nearest SIP along with the City personnel and remain there until further notice, taking guidance from and following the instruction of the senior City employee present.

G. Lockout / Tagout Policy: The AWTP Lockout / Tagout program is designed to set standards to help safeguard all employees from hazardous electrical or mechanical energy while they are performing service or maintenance on machines and equipment at the AWTP or any pump station. This program will also identify the practices and procedures to shut down and Lockout or Tagout machines and equipment. The Contractor shall be given a copy of the AWTP "LOCKOUT / TAGOUT POLICY AND PROCEDURES" instruction and shall make all of his employees and sub-contractors aware of this program.

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

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

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

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

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

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

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

SP-133 Tampa Port Authority Access and Treatment Plant Access

The Tampa Port Authority has restricted access in accordance with Florida Statute 311.12. Refer to the Tampa Port Authority's website for procedures on gaining access to the port. https://www.tampaport.com/about-port-tampa-bay/operations/security.aspx. The Port's Security and Operations departments are located in the Port Tampa Bay Security Operations Building (SOC) located at 2002 Maritime Blvd., Tampa, Florida 33605. All costs to comply with these procedures shall be included in the total Price for this project, and no separate payment shall be made therefore.

Wastewater Emergency Response Plan (ERP). The City has developed procedures to help protect the lives and health of all personnel working at the Wastewater facility in the event of an emergency. Everbridge is the software product and primary communication tool that is part of the Department's ERP. This product will be used to register daily visitors and contractors to Wastewater Departmental Facilities here at the Port and to send emergency notifications (via text or cell phone) in the event of an emergency.
Awardee will be required to provide a list of all employees who will be assigned to perform the services detailed in this bid document, including each employee's cell phone number, at least 24 hours prior to arrival to the City Inspector overseeing the services. The employee list must be maintained throughout the award and updated as needed.

Awardee must agree to attend various levels of safety awareness training as determined by the AWTP Safety Specialist.

AWTP Access. Upon entering and departing the AWT Plant, the lead on-site representative of the Awardee shall physically check in with the AWTP main dispatch area. The lead on-site representative of the Awardee must inform the AWTP representatives which Awardee employees are on-site, including start and stop times. These hours must match the hours reflected on the invoices submitted by the Awardee for acceptance.

WW-Collection Access. Upon entering and departing the Wastewater Collection area (WWC), the lead on-site representative of the Awardee shall physically check in with the WWC main dispatch area. The lead on-site representative of the Awardee must inform the WWC representatives which Awardee employees are on-site, including start and stop times. These hours must match the hours reflected on the invoices submitted by the Awardee for acceptance.

* * *

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		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.

SECTION 9 - STRUCTURAL AND MISCELLANEOUS STEEL

W-9.01 General

Structural and miscellaneous steel shall include all ferrous metals, whether wrought, rolled, fabricated, or assembled, except castings, pipelines, and ornamental iron.

Columns, girders, beams, lintels, trolley beams, frames for openings and removable slabs, ladders, baffle supports, weirs and weir angles, nuts and washers, sheet piling, and similar work are included in this classification.

W-9.02 Materials

Structural and miscellaneous steel shall meet the requirements of the following standards, except as otherwise shown or specified.

Structural Steel Shapes	
Plates and Grating	ASTM A 36 Carbon and Low Alloy Steel ASTM A276 Type 316
Type 316 Stainless Steel Plates	ASTM A167 or A666 Grade A
Type 304 Stainless Steel Plates	ASTM A 167 Type 304, No. 1 Finish
Stainless Steel Angles, bolting materials and other shapes	ASTM A 276 Type 304, No. 1 Finish
Type 316 Stainless Steel Bolts	ASTM F-593
Type 316 Stainless Steel Nuts	ASTM F594
Rivet Steel	ASTM A 502
High Strength Bolts	ASTM A 325
Steel Sheet Piling	ASTM A 328
Silicon Bronze Bolting Materials	ASTM B 98, Alloy A

W-9.03 Workmanship

The design, workmanship, and erection shall conform to the requirements of the latest AISC Specifications for Design, Fabrication and Erection of Structural Steel for Buildings unless otherwise shown, specified, or required. The Contractor shall be solely responsible for the correctness of all shop and field fabrication and fit. Members shall be straight, shall fit closely together, and finished work shall be free from burrs, twists, bends, and open joints. Holes, connecting angles, supports and braces for stair stringers, equipment, apparatus, and similar work shall be provided where required. Structural plates and members for equipment, piping, and similar supports shall be 1/4-inch minimum thickness, unless shown or specified otherwise.

The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of Work. The Contractor shall review the Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

Where shop assembly of field connections is shown, specified, or required, unmatched holes shall be reamed and the pieces match marked before disassembly. No drifting will be allowed. In case the eccentricity is too great for good work or the strength of the joint is liable to be weakened by reaming, the piece shall be rejected and a new and satisfactory one shall be provided by the Contractor at his own expense.

W-9.04 Connections in Field

Connections made in the field shall be welded or bolted as hereinafter specified unless riveted connections are approved by the Engineer.

W-9.05 Detailing

Completely detailed shop and erection drawings shall be submitted by the Contractor for approval. Working drawings will be approved for strength only. The numbering of columns, beams, and the like, as shown on detail and erection drawings, shall conform to the numbering shown on the Plans.

Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.

In accordance with the procedures and requirements set forth in the contract, the Contractor shall submit the following:

1. Certified Mill Test Reports
2. Affidavit of Compliance with grade specified
3. Shop Drawings
4. Certified Weld Inspection Reports

All Shop Drawings shall include the following:

1. Layout drawings indicating all structural shapes, sizes, and dimensions.
2. Beam and column schedules.
3. Detail drawings indicating jointing and anchoring details.
4. All steel work, framing, and details shall conform to Article 1.03 of this Section.

No fabrication shall be started until Shop Drawings have been approved by the Engineer.

Where structural design of the steel is not indicated on the Drawings, the Contractor shall submit design drawings of the steel framing, connections and anchor bolts. Such drawings shall be signed and sealed by a Professional Engineer registered in the State of Florida.

W-9.06 Welding

Welding shall be performed by certified welders holding current certificates in accordance with the requirements of the AISC, AWS, and ANSI standards. Welder Certifications shall be submitted for approval for all welders performing work on this project prior to starting any welding.

In assembling and during welding, the component parts of built-up members shall be supported and held by sufficient clamps and other adequate means to hold the parts in proper relation for welding. Welding at joints on weir plate appurtenances shall be watertight. Field welding on weir plates and appurtenances shall require prior written approval of the Engineer.

Field welds will be visually inspected in accordance with AWS Codes. Inadequate welds shall be corrected or redone as required in accordance with AWS Codes.

W-9.07 Bolted Connections

Bolted connections for structural framing shall be made with high strength bolts meeting the requirements of ASTM A 325.

All bolts shall be tightened by means of a torque wrench to the bolt tension recommended in Subsection 1.23.5 of the AISC Specifications.

High strength bolting will be visually inspected in accordance with AISC "Specification for Structural Joints Using A325 or A490 Bolts." Replace or retighten rejected bolts as required. In cases of disputed bolt installation, the bolts in question shall be checked by a calibrated wrench certified by an independent testing laboratory. The certification shall be at the Contractor's expense.

W-9.08 Riveting

Rivets shall be driven by skilled workmen only and with pneumatic hammers. Rivet heads shall be full, tight, and concentric with the shank. No caulking or recupping will be permitted. Loose, burned, or defective rivets shall be cut out and replaced in a manner which will not injure the surrounding metal. Punching shall be done accurately, but small inaccuracies may be corrected by reaming. Riveted members shall be well pinned and firmly drawn together before riveting. Rivets shall be thoroughly and uniformly heated to not less than a bright red before driving. In removing loose, burned, or otherwise defective rivets, the oxyacetylene torch shall not be used.

W-9.09 Bolts and Nuts

Bolts and nuts other than those specified above for structural framing connections shall be of the best quality mild steel, except where bronze, aluminum, stainless steel, or other materials are shown or required. Bolts shall have hexagonal nuts. Threads shall be clean cut of the American Standard size. Anchor bolts shall be accurately set, and if placed after concrete is poured, all necessary drilling and grouting shall be at the expense of the Contractor. Bolt anchors, unless shown or specified otherwise, shall be of the sizes indicated or approved and shall be Nations Lead Company "Cinch Anchor," Phillips "Stainless Steel Wedge Anchor," or equal.

All anchor bolts and nuts for equipment and items submerged or subject to periodic wetting shall be of Type 316 stainless steel, unless other shown or specified.

W-9.10 Stud Anchors

Welded headed studs and stud anchors shall be provided in locations and of sizes and shapes shown as manufactured by Nelson Stud Welding or equal.

W-9.11 Concrete Anchors

Where concrete anchors are called for on the Drawings, use one of the types listed below; except, where one of the types listed below is specifically called for on the Drawings, only that type shall be used. Unless otherwise noted, all concrete anchors which are submerged, or which are subject to vibration from equipment such as pumps and generators, shall be adhesive anchors. The determination of anchors equivalent to those listed below shall be on the basis of test data performed by a commercial testing laboratory. There are two types used:

1. Expansion anchors shall be wedge, sleeve, or drop-in mechanical anchors.
2. Adhesive anchors shall be two part injection type.

Expansion anchors shall be manufactured by Hilti, Inc., Molly Division of USMG Group, or equal and shall be embedded to the depths shown on the Drawings. If no embedment depth is given, the minimum embedment depth as recommended by the manufacturer shall be used.

Adhesive anchors shall consist of threaded rods or bolts anchored with an adhesive system into hardened concrete or grout-filled masonry. The adhesive system shall use a two-component adhesive mix and shall be injected with a static mixing nozzle following manufacturer's instructions. The embedment depth of the rod/bolt shall provide a minimum allowable bond strength that is equal to the allowable tensile capacity of the rod/bolt (see Table 1) unless noted otherwise on the Drawings. The adhesive system shall be "Sikadur Injection Gel" as manufactured by Sika Corporation, "G5 Adhesive" as manufactured by ITW Ramset/Redhead, or "HIT HY-150 Injection Adhesive Anchor System" as manufactured by Hilti, Inc., or equal. D. All concrete anchors shall be Type 316 stainless steel.

Allowable Tensile Capacity (Kips)		
Size	A36 Threaded Rod/Bolt	SST Threaded Rod/Bolt
3/8 inch	2.1	1.9
1/2 inch	3.8	3.5
5/8 inch	5.9	5.6
3/4 inch	8.4	8.2
7/8 inch	11.5	11.4
1 inch	15.0	15.0

W-9.12 Antiseize Lubricant

Antiseize lubricant shall be Graphite 50 Anti-Seize by Loctite Corporation, 1000 Anti-Seize Paste by Dow Corning, 3M Lube and Anti-Seize by 3M, or equal.

W-9.13 Sliding Plates

Sliding plates shall conform to ASTM B 147 (8B) and shall be "Lubrite Plates," manganese bronze No. 423, as manufactured by Merriman, Inc., or equal.

W-9.14 Steel Sheet Piling

Steel sheet piling shall have a minimum thickness of 3/8 inch in web and flange.

W-9.15 Product Delivery, Storage and Handling

Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

Structural steel members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with the ground. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

W-9.16 Fabrication:

General: Fabrication shall be in accordance with the American Institute for Steel Construction "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" of the AISC.

Anchor Bolts:

All anchor bolts for structural steel erection and other incidental items of the structural steel required to be built into concrete shall be properly set and securely held in position in the forms before the concrete is placed.

Anchor bolts and setting plans for steel columns shall be provided at the site, marked or tagged for ready identification.

Bolts shall be accurately set to template and at elevation to provide suitable projection above concrete and/or grout. Maximum tolerances allowable from indicated locations are: (tolerances may be tighter for manufactured/fabricated elements of work):

a. Elevation of concrete before grouting: + 1/4 inch.
b. Elevation of top of anchor bolts: + 1/2 inch to 0 inch under.
c. Line of anchor bolt: + 1/8 inch.

All holes in structural steel members required for anchors, anchor bolts, bolt holes, sag rods for securing wood or other members or for passing of other work noted on the drawings shall be provided by the fabricator and detailed on the Shop Drawings.

Where misalignment between anchor bolts and bolt holes in steel members are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misalignment for review by the Engineer.

Material

All materials shall be properly worked and match-marked for field assembly. Where finishing is required, assembly shall be completed including bolting and welding of units before start of finishing operations.

W-9.17 Erection

The erection of all structural steel shall conform to the applicable requirements of the current edition of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" of the ASIC. All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connections have been made shall be provided by the Contractor. High strength steel bolts shall conform to the Specifications of the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation for "Structural Joints using ASTM A325 or A490 Bolts".

Except where otherwise noted on the Drawings or in this Specification, all shop connections
shall be welded. All field connections shall be accurately fitted up before being bolted.

Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the holes or to distort the metal. All unfair holes shall be drilled or reamed.

High Strength Steel Bolts: All bolted connections with high strength bolts shall use Direct Tension Indicator devised in accordance with Paragraph 8(d)(4) of the "Specification for Structural Joints using ASTM A325 or A490 Bolts", approved by the Research Council on Structural Connections, November 13, 1985. High strength bolts shall be installed in properly aligned holes and tightened to at least the minimum tension specified in the table below. Alternately, calibrated

wrench tightened may be used in lieu of Direct Tension Devices provided the requirements of Paragraph 8(d)(2) of the same specification are met.

Fastener tension required for connections subject to direct tension:

	Minimum Tension in 1000s of Pounds (kips)	
Nominal Bolt Size (inches)	A325 Bolts	A490 Bolts
1/2	12	15
5/8	19	24
3/4	28	35
7/8	39	49
1	51	64
1-1/8	56	80
1-1/4	71	102
1-3/8	85	121
1-1/2	103	148

Wrenches may be manual torque or power wrenches designed by the manufacturer for use with high strength bolts. If manual torque wrenches are used, their dials shall be calibrated on the job. If power wrenches are used, the manufacturer's recommendations shall be carefully followed and proper working conditions of the machine demonstrated before the work is started.

The Engineer may review the procedure for calibration of wrenches and installation of bolts and, in general, shall satisfy himself that all requirements of the Specifications for "Structural Joints using ASTM A325 or A490 Bolts" are met.

W-9.18 Cutting and Burning

The use of gas cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Its use may be permitted on minor members if the member is not under stress, and then only after the written acceptance of the Engineer has been obtained. No cutting of structural steel members in the field will be allowed except by the written acceptance by the Engineer.

Holes shall be provided per AISC Specifications, or as indicated for securing other Work to structural steel framing and for the passage of other Work through steel framing members. Threaded nuts shall be welded to framing, and other specialty items, as shown, to receive other Work. No torch cut holes will be permitted.

W-9.19 Grouting of Base Plates and Bearing Plates

All loose column base plates and billets shall be accurately set to the designated levels on steel wedges or angle screens in preparation for grouting under this Contract. Leveling plates grouted in place shall be installed under all structural steel columns.

Prior to the placement of non-shrink epoxy grout beneath base and bearing plates, the bottom surface of the plates shall be cleaned of all foreign materials, and concrete and masonry bearing surface shall also be cleaned of all foreign materials and roughened to improve bonding.

Anchor bolts shall be tightened after the supported members have been positioned and plumbed and the non-shrink grout has attained its specified strength.

Baseplates shall be grouted with non-shrink epoxy grout to assure full uniform bearing. Grouting shall be done prior to placing loads on the structure.

W-9.20 Misfits at Bolted Connections

Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the Engineer. The Engineer will determine whether the remedy is acceptable or if the member must be refabricated.

Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Contractor shall notify the Engineer immediately and shall submit a proposed method of remedy for review by the Engineer.

W-9.21 Field Assembly

Structural frames shall be set accurately to the lines and elevations indicated. The various members shall be aligned and adjusted to form a part of a complete frame or structure before permanently fastened. Bearing surfaces and other surfaces which will be in permanent contact shall be cleaned before assembly. Necessary adjustments to compensate for discrepancies in elevations and alignments shall be performed.

Individual members of the structure shall be leveled and plumbed within specified AISC tolerances. The Contractor shall provide and install all temporary bracing required until structure is complete.

W-9.22 Painting

Structural steel shall be painted in accordance with the requirements of the Workmanship and Materials section headed "Painting." Stainless steel parts shall not be painted, but shall be wiped and rubbed clean of all foreign matter and left in a condition satisfactory to the Engineer.

End of Section

SECTION 10 - DUCTILE IRON PIPE AND FITTINGS

W-10.01 General

All ductile iron pipe shall meet the requirements of AWWA C151. The type and configuration of pipe bedding for buried pipe shall be as shown on the Plans. Coatings and linings for ductile iron pipe and fittings shall conform to the subsection headed "Coatings and Linings," contained herein. Pipe joints shall be bell and spigot, flanged, or mechanical joint as shown on the Plans.

Ductile iron pipe and ductile iron fittings buried in the ground for force mains or installed in pumping stations shall have a minimum thickness of Class 52 unless specified otherwise as shown on the Plans. Ductile push-on iron pipe and fittings for gravity systems, including house laterals, shall be Class 54 and shall have an interior lining as specified in the subsection "Lining for Ductile Iron Gravity Pipe."

W-10.02 Flanged Pipe

Flanged pipe shall conform to the requirements of AWWA C115. Flanges shall be ductile iron and shall have long hubs. There shall be no leakage through the pipe threads, and the flanges shall be designed to prevent corrosion of the threads from outside.

W-10.03 Fittings

All ductile iron fittings shall meet the requirements of AWWA C110, and have a pressure rating of 250 psi, or as specified, whichever is larger.

W-10.04 Flanged Joints

Ductile iron pipe above grade shall be flanged.

Flanged joints shall meet the requirements of ANSI Specification B16.1. Flanges, flange facing drilling, and protecting shall be as specified for flanged pipe. Bolts and nuts for flanged joints shall be Type 316 stainless steel unless otherwise stated on the Plans or directed by the Engineer.

Except where otherwise directed by the Engineer, gaskets for flanged joints shall be of the full-face type, meeting the requirements of ANSI B16.21. Gaskets shall be rubber with cloth insertion, as made by the Crane Company, Garlock Packing Company, U.S. Rubber Company, or equal.

W-10.05 Mechanical Joints

All pipe below grade shall have restrained joints. Mechanical joints shall meet the applicable requirements of AWWA C111.

W-10.06 Push-on Joints

Push-on joints shall be of the bell and spigot type which employs a single, elongated grooved gasket to effect the joint seal. Push-on joints shall meet the applicable requirements of AWWA C111.

W-10.07 Wall Castings, Connecting Pieces, and Special Fittings

Wall castings and connecting pieces, such as bell and bell, bell and spigot, bell and flange, flange and flange, flange and spigot, and flange and flare, shall meet the requirements of ANSI Specification A21.10. Unless otherwise shown or specified, fittings 14 inches and larger shall have a pressure rating of 250 psi.

Where special fittings are required, they shall be of an approved design and shall have the same diameters and thicknesses as standard fittings, unless otherwise required, but their laying lengths and other functional dimensions shall be determined by their positions in the pipelines and by the particular piping materials to which they connect.

Where watertightness is essential and at other locations where indicated, wall castings shall be provided with an integrally cast intermediate collar located at the center of the wall.

W-10.08 Sleeve-Type Couplings

Except where standard solid sleeves or split sleeves are shown or specified, sleeve-type couplings for ductile iron pipe shall be Style 38 couplings as made by Dresser Industries, Inc., or Type 411 as made by Smith-Blair, or equal. Gaskets shall be of molded rubber, Dresser Plain Grade 27, Smith-Blair 003, or equal. Middle rings shall be without a pipe stop and shall be at least 1/4 inch thick and 5 inches wide for 8-inch and smaller pipe, 3/8 inch thick and 7 inches wide for 10-inch through 30-inch pipe, and 1/2 inch thick and 10 inches wide for 36-inch and larger pipe with follower rings of appropriate thickness, unless otherwise shown or specified.

Sleeve-type couplings shall be shop coated with Dresser Red "D" Shop-Coat, Smith-Blair Standard Blue Shop Coat, or equal nontoxic material compatible with the finished coatings specified.

W-10.09 Reinforced Flexible Pipe Coupling (Expansion Joints)

Reinforced flexible pipe couplings (expansion joints) shall be single or multiple arch style No. 500 as manufactured by Mercer Rubber Company, or an equivalent model by General Rubber Co., Metraflex, Redvalve, or equal.

Couplings for sludge service shall be filled arch construction type to prevent material build-up within the arch(es).

Couplings for air service shall be rated for a working pressure of 30 psig and shall be constructed of Nordel elastomer rated for a maximum temperature of 350o F. A hypalon coating shall be applied to the exterior of the elastomer.

All couplings shall have integrally molded flanges with split and beveled galvanized steel retaining rings. Galvanized steel washers shall be provided at the point where the rings are split. Bolt holes and bolt circle patterns shall conform to the mating flange patterns as specified in the piping paragraphs. Coupling lengths shall be manufacturer's standard, subject to Engineer's review and acceptance.

Control rods and hardware shall be 316 stainless steel and shall be provided and installed with all flexible pipe couplings. The control rod assembly shall be supplied by the coupling manufacturer.

W-10.10 Flanged Coupling Adapter

Restrained flange adapters shall be used in lieu of threaded or welded flanged spool

pieces. Flanged adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10 (125#/Class 150 Bolt Pattern). Restraint for flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges. The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6 inch gap between the end of the pipe and the mating flange without affecting the integrity of the seal.

All internal surfaces of the gasket ring (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61. Exterior surfaces of the gasket ring shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.

The flange adapter shall be Series 2100 MEGAFLANGE Restrained Flange Adapter as produced by EBAA Iron, Inc. or approved equal.

W-10.11 Coatings and Linings

Pipe which is to be buried shall have the standard outside coating specified in AWWA C151-8.1.

Unless otherwise shown on the Plans or specified, all ductile iron pipe and fittings shall have a cement-mortar lining meeting the requirements of AWWA C151-8.2.

The weight and class designation shall be painted conspicuously in white on the outside of each pipe, fitting, and special casting after the shop coat has hardened.

W-10.12 Harnessing

Ductile iron pipe and fittings with mechanical joints that require harnessing shall be provided with ductile iron retainer glands, Megalug, as manufactured by EBAA Iron, or equal. The glands shall be installed in accordance with the manufacturer's recommendations. Set screws shall be tightened to 75 foot-pounds torque. Where the glands are to be buried or not exposed to view, the assembly shall be given 2 heavy coats of asphalt varnish after installation. Ductile iron pipe and fittings with push-on joints that require harnessing shall be Clow F-128 "Super Lock Joint," American Cast Iron Pipe "Lok-Fast Joint," U.S. Pipe and Foundry Company "TR Flex," or equal.

W-10.13 Lining for Ductile Iron Gravity Pipe

All ductile iron pipe and fittings, unless otherwise shown or specified, shall be provided with a special interior lining. For sizes 8 inches in diameter and above, the lining material shall be virgin polyethylene complying with ASTM D 1248 (40 mils thick) heat bonded to the interior of the pipe for all pipe sizes. For 6-inch diameter, the lining material shall either be the aforementioned polyethylene system or a 40 mil thick coal tar epoxy system. All pipe joint bells shall be coated on the inside with the same lining material as used in the pipe barrel. All field cuts shall be field coated with 40 mils of high build epoxy compatible with the lining.

W-10.14 Polyethylene Encasement

Polyethylene encasement shall be installed on all ductile iron pipe and fittings within the sections indicated on the Plans or as directed by the Engineer and in accordance with ANSI/AWWA C105/A21.5.

Although not intended to be a completely air-and-water-tight enclosure, the polyethylene shall prevent contact between the pipe and the surrounding backfill.

Polyethylene encasement shall be installed in accordance with the pipe manufacturer's instructions, or in a manner acceptable to the Engineer. Polyethylene encasement shall extend 1 foot beyond the joint in both directions (a total of 2-foot overlap) and shall be adhered to said joint with 2-inch wide green marking tape. The slack width shall be taken up at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points. Upon installation of the encasement, any cuts or damaged portions of the polyethylene encasement shall be securely mended with tape or with a short length of polyethylene sheet, or a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

Backfill material shall be the same as specified for pipe without polyethylene wrapping; however, extra care should be taken that the backfill be free from cinders, refuse, boulders, rocks, stones, or other materials that could damage the encasement. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill.

Because prolonged exposure to sunlight will deteriorate polyethylene film, such exposure prior to backfilling the wrapped pipe shall be kept to a minimum.

W-10.15 Ductile Iron Pipe Exterior Coating

All pipe and fittings shall have an exterior asphaltic coating conforming to the following requirements:

Viscosity, KU at 25 degrees C	56-60
Flashpoint, degrees F (TCC)	40 degrees F Min
Dry set to touch, minutes	6
Dry hard, minutes	22

Field coat the exterior of exposed ductile iron pipe in accordance with Section 36 “Painting”.

W-10.16 Force Main Identification

Ductile iron pipe sanitary force main shall be continuously spiral wrapped with 2-inch wide green stick-on vinyl tape prior to installation for permanent identification purposes. The tape shall have a minimum thickness of 6 mils with a minimum tensile strength of 22 pounds per inch and a minimum adhesive factor of 40 ounces per inch. The pipe shall be clean and dry when wrapped.

W-10.17 Shipping, Handling and Storage

Special care in handling shall be exercised during delivery, distribution and storage of pipe to avoid damage and setting up stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

No pipe shall be dropped from cars or trucks to the ground. All pipe shall be carefully lowered to the ground by mechanical means. In shipping, pipe and fittings shall be blocked in such manner as to prevent damage to castings or lining. Any broken or chipped lining shall be carefully patched. Where it is impossible to repair broken or damaged lining in pipe because of its size, the pipe shall be rejected as unfit for use.

All mechanical joint pipe shall be laid with 1/8-inch space between the spigot and shoulder of pocket.

W-10.18 Installing Pipe General

Unless otherwise directed, ductile iron pipe shall be laid with the bell ends facing upstream in the normal direction of flow and in the direction of laying.

Thrust restrained and mechanical joints shall be made in accordance with the manufacturer's standards except as otherwise specified herein. Joints between mechanical joint pipe and/or fittings shall be made in accordance with ANSI/AWWA Standard C600, except that deflection at joints shall not exceed one-half of the manufacturer's recommended allowable deflection, or one-half of the allowable deflection specified in ANSI/AWWA C600, whichever is the lesser amount.

Before laying thrust restrained and mechanical joint pipe and fittings, all lumps, blisters and
excess bituminous coating shall be removed from the bell and spigot ends. The outside of each spigot and the inside of each bell shall be wire brushed, and wiped clean and dry. The entire gasket groove area shall be free of bumps or any foreign matter which might displace the gasket. The cleaned spigot and gasket shall not be allowed to touch the trench walls or trench bottom at any ime. Vegetable soap lubricant shall be applied in accordance with the pipe manufacturer's recommendations, to aid in making the joint. The workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Deflections shall only be made after the joint has been assembled.

Prior to making up flanged joints in ductile iron pipe and fittings, the back of each flange under the bolt heads and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry. Flange faces shall be kept clean and dry when making up the joint, and the workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Bolts and nuts shall be tightened by opposites in order to keep flange faces square with each other, and to insure that bolt stresses are evenly distributed

Bolts and nuts in thrust restrained, mechanical and flanged joints shall be tightened in accordance with the recommendations of the pipe manufacturer for a leak-free joint. The mechanics shall exercise caution to prevent overstress. Torque wrenches shall be used until, in the opinion of the Engineer, the mechanics have become accustomed to the proper amount of pressure to apply on standard wrenches.

Cutting of the ductile iron pipe for inserting valves, fittings, etc., shall be done by the Contractor in a neat and workmanlike manner without damage to the pipe, the lining, or the coating. Pipe 16 inches and larger in diameter shall be cut with a mechanical pipe saw. After cutting the pipe, the plain end shall be beveled with a heavy file or grinder to remove all sharp edges.

Areas of loose or damaged lining associated with field cutting shall be repaired or replaced as recommended by the pipe manufacturer and required by the Engineer. Repair methods shall be as recommended by the manufacturer and shall be submitted to the Engineer for review.

Any work within the pipe shall be performed with care to prevent damage to the lining. No cable, lifting arms or other devices shall be inserted into the pipe. All lifting, pulling or pushing mechanisms shall be applied to the exterior of the pipe barrel.

Homing the pipe shall be accomplished by the use of a hydraulic or mechanical pulling device, unless otherwise accepted by the Engineer. No pipe shall be driven or struck in order to seat it home.

Cleaning methods shall be acceptable to the Engineer, and must be sufficient to remove silt, rocks, or other debris which may have entered the pipeline during its installation and shall also follow the requirements of Section 15995 entitled "Pipeline Testing".

No field welding of ductile iron or cast fittings shall be allowed.

Use of impact wrench tools for tightening restrained joint fittings shall not be allowed.

W-10.19 Installing Flanged Pipe

Flanged joints shall be made up with full face gaskets as specified in the piping paragraphs. Flange faces shall have a uniform bearing on the gaskets. Flanges shall be drawn together uniformly until the joint is tight. No washers shall be permitted for the bolt and nut assemblies. The length of the bolts shall be uniform and in accordance with the standards specified herein. The bolt's maximum projection beyond the end of the nut shall be 0.25-inch nor shall the bolt fall short of the end of the nut. All buried flanges shall be installed with 316 SS nuts and bolts.

* * *

SECTION 27 - DEMOLITION

W-27.01 General

Demolition includes all work necessary for the removal and disposal of masonry, steel, reinforced concrete, plain concrete, wastewater equipment, piping, electrical facilities, and any other material or equipment shown or specified to be removed. Dust control shall be provided and provision made for safety.

Demolition shall be carried out in such a manner that adjacent structures, which are to remain, shall not be endangered. The work shall be scheduled so as not to interfere with the day to day operation of the existing facilities, all in accordance with the Sequence of Operations specified in the Specific Provisions. Doorways or passageways in existing facilities shall not be blocked.

Care shall be taken to assure that concrete shall be broken and removed in reasonably small masses. Where only parts of a structure are to be removed, the concrete shall be cut along limiting lines with a specially designed saw so that damage to the remaining structure is held to a minimum.

W-27.02 Requirements Prior to Demolition

The Contractor shall visit the site and inspect all existing structures. Special care shall be taken to observe and record any defects, which may exist in buildings or structures adjacent to but not directly affected by the demolition work. Prior to commencing the demolition, the Contractor shall provide the Engineer with a copy of this inspection.

Drawings of existing structures and equipment will be available for inspection by the Contractor at the office of the Engineer and Owner.

The Contractor shall submit for review, in accordance with Section entitled "Submittals" the proposed methods, equipment and operation sequence. Include coordination for shut-off, temporary services, continuation of service and other applicable items to ensure no interruption of operations except as herein before specified.

Scheduling: The Contractor shall carry out his operations so as to avoid interference with operations and work in the existing facilities.

Notification: At least seven (7) calendar days prior to commencement of a demolition or removal, the Contractor shall notify the Owner in writing of his proposed removal schedule. No removals shall be started until the schedule is acceptable to the Owner.

Warning signs, protection barriers and red warning lights shall be provided as necessary adjacent to the work as approved by the Engineer and shall be maintained during the demolition period.

Demolition work shall not be undertaken until all mechanical and electrical services affected by the work have been properly disconnected. Interconnecting piping or electrical services that are to remain in service either permanently or temporarily shall be capped, rerouted or reconnected in a manner that will not interfere with the operation of the remaining facilities.

Where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

W-27.03 Requirements During Demolition

The use of explosives will not be permitted.

All mechanical and electrical equipment shall be carefully protected against dust and debris.

All debris shall be removed from the structures during demolition and not allowed to accumulate in piles.

Safe access to and egress from all working areas shall be provided at all times with adequate protection from falling material.

Adequate scaffolding, shoring, bracing and protective covering shall be provided during demolition to protect personnel and equipment against injury or damage. Floor openings not used for material drops shall be covered with material substantial enough to support any loads placed on it. The covers shall be properly secured to prevent accidental movement.

Adequate lighting shall be provided at all times during demolition.

Areas below demolition work shall be closed to workmen while removal is in progress.

No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effectively protected.

No workmen shall stand on any wall to remove material except when adequate staging or scaffold protection is provided at a distance not exceeding 12 feet below the top of such walls and other reasonable precautions are taken. Whenever a workman is required to work at a height of more than 12 feet above a floor, platform, scaffold or the ground, he shall be equipped with a safety belt with a life line attached.

The Contractor shall use temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Existing electrical and mechanical equipment to remain shall be protected from damage, dust, and debris.

Where existing equipment, equipment pads and bases, piping, piping supports, handrail, electrical panels and devices, conduits, and associated appurtenances are removed, the Contractor shall rehabilitate the affected area such that little or no evidence of the previous installation remains. Openings in concrete floors, walls, and ceiling from piping, conduit, fastener penetrations, etc., shall be filled with nonshrink grout and finished to match the adjacent area. Concrete pads and bases for equipment and supports shall be removed by chipping away concrete and cutting any exposed reinforced steel and anchor bolts a minimum of 1-1/2 inches below finished grade. The area of concrete to be rehabilitated shall be scored by saw cutting clean, straight lines to a minimum depth of 1-1/2 inches, and all concrete within the scored lines removed to a minimum depth of 1-1/2 inches. The area within the scored lines shall be patched with nonshrink grout to match the adjacent grade and finish. Unless otherwise shown, abandoned connections to piping and conduits shall be terminated with blind flanges, caps, and plugs suited for the material, type, and service of the pipe or conduit. Walls shall be painted in accordance with requirements set forth in Section entitled "Painting".

Where existing structural steel members are removed or modified, the surface of the remaining existing steel members damaged by construction activities shall be repaired.

The affected areas shall be surface prepared and coated in accordance with Section entitled "Painting".

W-27.04 Disposal of Materials

All debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition shall become the property of the Contractor and shall be removed from the site, except for the items designated by the Engineer to be salvaged.

W-27.05 Cleanup

The Contractor shall remove from the project site all debris resulting from the demolition and removal operations as it accumulates. Upon completion of the demolition work, all materials, equipment, waste and debris of every sort shall be removed and the premises shall be left clean, neat and orderly.

End of Section

SECTION 30 - MISCELLANEOUS PIPE AND FITTINGS

W-30.01 General

Miscellaneous pipe and fittings include polyvinyl chloride (PVC) pipe, copper pipe, steel pipe, and plastic tubing.

W-30.02 Polyvinyl Chloride Pipe

Polyvinyl chloride (PVC) pipe shall be Schedule 80 minimum meeting the requirements of ASTM Des: D 1785, 1254B. Pipe and fittings joints shall be socket welded except where threaded and flanged joints are required to connect to unions, valves, and equipment. Solvent cement for socket joints shall comply with ASTM D 2564.

All PVC pipe four (4) inches in diameter and larger, unless otherwise scheduled, intended for buried service shall be in accordance with the AWWA C900/C905 Pipe.

Fittings shall be Schedule 80 and shall conform to ASTM D 2464 for threaded fittings and ASTM D 2467 for socket-type fittings.

Union shall have socket-type ends, Viton o-rings, and shall be Schedule 80. Material shall be Type 1, Grade 1 PVC, per ASTM D 1784.

Bolts and nuts for interior flanges shall be carbon steel conforming to ASTM A 307, Grade B.

Bolts and nuts for buried flanges and flanges located outdoors above ground or in vaults and structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M for bolts, and ASTM a 194, Grade 8M for nuts. Bolts and nuts larger than 1-1/8 inch shall be steel, ASTM A 307, Grade B, with cadmium plating, ASTM A 165, Type NS.

Provide washers for each nut. Washers shall be of the same material as the nut.

Do not install PVC pipe when the temperature is below 40 F or above 90 F. Store loose pipes on racks with a minimum support spacing of 3 feet. Provide shade for pipe stored outdoors or installed outdoors until the pipe is filled with water.

Store fittings indoors in their original cartons.

Store solvent cement indoors or, if outdoors, shade from direct sunlight exposure. Do not use solvent cements which have exceeded the shelf life marked on the storage container.

Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting on pipe ends. Remove any pipe section containing defects by cutting out the damaged section as a complete cylinder.

Do not drag PVC pipe over the ground, drop it onto the ground, or drop objects on it. Cut pipe ends square and remove all burrs, chips, and fillings before joining pipe or fittings. Bevel solvent welded pipe ends as recommended by the pipe manufacturer.

Prior to solvent welding, remove fittings and couplings from their cartons and expose them to the air for at least one hour to the same temperature conditions as the pipe.

Wipe away loose dirt and moisture from the ID and OD of the pipe end and the ID of the fitting before applying solvent cement. Do not apply solvent cement to wet surfaces.

Make up solvent welded joints per ASTM D 2855.

Allow at least eight hours of drying time before moving solvent welded joints or subjecting the joints to any internal or external loads or pressures.

When installing flanged joints lubricate bolt threads with MRO solution 1000 Food Grade Antiseize, or equal before installation.

Tighten bolts on PVC flanges by tightening the nuts diametrically opposite each other using a torque wrench. Complete tightening shall be accomplished in stages and the final torque values shall be as shown in the following table:

Pipe Size (inches)	Final Torque (foot-pounds)
1/2 to 1-1/2	10 to 15
2 to 4	20 to 30
5 to 8	30 to 40
10	60 to 70

Threaded joint installation: Cut threaded ends on PVC to the dimensions of ANSI B2.1. Ends shall be square cut. Follow the pipe manufacturer's recommendations regarding pipe holddown methods, saw cutting blade size, and saw cutting speed.

Pipe or tubing cutters shall be specifically designed for use on PVC pipe. Use cutters manufactured by Reed Manufacturing Company, Ridge Tool Company, or equal.

If a holddown vise is used when the pipe is cut, insert a rubber sheet between the vise jaws and the pipe to protect from scratching the pipe. Thread cutting dies shall be clean and sharp and shall not be used to cut materials other than plastic. Apply Teflon thread compound or Teflon tape lubricant to threads before screwing on the fitting.

Provide unions on exposed piping 3 inches and smaller as follows:

1. Provide a union at every change in direction (horizontal and vertical).
2. Provide a union 6 to 12 inches downstream of valves.
3. Provide a union every 40 feet in straight piping runs.
4. Near threaded connections to mechanical or piping equipment.
5. Where shown on the drawings.

Installing Buried Pipe: Trench bottom shall be continuous, smooth, and free of rocks. See the details on the drawings for trench dimensions, pipe bedding, and backfill.

After the pipe has been solvent welded and the joints have set, snake the pipe in the trench per the pipe manufacturer's recommendations in order to allow for thermal expansion and contraction of the pipe.

Do not backfill the pipe trench until the solvent welded joints have set. Support the pipe uniformly and continuously over its entire length on firm, stable soil. Do not use blocking to change pipe grade or to support pipe in the trench.

Install buried PVC pipe in accordance with ASTM D 2774 and the pipe manufacturer's recommendations. Backfill materials in the zone between the trench bottom and to a point 8 inches above the top of the pipe shall be imported fill per Section entitled "Excavation and Backfill for Utilities". Compact by means of vibratory equipment or by flooding. Apply backfill in layers having a maximum thickness of 8 inches. If water flooding is used, do not

add successive layers unless the previous layer is compacted to 90% relative compaction.

Install above grade pipe on pipe hangers and supports as detailed on the drawings and as specified in Section entitled “Pipe Supports”. Install pipe without springing, forcing, or stressing the pipe or the adjacent valves and equipment to which the pipe is connected.

Coat piping per Section 36 entitled “Painting”.

Perform hydrostatic testing for leakage in accordance with requirements set forth in Section entitled “Pipeline Testing and Disinfection”.

W-30.03 Copper Pipe

Copper pipe shall be Type K or L hard-drawn copper tubing and shall meet the requirements of ASTM Des: B 88.

Fittings shall be of the streamlined, solder joint type, and shall meet the requirements of ANSI Specifications B16.22.

W-30.04 Steel Pipe and Stainless Steel Tubing

Steel pipe other than compressed air supply shall be galvanized, meet the requirements of ASTM Des: A 53 and shall not be less than Schedule 40. Dimensions of steel pipe shall conform to ANSI B36.10.

Fittings for steel pipe shall be galvanized and shall be made to standard dimensions or as shown. Fittings used in pipelines 2 inches in diameter or smaller shall be of the screwed pattern and shall be of malleable iron meeting the requirements of ASTM Des: A 197. The fittings shall conform to ANSI B 16.3. Where galvanized fittings are shown or specified, galvanizing shall meet the requirements of ASTM Des: A 120. Steel flange fittings shall meet the requirements of ANSI B 16.5 for 150-pound standard, except that the flanges shall be plain faced.

All flanges for steel pipe, except blind flanges, shall be of the slip-on welding type with hubs meeting the requirements of AWWA C207 Class B, D, or E suitable for the size of pipe and test pressures specified, and conforming to the requirements of ASTM Des: A 181, Class 1. The flanges shall be attached to the barrel of the pipe with two continuous fillet welds. The flanges shall be attached to the barrel of the pipe with two continuous fillet welds. Blind flanges shall be plain faced and shall conform to ANSI B 16.5, Class 150. All flanges shall be covered and protected during delivery and storage.

Flanged joints shall be made with bolts or bolt studs with a nut on each end. Bolts, stud bolts, and nuts shall meet the requirements of ASTM Des: A 307, Grade B and ANSI B 16.1 unless noted otherwise on the Plans.

Gaskets for flanged joints shall be of rubber with cloth insertion of the full face type meeting the requirements of ANSI B 16.21 and shall be those made by the Garlock Packing Company, Crane Company, U.S. Rubber Company, or equal. Gaskets shall be 1/16 inch thick.

Zinc for galvanizing, zinc coating, and plating shall meet the requirements of ASTM Des: B 6 and shall be at least equal to the grade designated as "Prime Western."

Wrought metals and castings shall be sandblasted or ground smooth. When a smooth coat is required, castings shall be tumbled and all high spots ground flush. Castings shall be normalized to prevent cracking.

Base metal shall be thoroughly cleaned, using only approved solvents and wire brushes, after which it shall be pickled.

Products to be galvanized shall be safeguarded against embrittlement in accordance with ASTM Des: A 143 and against warpage and distortion in accordance with ASTM Des: A 384.

Galvanizing shall be done by the hot-dip process after fabrication, unless otherwise specified in conformance with the appropriate ASTM and American Hot Dip Galvanizers Association, Inc. specifications. The dipping shall not come in contact with or rest upon the dross during the operation.

Galvanizing and coating shall be done in a plant having sufficient facilities to produce the quality of coatings herein specified and ample capacity for the volume of work required. Galvanized material shall be shipped and handled in a manner which will avoid damage to the zinc coating.

Galvanizing shall meet the requirements of ASTM Des: A 120.

Compressed air tubing shall be 316L stainless steel, seamless, annealed, ASTM A269 with Type 316 – 37 degrees stainless steel flared fittings or Swagelok or Parker-CPI flareless fittings.

W-30.05 Plastic Tubing

Plastic tubing for the air supply line shall be clear vinyl instrument grade tubing with an inside diameter of 3/8 inch and a minimum wall thickness of 0.062 inch. The tubing shall be FAST & TIGHT, Formula PV-2 as manufactured by Parker Hannifin, Kent, Ohio, or equal.

W-30.06 Workmanship

Working drawings, delivery, erection, testing, insulation, and disinfection of miscellaneous pipe and fittings shall meet the applicable portions of similar requirements for ductile iron pipe specified under the respective sections of Workmanship and Materials.

– END OF SECTION –

SECTION 31 - HANGERS AND SUPPORTS

W-31.01 General

Hangers and supports shall include all hanging and supporting devices of metallic construction shown, specified, or required for pipelines, apparatus, and equipment other than electrical equipment. The Contractor's working drawings, as required by the General Provisions hereof, shall show the quantity, type, design, and location of all hangers and supports required.

W-31.02 Materials

Structural and miscellaneous steel, iron castings, cast-iron pipe, and steel pipe used for hangers and supports shall meet the requirements of the applicable Workmanship and Materials sections.

W-31.03 Design

Hangers and supports not detailed on the Drawings shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions with due allowance for expansion and contraction, and shall have springs where necessary. Hangers and supports shall be of standard design where possible, and be best suited for the service required, as approved by the Engineer. Where required, they shall be screw adjustable after installation.

Supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. Sufficient hangers and supports shall be installed to provide a working safety factor of not less than five for each hanger.

All supporting devices shall be designed as to minimize interference with access and movement. The injury hazard shall be considered and minimized in all protruding supporting devices.

On pipes which are covered with heating insulation, hangers and supports shall include proper pipe protection saddles.

Overhead hangers shall be supported by threaded rods properly fastened in place by suitable screws, clamps, inserts, or bolts, or by welding.

Brackets for the support of piping from walls and columns shall be made of welded steel and shall be designed for three maximum loads classified as follows:

Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

When medium or heavy brackets are bolted to walls, backplates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. When the use of backplates is not practicable, the brackets shall be fastened to the wall in such a manner that the safe bearing strength of the wall will not be exceeded.

Pipe rolls or chairs shall be of the cast-iron type. Pipe rolls shall be provided with threaded nuts or with sockets to take threaded rods.

Saddle stands shall be of the adjustable type. Each stand shall consist of a length of steel pipe fitted at the base with a standard threaded cast-iron flange and at the top with an adjustable

saddle or roll. The base flanges shall be bolted to the floor foundation or concrete base.

Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with cast-iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.

Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller may be supported on cast-iron, malleable iron, or steel hook, hook plates, rings, or ring plates.

W-31.04 Anchors

Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval by the Engineer.

Anchors for piping shall be of the cast-iron chair type with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

W-31.05 Inserts

Inserts for concrete shall be galvanized and shall be installed in the concrete structures where required for fastening supporting devices. They shall be designed to permit the rods to be adjusted horizontally in one place and to lock the rod nut or head automatically. Inserts shall be recessed near the upper flange to receive reinforcing rods. Inserts shall be so designed that they may be held in position during concrete placing operations. Inserts shall be designed by the rod which they engage.

W-31.06 Painting

Hangers, supports, anchors, and similar devices shall be painted in accordance with the Workmanship and Materials section headed "Painting."

– END OF SECTION –

SECTION 32 - VALVES

W-32.01 General

This section includes all valves to be used on City maintained force mains, City owned pump stations and the Howard F. Curren Advanced Wastewater Treatment Plant. Requirements of this section apply to all valves unless exceptions are shown or stated on the plans or specific provisions.

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

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

Valves 2 inches in diameter and smaller shall be all brass or bronze, except the handwheel, and shall have screwed ends. Valves 2-1/2 inches in diameter and larger shall be iron body, bronze mounted with flanged ends, except that in the smaller sizes, valves may be all bronze at the Contractor's option.

All gate, globe, and angle valves shall have rising stems, unless otherwise specified, and shall open when the nut or handwheel is turned counterclockwise. Each handwheel shall be marked with an arrow and the word "Open.” Each nut shall be marked with an arrow and shall not be greater than 24 inches in depth below finished grade.

All references to “stainless steel” or “SS” shall mean 316 stainless steel.

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

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

W-32.02 Submittals

The Contractor shall prepare and submit for approval a complete detail drawing of all valves and valve actuators in accordance with the requirements of the General Provisions. At a minimum the submittal shall show all proposed materials used for all components, weights and dimensional data for all assemblies, as well as proposed interior and exterior coating manufacturer, coating type and proposed minimum dry film thickness.

For pneumatically actuated valves, include cut sheets for all components such as solenoid valves and positioners along with electrical power and signal requirements to make each valve suitable for open/close or modulating service as called for herein. Prepare and submit a table of the torque requirements for each actuated valve and the corresponding valve actuator capacity to demonstrate that the valve actuator has been properly sized and will satisfy the minimum torque requirements.

W-32.03 Flanges

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

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

W-32.04 Gate Valves

Except as otherwise specified, gate valves shall meet the requirements of Fed. Spec. WW-V-54, Class A, 125 pounds and shall be manufactured in compliance with the latest edition of ANSI/AWWA C515. All gate valves and tapping valves shall be of the American Flow Control Series 2500 resilient wedge gate valves, or approved equal.

Gate valves shall have standard stuffing box seals. Bonnet bolts, studs, and nuts shall be cadmium plated. Wedging devices shall be bronze to iron or bronze to bronze as specified. Glands shall be bronze bushed; gland bolts and nuts shall be bronze.

Gate valves 2-1/2-inch diameter and larger shall be of the double disc type. Gate valves 2-inch diameter and smaller may be of the double disc or solid wedge type.

Valves with operating nuts or wheels 7 feet or more above the floor shall be provided with chains and chain wheels.

W-32.05 Globe and Angle Valves

Except as otherwise specified herein, globe and angle valves shall meet the requirements of Fed. Spec. WW-V-51, Class A, 125 pounds.

W-32.06 Hose Valves

Hose valves shall be globe or angle valves with rising stems, and rubber composition discs for cold water pressures up to 200 psi, nonshock.

Hose valves shall be all bronze or brass, except the handwheel which shall be of malleable iron. Hose threads shall conform to ANSI B2.4.

W-32.07 Check Valves

Check valves, unless otherwise specified, shall be APCO Series 100 of the horizontal, swing type designed to allow full diameter passage and to operate with a minimum loss of pressure. A Letter of Standardization has been executed for this valve. The letter states that no other valve shall be considered an “or equal” in accordance with the City’s standardization program. The “or equal” clause applies to all other equipment, unless specifically excluded by a Single Source Certificate or Letter of Standardization.

Check valves shall have body and body cover of heavily constructed cast iron meeting requirements of ASTM A48, Class 30. Check valve body shall have integrally cast-on end flanges. The flapper shall be rubber and have an "O" ring seating edge and be internally reinforced with steel. The flapper shall be easily replaced while the valve remains in place.

The exterior of the check valve shall be factory coated with an approved interior and exterior corrosion resistance coating. The exterior of the check valve shall receive a field coat as indicated for “Steel Pipe and Fittings” in the Workmanship & Materials Section titled “Painting”.

W-32.09 Eccentric Plug Valves

Plug valves shall be of the eccentric valve design and shall meet or exceed the requirements of AWWA C517 and shall be designed for 175 PSI 3’-12” and 150 PSI 14”-36”. Manufacturer’s Name shall be cast in body and Valve shall be serialized for future parts identification. Port area shall be 100% of standard pipe area. The Plug shall be Rectangular with associated Rectangular Port and shall provide dead tight shutoff when seated in the closed position. Body material shall be Cast Iron ASTM A126

Class B, Seats shall be 1/8” thick 95% Nickel and 1/2" wide for proper plug seating. Plug shall be Ductile Iron ASTM A536 and Chloroprene Faced. Bearings shall be sintered, oil impregnated permanently lubricated type 316 stainless steel, include upper and lower grit excluders to prevent grit and foreign solids from entering the bearings. Shaft seals shall be multiple V-ring type and shall be externally adjustable via an air gap and re-packable under pressure without removing the actuator or bonnet from the valve. Valves shall have interior and exterior epoxy.

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

Plug valves shall be provided with pneumatic actuators as specified under W-33. Pneumatic actuators shall be supplied with the valve by the valve manufacturer as a complete single source responsibility unit.

Plug valves shall be Dezurik PEF (100% Port) eccentric plug valve. This valve manufacturer is standardized and no other manufacturers will be considered.

W-32.10 Knife Gate Valves

Valves shall be bonnetless wafer knife gate type with cast single-piece body construction. Lugged ends shall have threaded holes in accordance with ANSI B16.1 125/150 pound standards. Working pressure rating shall be 150 psi in sizes 2”-24”. Valve body and gate shall be stainless steel type 316 or as specified. Stem shall be type 304 stainless steel. Valve shall have a round port equal to 100% of the connecting pipe. Valves shall be chloroprene resilient seated or as specified.

The body design shall have no pockets or grooves in the flow port where media can settle and adversely affect closure. The gate shall be polished to provide low thrust requirements and long packing life. The leading edge of the gate shall be beveled to assist in closure. The stem shall be outside of the body and will not contact the flowing media. Valves shall have multi-layer square packing with adjustable packing gland bolting.

All valve bodies shall be tested with water at 150% of rated pressure with no visible leakage. Assembled valves shall be tested for seat leakage with water at 40 psi applied to the back of the gate (pressure in the normal flow direction) and allowable leakage shall be as per MSS SP-81 specifications.

Knife gate valves shall be equipped with deflector cones to protect the seat and body from wear as well as preventing build up material on the seat, or from becoming lodged in the valve body chest . Deflector cone material shall be 316 SS. Valve superstructures shall be designed to allow easy field interchangeability between manual and pneumatic actuators. New superstructures shall not be required for conversion between manual and pneumatic operators.

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

Valves shall be model GKU by DeZURIK, Inc, or approved equal. Knife gate valves, where indicated on the Drawings, shall be fitted with a pneumatic actuator meeting the requirements as specified under W-33 for open/close service.

W-32.11 Pinch Valves

Modulating pinch valves for the grit flow control shall be of the full cast body, mechanical pinch type with flange joint ends. The flanges shall be drilled and tapped to mate with ANSI B156.1, Class 125/ANSI B16.5, Class 150 flanges.

The sleeve trim shall be one-piece construction with integral ANSI flanges drilled to be retained by the flange bolts. Valve shall have a fusion-bonded epoxy coated ductile iron body. The sleeve trim shall be reinforced with calendared nylon or calendared polyester fabric to match service conditions. The sleeve trim shall be connected to the pinch bar by tabs imbedded in the sleeve trim reinforcing ply. All internal valve metal parts are to be completely isolated from the process fluid by the sleeve trim. To promote laminar flow, the interior surface of the sleeve shall be smooth. Sleeves manufactured with interior arches or folds shall not be permitted.

The fixed pinch bar shall be set to pre-pinch the sleeve so that the minimum full open area is centered in the valve. The port areas shall be 100% of the full pipe area at the valve ends.

The closing mechanism shall be designed so that the upper and lower stainless steel pinch bars move at the same time. The sleeve shall be Buna-N and shall close to form a leak-proof seal. The inside diameter of the sleeve shall be equal to the inside diameter of the pipe. The mechanism shall be supported by a grove in the valve body to prevent forward thrust of the mechanism. To prevent pitting, corrosion, seizing and jamming, the pinch mechanism and side-rails shall be fully enclosed within the valve body. Side-rails that slide through bushings or protrude through the valve body shall not be permitted. There shall be no cast parts in the operating mechanism. The mechanism shall be connected to the pneumatic actuator through an ACME threaded stem. The pinch mechanism shall be adjustable for stroke without removing the valve from the line. Valve shall be manufactured in the USA.

All valves shall be of the series 5200-E as manufactured by the Red Valve Co., Inc. of Carnegie, PA 15106 or approved equal.

Pinch valves shall be fitted with a pneumatic actuator meeting the requirements as specified under W-33 for modulating service. Pinch Valve Criteria:

Parameter	
Maximum Working Pressure	15 psi
Minimum/Maximum Upstream Pressure	20/30 psi
Minimum/Maximum Downstream Pressure	3/15 psi
Valve Size	4 inch

W-32.12 Solenoid Valves

Solenoid valves, unless otherwise shown or specified, shall be normally closed packless type with full area ports. The body and bonnet shall be Type 316 stainless steel and the solenoid core shall be stainless steel. The diaphragm shall be of synthetic rubber assuring long service life. The coils shall be designed for 115-volt, 60-hertz operation and shall be embedded in molded plastic in NEMA rated explosion proof, hazardous area.

W-32.13 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-32.14 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.

W-32.15 Sewage Air Release Valves

The Contractor shall furnish and install sewage air release valves where indicated on the Drawings, and specified herein. Air release valves shall be designed to allow large quantities of air to escape out the orifice when filling a pipeline and to close watertight when the liquid enters the valve. The discharge orifice area shall be equal to or greater than the inlet of the valve.

The valve shall consist of a body, cover, baffle, float and seat. The baffle shall be designed to protect the float from direct contact of the rushing air and water to prevent the float from closing prematurely in the valve. The seat shall be fastened into the valve cover, without distortion, and shall be easily removed, if necessary. The float shall be stainless steel designed to withstand a maximum pressure of 1000 psi. The float shall be center guided for positive shutoff into the seat. Valves shall be designed for a working pressure of 150 psi.

Air release valves shall have a plain outlet. All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

Body, cover	Cast iron	ASTM A 126 Gr. B
Float	Stainless Steel	ASTM A 240
Seat	Buna-N	

Sewage air release valves shall have outlets and inlets of the size as shown on the Drawings. Sewage air release valves shall be APCO (Valve and Primer Corp.) Series 400, or equal.

W-32.16 Tapping Valve and Sleeve

The tapping valves shall conform to the applicable requirements of ANSI/AWWA C500. Valves shall be installed as shown on the Drawings and shall be designed for 150 psi working pressure. Valve body shall be cast iron ASTM A 126, Class B or ductile iron ASTM A 395 or A 536. Valves shall have a bronze trim, double disc, a non-rising stem and parallel or inclined seats. Stem seals shall be neoprene O-rings. The valve shall open counter clockwise and have enclosed bevel gears, track rollers and scrapers and a standard bypass valve. The inlet shall be ANSI sized to match the tapping sleeve. The outlet shall be a mechanical joint connection. The valves shall be as manufactured by Mueller, American, or equal.

The Contractor shall verify the material and diameter of the existing lines to be tapped prior to ordering the sleeve. The tapping sleeves for prestressed concrete cylinder pipe shall be in accordance with AWWA M9. The sleeves shall have a separate gland which permits installation of the sleeve prior to cutting of the prestress wires. The gland shall have an AWWA C213 fusion epoxy coated waterway, and a broad gasket set in a retaining groove of a pressure plate gusseted to eliminate flexing. The gland shall be equipped with load bearing setscrews to protect the cylinder. Grout under the saddle shall be required whether the saddle is epoxy coated or not. The grout shall provide uniform bearing transfer between the rough mortar coating and the saddle. Sleeves shall be furnished with grouting seals and grout horns to facilitate filling the space between the sleeve and the pipe. Tapping sleeve straps, bolts and nuts shall be stainless steel or hot-dip galvanized after fabrication in accordance with ASTM A 123 and ASTM A 385. All internal threads shall be tapped or retapped after galvanizing. The tapping sleeve shall be a Price Brothers Company Tapping Sleeve for prestressed concrete cylinder pipe, or equal.

W-32.17 Corporation Stops

Corporation stops shall be provided with all service saddle connections. Corporation stops shall be O-ring sealed, balance pressure, plug type valves having a full open unobstructed flow way. Corporation stops shall be suitable for buried service and shall have threaded inlet and outlet connections unless otherwise indicated.

The suppliers shall be the following or equal:

1. Ford Meter Box Company;
2. James Jones Company;
3. Mueller Company.

W-32.18 Tapping Saddles

Tapping saddles shall fit to the maximum O.D. of the saddle's range, and extend a minimum of 160 degrees around the pipe. When the saddle is used on pipe to the minimum pipe size of the range, the saddle shall extend 180 degrees around the pipe. Straps shall have ends chamfered and be provided with Class 2 fit, National Coarse Threads. Saddle casting shall be ductile iron, double strap and shall have fusion-bonded epoxy coating, minimum 12 mils. Straps, bolts, washers, and Teflon-coated nuts shall be Type 304L stainless steel. Valve gaskets shall be self-sealing, neoprene except for chlorine lines which shall be Viton.

W-32.19 Small Pressure Reducing Valves (Air and Water)

Air and water pressure reducing valves through 3-inches in size shall be of the spring-loaded diaphragm type with a minimum pressure rating of 250 psi, with bronze body, nickel alloy or stainless steel seat, and threaded ends. Each valve shall be furnished with built-in or separate strainer and union ends. Valve rating shall be such that setpoint is near mid-span of the valve’s full range. The suppliers shall be Mueller Company, Watts, Wilkens, or approved equal.

W-32.20 Quick Connect Couplings and Dust Caps

Quick connect couplings and dust caps shall be provided on all chemical fill lines and where shown on the Drawings or specified. Quick couplings shall be manufactured to the dimensional specifications of MIL-C-27487 for compatibility with couplings of other manufacturers and delivery hose systems and shall match the City’s selected vendor’s hoses on delivery trucks. Insulating type fittings or Teflon tape shall be provided to prevent galvanic action between dissimilar metals. Couplings shall be made type OPW Figure 633-
A (threaded) or Figure 633-LAS (flanged) – dust caps shall be OPW 643-B. A 1/16-inch vent opening shall be drilled in each dust cap to prevent pressurization of the cap. Coupling and dust cap materials shall be type 316 stainless steel of material suitable for service intended, subject to Engineer's acceptance.

W-32.21 Hose Bibbs

Hose bibbs shall be 3/4-inch globe valves as specified herein with stainless steel quick connect female coupling to match quick connect male coupling on hoses provided.

W-32.22 Washdown Hoses and Nozzles

Hoses shall be 3/4 inch diameter abrasion and weather resistant (0.47 lb/LF) EPDM red cover, rayon braided hose with 8 inch plain brass hose nozzle on discharge end and 3/4 inch stainless steel quick connect coupling on supply end. All components shall be as manufactured by Amazon Hose & Rubber Company, or approved equal.

Hoses shall be provided as follows:

Grit Washer area – one (1), 50-foot hose

W-32.23 Wye Strainers

Strainers for sizes 2 ½ inches and smaller shall be Y-type manufactured of transparent Type I, Grade 1 PVC with threaded, true-union ends. Strainers for sizes 3 inches and larger shall be Y-type with all ductile iron bodies and flanged ends. Screen for strainers shall be 20 mesh Type 304 stainless steel. The screen shall be easily removed for cleaning or replacement from the filter body without removing the body from the pipeline. Bonnet seal shall be EPDM "O" rings. Pressure rating shall be minimum 90 psi. Strainers shall be as manufactured by Asahi/America for PVC type, and shall be as manufactured by Watts for iron type, or approved equal.

W-32.24 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-32.25 Painting and Coating

Plug valves shall receive a factory interior and exterior coating of Tnemec Series 141 (4 mils thick).

All other valves shall receive a factory interior and exterior coating of an approved system.

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

Chain wheels shall be coated by galvanizing or electroplating with zinc or cadmium. The chain shall be coated by electroplating with zinc or cadmium. Zinc electroplating shall meet the requirements of Fed. Spec. QQ-Z-325, Type II, Class 2; and cadmium electroplating shall meet the requirements of Fed. Spec. QQ-P-416, Type II, Class 2.

W-32.26 Ball Valves for PVC Piping

Manually operated ball valves for PVC piping shall be PVC 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 PVC 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. PVC ball valves shall be as manufactured by Hayward Industrial Products, Inc., or equal.

W-32.27 Stainless Steel Ball Valves

Ball valves for use with stainless steel piping systems, including instrument isolation and pneumatic air lines shall be end entry type with type 316 stainless steel body and trim, Teflon seats and seals and end connections as indicated. Valve body shall be either two or three piece design, no internal ring for the ball shall be acceptable. Valves shall be class 150. Valves shall be supplied with stainless steel manual lever or "T" handle. Provide an isolation ball valve on the feed to each pneumatic actuator and for isolation on all instruments. Stainless steel ball valves shall be as manufactured by Janesbury Corporation, Jenkins Bros., Lunkenheimer Flow Control, Wm. Powell Company, Worcester Controls, or equal.

– END OF SECTION –

SECTION 33 – PNEUMATIC VALVE ACTUATORS

W-33.01 General

This section includes all pneumatic valve actuators to be supplied with plug valves, knife gate valves, and pinch valves as noted on the Drawings at the Howard F. Curren Advanced Wastewater Treatment Plant. Requirements of this section apply to all pneumatic actuators unless exceptions are shown or stated on the plans or specific provisions.

Plug valves requiring actuators shall be provided with quarter turn, open-close, non-modulating actuators as specified herein.

Pinch valves and knife gate valves requiring actuators shall be provided with multi-turn, linear modulating actuators as specified herein.

All references to “stainless steel” or “SS” shall mean 316 stainless steel.

All actuators shall be from a single manufacturer for each type of actuator with identical make and model from that manufacturer. Parts of actuators of the same type shall be interchangeable.

All actuators shall be carefully fitted on to their respective valves by the valve manufacturer at the factory, free from all deflection and strain, and installed with orientation that allows for adequate visibility of valve position, ease of access for maintenance, and demonstrated to be ready for satisfactory operation.

Furnish and install the required Type 316 stainless steel air tubing with fittings, connections, taps, isolation valves, solenoids, wiring, and terminations necessary for a complete valve actuator system for each actuated valve shown on the Drawings. Each actuator shall have an isolation safety exhaust valve with locking handle provided at each branch airline to the actuator. Air tubing shall be furnished and installed from the nearest existing air supply line to the actuators. Slope new air lines back and down to the existing supply line with connections made off the top of the existing line.

Coordinate between the pneumatic valve actuator supplier, the valve supplier, and the control system supplier to provide complete and fully operational actuated valve systems, providing actuators that are capable of sending and accepting the necessary signals from the control system and providing full and reliable actuation of the valve provided. The valve/actuator supplier shall provide any limit switches, positioners or other devices necessary to enable the status of the valves (OPEN/CLOSE or position for modulating valves) to be monitored and controlled by the control system as noted on the Drawings.

W-33.02 Submittals

The Contractor shall prepare and submit for approval a complete detail drawing of all valves / valve actuator assemblies in accordance with the requirements of the General Provisions. In addition to valve information required under Section W-32, the submittal shall show all proposed materials used for all actuator components, actuator weights and dimensional data, as well as valve and actuator assembly weight and proposed orientation for actual installation.

For each type of pneumatic actuator, include cut sheets for all components such as solenoid valves and positioners along with electrical power and signal requirements to make each valve suitable for open/close or modulating service as called for herein. Prepare and submit a table of the torque requirements for each actuated valve and the corresponding valve actuator capacity to demonstrate that the valve actuator has been properly sized and will satisfy the minimum torque requirements. The following submittals are required at a minimum:

1. Shop drawings and applicable product data specific to each product with the following information:
    a. Manufacturer and model number of each device with a schedule showing all actuators and valves furnished for this project.
    b. Design performance characteristics, capacities, sizes, ratings, and other appropriate information.
    c. Layout drawings including all proposed system components with dimensions, clearances required and sizes indicated, and arrangement and size of connections.
    d. Listing of materials of construction for all components.
    e. Complete information on all electric and instrumentation equipment and electric power requirements.
    f. Complete wiring diagrams and data on controls to be furnished.
    g. Manufacturer's instructions regarding delivery, storage and handling of equipment.
    h. Adjustable settings with range provided for valve opening, closing, and emergency closing speeds.
2. Complete operation and maintenance data for the actuators
3. Warranties information.

W-33.03 Quality Assurance

Supplier shall maintain a complete stock of spare parts commonly needed for the actuators specified at a location within the State of Florida or Supplier shall demonstrate ability and willingness to guarantee the furnishing of spare parts within 48 hours of request.

All pieces of equipment shall have an engraved Type 316 stainless steel manufacturer's nameplate securely affixed in a conspicuous place on the actuators showing the ratings, serial number, model number, manufacturer and other pertinent nameplate data.

W-33.04 Experience Requirements

All equipment shall be furnished by a supplier or manufacturer having at least twenty (20) installations in the US of the type being proposed, including coordination and assembly responsibility for the actuator on the associated valve type for a complete package, each with a minimum of 5 years of satisfactory service.

A list of similar installations shall be furnished with the shop drawing submittal, including names and telephone numbers of contacts.

W-33.05 Delivery, Storage, and Handling

Delivery, storage and handling shall be in full accordance with actuator manufacturer's instructions as well as each actuator is to be assembled at the valve manufacturer’s factory and shipped accordingly with the valve, fully assembled and ready for installation in the associated piping.

W-33.06 Warranty

All actuator assemblies shall be warranted for a period of two (2) years from the date of final acceptance or three (3) years from date of shipment, whichever comes first. Actuators shall be fully warranted by the actuator manufacturer for full replacement in the event of failure of any type. A certificate listing actuator serial numbers shall be provided prior to shipment in order to validate the warranty.

W-33.07 Open-Close, Quarter Turn Pneumatic Actuator

The plug valve manufacturer shall fit valves with pneumatic valve actuators. All actuators shall be sized to cover the full torque range of each plug valve over the full travel and operating conditions. Actuators shall comply with state, federal and local requirements for designated area classification as specified herein

Actuator Design: Pneumatic actuators for plug valves shall be of the vane type design with only one (1) moving part. Actuator shall have a vane position indicator milled into the output shaft. One side of the actuator shall be manufactured to ISO/NAMUR mounting standards for attachment of accessories (limit switches, indicators, positioners). Seals shall be double opposed lip seals with stainless steel expanders. Seal backing plates shall be steel. 0-ring seals on vane will not be acceptable.

A. Actuator Materials of Construction:

1. Housing: Pressure die cast ADC1 or A356 aluminum casting with all surfaces coated with thermosetting polyester powder coat with Ultraviolet Inhibitor. Actuator housing to include industry-standard NAMUR accessory mount interfaces as an integral part of the housing. The NAMUR VDWDE 3845 to be included on top of the actuators and on the solenoid manifold to allow for the easy installation of standard actuator control accessories.

   (i) Provide a Fluoropolymer final finish on both the actuator interior and exterior and on the complete vane and output shafts suitable for highly corrosive ambient conditions.

   (ii) The Fluoropolymer coating shall have documented testing to chemical resistance to salt spray, ammonium hydroxide, hydrochloric acid, calcium hypochloride, sodium hypochloride, ferric chloride, among other chemicals for a period of six (6) months with no deterioration.

   (iii) Vane actuator case halves will have Fluoropolymer coating prior to assembly. The case halves shall be Fluoropolymer coated on all surfaces including all tapped holes, untapped holes, flat face flange, and any other opening or ports.

   (iv) Actuator vane shall be electroless nickel-plated finish prior to application of the Fluoropolymer coating on vane.

   (v) All threaded fittings shall have a locking and sealing compound designed for metal tapered threads and fittings. All actuators shall be tested after assembly. Actuators shall not require more than three (4) psig to be cycled a complete stroke in each direction before they are connected to the valve. Test report documenting zero (0) cross vane leakage shall be submitted prior to shipment.

2. Vane / Output Shaft: Steel ASTM A148 per AWWA C541-2, Grade 115-95, heat treated with electroless nickel plated finish.

3. Vane Seals: HBNR highly-saturated Buna Nitrile, rated -5 to +300 degrees F.

4. Shaft Seals: Buna N.

5. Vane Seal Expanders: Stainless spring steel.

6. Side Plates: Steel with all surfaces coated with thermosetting epoxy powder coat.

B. Actuator Position-Control Capability:

1. Open/Close Valves: Actuators shall be solenoid operated. Solenoids for smaller size actuators shall be standard ISO/NAMUR VDWDE 3845 direct mounted with the option to be remote mounting for increased accessibility. Solenoid coils shall be NEMA 4 rated and operate on 120V (verify with control supplier). Speed control devices shall allow independent adjustment of OPEN and CLOSE cycling speed. Each solenoid valve to include detented pushbutton manual override to lock-and-hold valve in either the OPEN or CLOSE position in the event of a power outage. Exhaust air mufflers shall be standard. Solenoid valves shall be K-TORK 'SIDEWINDER' Series.

   Each Open/Close actuator shall include valve position feedback limit switches for remote OPEN and CLOSE indication. Two SPDT switches shall be housed in a NEMA 4/4X aluminum enclosure with polycarbonate lid and include a 3D Dome-style visual valve position indicator that can be seen from above and from the side. Green=Open and

Red=Close. The switch box output shaft and fasteners to be stainless steel and shall mount to the actuator per NAMUR VDWDE 3845 with a stainless steel bracket. The two electromechanical switch contacts shall be rated 5A@250 VAC, 0.5A@24 VDC, resistive/inductive. Limit switches shall be adjustable by press, turn and release motion requiring the use of no tools. The limit switch assembly to be UL and CUL Listed and approved and shall be manufactured by Rotork / K-TORK `SOLD0' Series.

The solenoid coil must be pre-wired to spare terminals labeled 'Solenoid Valve' inside the limit switch enclosure and all field connections for both the limit switches and solenoid valves shall be terminated inside the limit switch box.

2. Mechanical Manual Override: Actuator shall include a mechanical worm gear manual override de-clutch gearbox and hand wheel to be mounted between the valve and the actuator. The manual override shall be able move and hold the valve in any position between full OPEN and full CLOSE after incoming air is isolated and bled off. When the actuator is in 'AUTO' operation, the gear shall be declutched and will 'free wheel'. The engagement lever shall include a stainless steel legend plate clearly identifying the lever position with "AUTO" and "MANUAL". The manual override shall be capable of remaining on the valve and fully operational with the actuator removed and include two mechanical valve position stops. The manual override shall have a cast iron housing and stainless steel input shaft and fasteners, rated for IP68 / NEMA 4/4X environments. The manual override shall have an EPDXY NZ PRIMER and Polyurethane finish paint, both 40 - 60 microns. Hand wheel diameter to be selected to limit rim pull to a maximum of 80#. Include 3-way actuator vent valve(s) as required to bleed the actuator and isolate the supply air during manual operation. The 3-way vent valve(s) shall include "Auto" and "Manual" legend plate and the hand wheel shall include OPEN and CLOSE designations and directional arrows. The de-clutch manual override shall be manufactured by Rotork / K-TORK, the actuator supplier without exception.

C. Torque Capability: The rated torque capability of each actuator shall be sufficient to seat, unseat, and rigidly hold, in any intermediate position, the valve disc it controls under the operating conditions specified herein. Torque safety factors shall conform to AWWA Standards and in no case be less than 1.25 times the valve manufactures specified torques based on operating conditions.

D. Safety Factor: Actuator housings, supports, and connections to the valve shall be designed with a minimum safety factor of 5, based on the ultimate strength, or a minimum safety factor of 3, based on the yield strength of materials used.

E. Electrical Classification: All electrical components and enclosures shall be rated Class 1, Division 1, Group D, hazardous.

F. Stop-Limiting Devices: Valve actuators shall be equipped with adjustable mechanical stop-limiting devices to prevent over-travel of the valve disc in the open and closed positions. Position stops shall provide, at minimum, 80 to 100 degrees of adjustable travel.

G. The pneumatic actuators shall have a working pressure of 150 psig per AWWA C541-08 standards with an overload pressure of 220 psig.

H. Actuators shall be equipped with adjustable flow-control devices controlling the operating air exhausting from the actuator. The devices shall be located at or near the actuator or on the solenoid valve. The opening and closing speeds shall be nominally set for a range of 30 to 90 seconds, variable with valve sizes. Final adjustments shall be made by the purchaser to minimize line surges during normal operation.

I. Actuators shall not require more than three (4) psig to be cycled a complete stroke in each direction before they are connected to the valve.

J. Bracket and Couplings:

1. Custom fabricated bracket to adapt the actuator to the new or existing (retrofit) valves shall be heavy wall rectangular carbon steel tube and shall retain the valve stem packing or provide for use of the original draw-down packing gland as required.

2. All brackets and couplings shall have electro statically applied fusion bonded polyester powder coated finish.

3. Couplings shall be made of bar stock carbon steel with keyway and stainless steel setscrew.

J. Acceptable Manufacturers: Rotork K-TORK Actuators or approved equal.

W-33.08 Modulating, Linear, Pneumatic Actuator with Electro-pneumatic positioner

The pinch valve and knife gate valve manufacturer shall fit valves with pneumatic actuated modulating valve actuators. Pinch valves and knife gate valves shall have linear actuators suitable for operation with the valves supplied. All actuators shall be sized to cover the full torque range of each actuated valve over the full travel and operating conditions. Actuators shall comply with state, federal and local requirements for designated area classification as specified herein.

A. Actuator Materials of Construction:

1. Housing: Carbon steel with all surfaces coated with a baked-on enamel coating highly resistant to corrosive ambient conditions.
2. Piston and Tie Rods: Chrome plated alloy steel.
3. O-Ring Seals: Buna N.
4. Cylinder Tube: Nickle-plated carbon steel.

B. Actuator Position-Control Capability:

1. Modulating Valves: The actuator shall be designed to control the valve in all positions from fully open to fully closed, and from fully closed to fully open with control in any intermediate position corresponding to the variable controls system input. Positioner shall consume a MAXIMUM of .070 SCFM while in the resting state. The positioner will receive a 4-20 mA positioning signal from the control system for precision positioning control of the valve in all positions from closed to open. As standard, the positioner shall include an Auto / Manual switch to allow for local actuator control without removing the positioner cover. Additionally, the positioner will have four pushbuttons for local control located inside the enclosure. The positioner shall have auto-stroke / auto-calibration capability as standard for easy commissioning. LCD 0-100% visual indication of valve position will be located in the positioner cover. Where specified in the Valve Actuator Schedule, provide optically-isolated analog 4-20 mA position transmitter, (2) mechanical limit switches or both, mounted inside the positioner housing. Positioner construction shall be of Aluminum or Stainless Steel (optional), with NEMA 4/4X, IP66 rating and be suitable for -22° F. to +185°. Fasteners to be stainless steel. Provide 80-100 psi clean dry supply air to the positioner. Positioner shall be manufactured and supplied by the actuator manufacturer and shall be intended for use with the actuator provided for modulating application. Positioner shall be as manufactured by the actuator supplier.

C. Torque Capability: The rated torque capability of each actuator shall be sufficient to seat, unseat, and rigidly hold, in any intermediate position, the valve disc it controls under the operating conditions specified herein. Torque safety factors shall conform to AWWA Standards and in no case be less than 1.25 times the valve manufactures specified torques based on operating conditions.

D. Safety Factor: Actuator housings, supports, and connections to the valve shall be designed with a minimum safety factor of 5, based on the ultimate strength, or a minimum safety factor of 3, based on the yield strength of materials used.

E. Electrical Classification: All electrical components and enclosures shall be rated Class 1, Division 1, Group D, hazardous.

F. Stop-Limiting Devices: Valve actuators shall be equipped with adjustable mechanical stop-limiting devices to prevent over-travel of the valve open and closed positions. Position stops shall provide, at minimum, 80 to 100 degrees of adjustable travel.

G. The pneumatic actuators shall have a working pressure of 150 psig per AWWA C541-08 standards with an overload pressure of 220 psig.

H. Actuators shall be equipped with adjustable flow-control devices controlling the operating air exhausting from the actuator. The devices shall be located at or near the actuator or on the solenoid valve. The opening and closing speeds shall be nominally set for a range of 30 to 90 seconds, variable with valve sizes. Final adjustments shall be made by the purchaser to minimize line surges during normal operation.

I. Actuators shall not require more than three (4) psig to be cycled a complete stroke in each direction before they are connected to the valve.

J. Bracket and Couplings:

1. Custom fabricated bracket to adapt the actuator to the new or existing (retrofit) valves shall be heavy wall rectangular carbon steel tube and shall retain the valve stem packing or provide for use of the original draw-down packing gland as required.
2. All brackets and couplings shall have electro statically applied fusion bonded polyester powder coated finish.
3. Couplings shall be made of bar stock carbon steel with keyway and stainless steel setscrew.

J. Acceptable Manufacturers: Rotork LP Actuators or approved equal.

W-33.09 Testing

The following actuator tests shall be performed. The purpose of the proof-of-design test is to prove that the design, material selection, and manufacture of the actuator are suitable for the purpose intended as defined by this standard. The purpose of the performance test is to prove that each actuator is in working order prior to being placed in service. Actuators shall meet the requirements for each type of test.

1. Proof-of-Design Tests: One (1) production sample of each pneumatic actuator type shall be tested. Should the actuator design be changed or modified so as to affect its strength of function, the test shall be repeated in accordance with the requirements of AWWA C504 (latest edition).

2. Performance Tests: Each actuator and valve assembly shall be cycled a minimum of three (3) times in the field using the remote and local controls from the fully closed to the fully open position to demonstrate that the complete assembly, including controls, operates properly.

W-33.10 Field Quality Control

Verify that structures, equipment, pipes, valves, fittings, and other appurtenances are compatible with valve/actuator assembly so they assembly can be mounted as required without interference. Coordinate field devices, voltages, signal types, power needed, and programming with valve actuator to provide proper functioning system.

W-33.11 Manufacturer’s Representative

The services of a manufacturer's technical representative shall be provided for pre-startup installation checks, startup, training of Owner’s personnel, troubleshooting, acceptance testing. Provide at least 1 day per two actuators and all documentation in contract documents pertaining to start up and certificates of proper installation, must be given to rep prior to start up. Manufacturer's representative shall:

1. Approve installation in writing

2. Verify conformance to all specified requirements.

3. Fully instruct all designated personnel for the plant on proper care, maintenance, and operation of all equipment and appurtenances.

4. Perform specified acceptance tests and operate system to verify satisfactory operation of all equipment in presence of Owner's personnel and Engineer.

5. Check all equipment for excessive noise or vibration, proper alignment, general operation, etc.

6. Operate the equipment through the design performance range consistent with available flows. Adjust, balance, and calibrate and verify that the equipment, safety devices, controls, and process system operate within the design conditions. Each safety device shall be tested for proper setting and signal. Response shall be checked for each equipment item and alarm. Simulation signals may be used to check equipment and alarm responses.

7. Place each piece of equipment in the system in operation until the entire system is functioning. All components shall continue to operate without alarms or shutdowns, except as intended, for 8 consecutive hours to be considered started up.

W-33.12 Actuator Controls and Air Supply Connections

Actuators for open/close plug valves and modulating pinch valves shall be electrically controlled through the new Grit Removal System Main Control Panel provided within each building as shown and indicated on the Drawings and specified in Division 17. Air supply to be connected by the Contractor using all stainless steel pipe, minimum 3/8" internal diameter or match existing, which ever is greater.

Provide a stainless steel ball valve (see Section W-32) for each air supply line to each plug valve and pinch valve actuator. Ball valve size to match air line size.

Actuators for the replacement knife gate / actuator assembly shall be connected to the existing air supply line piping, extend and/or modify as needed. Control of the knife gate shall be through the existing manual operation valves at the truck loading bay floor level. Test actuators using manual valves (no electric connection).

– END OF SECTION –

SECTION 35 - MAGNETIC FLOW METERS

W-35.01 General

The flow meter system, including the flow elements and remote signal converter (transmitter) shall be manufactured by ABB Ltd., Process Master Series, FEP325 process flow tube and FET325 remote transmitter. This flow meter manufacturer is standardized and no other manufacturers 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 of sufficient length to connect meter with remote transmitter, 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, a nonconductive liner material rated for raw sewage service. For the intended service as described in this document, a meter housing rated for IP68/NEMA 7, explosion proof, continuous submergence conditions and an exterior coating consisting of a corrosion resistant finish. Output signal from the metering tube shall be fed through a continuous signal cable pre-connected by the manufacturer to the metering tube with factory prepared ends that are prepared and ready to be terminated at the remote signal converter. Length of cable shall be as required for the distance between each meter and it's associated remote signal converter. Type 316 stainless steel grounding rings shall be provided. The flow meter shall have an operable measurement range of 1000:1, and shall have bi-directional measurement capability with forward, reverse and net totalization.

The signal converter/transmitter shall use a DC pulsed technique to drive bi-polar flux-producing coils and convert the DC pulse signal from the tube to a 4-20 MA DC signal. The signal converter/transmitter shall be microprocessor based, and have a LCD back-lit display with forward/reverse/net flow register, flow rate indication register, and alarm monitoring icon housed in an 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 7 Designed for continuous submergence, hazardous area, FM Class 1, Div 1 explosion protection
Transmitter:	IP65/NEMA 4X Remote signal converter
Accuracy:	0.20% of reading or +/- 0.003 ft/sec up to a maximum velocity of 49ft/sec
Repeatability:	0.05% or +/- 0.008ft/sec.
Rangeability:	1000:1
Temperature:	Up to 80°C.
Power:	90 to 260VAC. Power consumption <20VA with transmitter
Output:	4 to 20 MADC into 800ohms. Isolated and fully programmable Two pulse/frequency outputs

W-35.03 Flow Metering Tube

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

The flow meter tube shall be constructed of type 316 stainless steel. The magnetic field generating coils shall be located within the metering tube. The coils shall be potted with an epoxy-base compound. An insulating interior liner of elastomer shall be inserted and turned out against the flange faces. The metering tube shall be capable of withstanding a test pressure of at least 75 PSI. The flow meter shall have 150 pound ANSI or AWWA Class D flanges and built in grounding electrodes. The flow meter shall be rated for continuous submergence to a depth of 30 feet in accordance with the requirements of IP68. The flow meter shall be suitable for mounting within a Class 1, Division 1 classified area for regular exposure to explosive gases.

The metering tube shall have an internal liner of material with sufficient hardness that is certified for use with a grit slurry extracted from raw sanitary sewage.

The flow meter electrodes shall be a flush design suitable for an abrasive fluid with a self-cleaning design and made of type 316 stainless steel. Removable electrodes or ultrasonic cleaners are not acceptable. The input impedance of the electrodes shall be greater than ten million (10,000,000) mega ohms to achieve a meter accuracy that is completely unaffected by coatings. The laying length shall be the current standard for magnetic flow meters (60”). 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, grit slurry 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. The flow tubes shall be sized as noted on the Drawings with full range of 500 gpm and low flow cutoff set at near 0.1 fps.

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 surface 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.

End of Section

SECTION 45 - ELECTRICAL

W-45.01 Scope of Electrical Work

The work consists of furnishing all labor, materials, equipment, transportation, and performing all operations required to support the installation and commissioning of the electrical portion of the HFC AWTP Grit Washer Replacement project. The work includes, but is not limited to, the following:

1. Submit working drawings, parts schedules and cut-sheets to the Engineer.

2. Furnish and install all equipment, controls and instrumentation as shown on the Plans and described in the Specifications.

   Specifically:

   a. In and around the existing grit washers, remove all existing electrical conduits, supports, conductors, and devices associated with the grit washers and header feed valves. This must be done one unit at a time such that one working unit, either new or existing, is left in service and available for operation at all times during construction.

   b. Remove all existing electrical conduits, supports, and devices for the two existing grit system explosion proof control panel enclosure racks after pulling back existing conductors to nearest pull box or condulet. This must be done one panel at a time such that two grit trains are left in service and available for operation at all times during construction.

   c. Install all new conduit, conductors, and electrical devices associated with the two new grit washers including the new control panel, electric motors, motion sensors, NPW solenoid operated valves, feed line flow meters, feed line modulating pinch valve pneumatic operator positioners, and feed line isolation plug valve pneumatic operator solenoid valves (in support of and in coordination with equipment supplied under Division 11).

   d. Install all new conduit, conductors, and electrical devices associated with the two new grit system local control panels, including interface with the existing system isolation gates, grit pumps, grit pump isolation valves, and grit collector electric motors, reusing existing conduits and conductors where applicable and approved by the City (in support of and in coordination with components supplied under Division 17).

   e. Install all new conduit, conductors, and electrical devices associated with the new main grit system control panel (supplied under Division 17), including interface with the existing MCC and control components supplied under Division 11 and 17, reusing existing conduits and conductors where applicable and approved by the City.

   f. Reroute and reuse of existing conductors within existing conduits as needed to separate intrinsically safe conductors from non-intrinsically safe conductors as indicated in the approved shop drawings submitted under Division 17.

   g. Conduits, fittings, conduit bodies, and device boxes shall be rigid aluminum. PVC coated aluminum shall be used in classified areas.

   h. Field verify the operation of existing power and control functions, and mark wires, prior to performing demolition work. Coordinate verification of power and control functions with City personnel and document all such functions for later verification of full restoration of the power and control functions after new

electrical conduit system and equipment are in place and ready to be placed back in service.

i. Coordinate new motors and valve actuators, as well as any re-used motors and gate/valve actuators with existing power and control interface. Field verify conduit/conductor riser diagrams and power/control schematic diagrams of existing equipment, motor control centers (MCCs), and control panels to accurately reflect existing power and control interface for equipment impacted by this project prior to submitting proposed power and control systems. Submit these field verified conduit/conductor riser diagrams and power/control schematic diagrams, marked up as needed, and indicate how new devices will be connected to existing power and control systems to provide a fully functional system, incorporating the return of existing control functions along with adding any new power and control functions required by the new equipment supplied (as indicated by the approved submittals for the equipment). Provide new control and power wires as needed to accommodate new functions.

j. All removed equipment not claimed by the City shall be removed from the premises and disposed of properly.

k. Provide and install all Type 316 stainless steel hardware support systems to mount and support new enclosures, boxes, conduits and other equipment.

l. All electrical work shall be performed in accordance with the 2014 National Electrical Code (NEC) and Chapter 5 of the City of Tampa Code.

m. All electrical work outside the electrical room shall be suitable for Class 1, Division 1, explosion proof, hazardous area rated. All work passing through the walls of the electrical room shall be sealed gas tight both around new conduit penetrations and within the conduits themselves (seal offs).

W-45.02 General Requirements

1. Codes: Any conflicts between the Specifications and Drawings or with the regulations of local codes, public utility company, or the National Electrical Code or the National Electrical Safety Code shall be promptly brought to the attention of the Engineer for clarification. All materials and work shall be in accordance with said standards.

2. Contract Documents: The drawings are generally diagrammatic not necessarily showing in detail all of the minor items and it shall not be interpreted to mean that any minor item required may be omitted. The Contractor shall make use of all the data in all of the Contract Documents and shall verify all information at the site which may influence his proposal. The Contractor shall obtain all necessary shop drawings and shall consult manufacturer's representatives during installation startup as needed.

3. Tests: The Contractor shall provide all necessary instruments and special apparatus to conduct any test that may be required to ensure that the system is free of all improper grounds and short circuits. These tests shall be conducted in the presence of the Engineer prior to final acceptance.

4. Guarantee: The Contractor shall submit a written guarantee to the City that all electrical work and material provided under this Contract is free from defects for a period of two (2) years after final acceptance of the job. There will be no additional charge to the City to repair or replace any such work which is found to be defective within the guarantee period.

5. Materials and Equipment: All materials and equipment shall be new and shall bear the manufacturer's name, date of manufacture, trade name, and the UL label. Equipment

and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection.

6. Operation and Maintenance Manuals: Supply nine sets of operational and maintenance manuals and one complete set of blue line Contract Drawings marked in red reflecting all as-built information.

7. Test Documentation: Test all equipment and document tests.

W-45.03 Execution of Work

All work shall be executed in a neat and workmanlike manner by experienced and capable electricians so as to present a neat installation upon completion.

The execution of work on one drive system shall not interfere with the normal operation of the remaining pumps and drives.

Electrical work shall be coordinated so as not to interfere with or delay other construction operations.

The ends of all conduits shall be carefully reamed free from burrs after threading and before installation. All cuts shall be made square. All joints shall be made up tight. Care shall be taken to see that all control and power conduits are grounded as required by the NEC and Chapter 5 of the City of Tampa Code, Building and Construction Regulations.

– END OF SECTION –

SECTION 46 - CONTROLS

W-46.01 General

Control components shall comply with the latest ANSI, IEEE, and NEMA standards where applicable.

Maximum control voltage shall be 120 VAC, 60 Hertz.

Control devices shall be of industrial grade, heavy-duty design, utilizing modular construction to increase flexibility.

W-46.03 Switches and Push Buttons

Switches and push buttons within the electrical room shall be heavy-duty, oil-tight, watertight, NEMA Type 4X, corrosion resistant units intended for industrial applications. Devices outside the electrical room shall be rated for Class 1, Division 1, explosion proof hazardous area heavy-duty, explosion proof, NEMA Type 7, corrosion resistant units intended for industrial applications. The operator shall mount in a 1.20-inch diameter opening and be provided with the proper legend plate.

Switches and push buttons shall be as manufactured by Square D, General Electric, Allen-Bradley, or equal.

W-46.04 Pilot Lights

Pilot lights for non-classified areas, shall be heavy-duty, oil-tight, NEMA Type 4X, corrosion resistant, push to test, light emitting diode (LED) type, rated for 120VAC, and intended for industrial applications. The operator shall mount in a 1.20-inch diameter opening and be provided with the proper legend plate and lens color.

Pilot lights shall be as manufactured by Square D, General Electric, Allen Bradley, or equal.

W-46.05 Circuit Breakers

Circuit breakers shall be of the molded case, air-break type designed for 600 volt, 60 Hz service or as shown on the Drawings. They shall have both thermal and magnetic elements on all three poles. These elements will actuate a common tripping bar to open all poles when an overload or short circuit occurs.

The circuit breakers shall have an AIC rating greater than the available fault current at the panel.

The equipment shall be as manufactured by Square D, General Electric, or equal.

W-46.06 Control Relays

a. Multi-contact – Unless otherwise noted, relays shall have a minimum of two (2) form C contacts rated at 10 amps, 120 VAC or 24V DC as indicated on the drawings. They shall be of the type, which utilizes the circular plug system with hold down springs. Each relay shall be provided with an indicator lamp to show its status. The covers shall be dustproof, and manufactured of a clear polycarbonate material. The relays shall be Model KRPA as manufactured by Potter & Brumfield, Struthers Dunn, Square D, or equal.

b. Timing relays shall have DPDT, 10 amp, 120 VAC contacts. Timers shall be solidstate and adjustable as required. They shall utilize a plug in base mounting system. Timing relays shall be Model 328 as manufactured by ATC, Potter & Brumfield or equal.

c. NEMA Type Relays shall have two (2) normally open, 10 amp, 600 VAC, convertible instantaneous contacts. They shall have plug-in contact cartridges for easy contact conversion and replacement. Contact conversion shall be capable without removing terminal screws or wires. Coil voltage shall be as shown on the drawings or as required. NEMA Type Relays shall be Model X as manufactured Square D or equal.

W-46.12 Type 1 Surge Protective (SPD)

The SPD shall be able to suppress lightning induced voltage surges three times greater than the industry standards. The rated line voltage for SPD shall be 120 VAC single-phase, 3-wire (Line, Neutral, Ground. The maximum single impulse current shall be 2.5kA.

1. The clamp voltages for the SPD shall be the following:
   Line to neutral – 620 volts
   Line to ground – 850 volts
   Neutral to ground – 850 volts

The Surge Protection Device shall be Phoenix Contact PT 2-PE/S-120AC/FM part number 2856812, or equal.

W-46.13 Transient Voltage Surge Suppressor (TVSS)

The TVSS shall be able to suppress lightning induced voltage surges three times greater than the industry standards. The rated line voltage for TVSS shall be 277/480 VAC, 3-phase 4-wire wye. The maximum single impulse current shall be 80kA per phase.

1. The TVSS shall have line to neutral protection on all phases, and also neutral to ground protection.

2. The TVSS shall have a 5 year warranty. Under that warranty, the TVSS shall be replaced if it is destroyed by lightning or other impulses.

3. The TVSS shall have an LED failure indicator on all three phases.

4. The clamp voltages for the TVSS shall be the following:

   Line to neutral - 700 volts
   Line to ground - 700 volts
   Neutral to ground - 700 volts
   Line to line - 1200 volts

The Transient Surge Suppressor shall be Advanced Protection Technologies model TE/4XF, or equal.

W-46.15 Control Enclosures and Panels

New control enclosures shall be NEMA rated and as specified and scheduled in Section 17000. The doors shall be provided with a positive stop mechanisms to prevent them from closing while controls are being serviced. Stiffeners shall be provided on the enclosure and

doors as necessary to provide rigidity. The closing surfaces shall have rolled lips. All hardware shall be heavy-duty, stainless steel. A print pocket shall be provided on the inside of the door. The enclosure dimensions shall be as shown or required.

The enclosures and panels shall be as manufactured by Quality Metals, Hoffman Engineering, or equal.

W-46.16 Panel Mount Terminal Blocks

Control terminal blocks shall be single pole units constructed of a polyamide plastic base with wire clamp terminals attached. The terminals shall be rated for 30 amps, 600 volts. The terminals shall accommodate #24 to #10 AWG conductors. The block shall mount on an aluminum DIN rail.

The terminal blocks shall be style UK5N, as manufactured by Phoenix Contact, or equal.

– END OF SECTION –

SECTION 47 - ELECTRIC MOTORS

W-47.01 General:

Electric motors shall be of the high energy efficient and high power factor type mounted on the equipment being driven. Motor characteristics shall be as specified under the Workmanship and Materials sections for equipment.

W-47.02 Design:

Motors shall conform to the latest ANSI Standards for rotating electrical machinery and in matters not covered therein, the latest NEMA Standards for motors and generators shall apply.

W-47.03 Ratings:

Motors shall have suitable output torque and speed characteristics to operate the driven equipment under design load conditions without exceeding their nameplate ratings. They shall have a 1.15 service factor. Definite purpose motors shall be used on specialized equipment requiring them.

Motors supplied for use with adjustable frequency drives (AFD) and solid-state soft starters shall be rated for inverter duty.

Ratings shall be based on NEMA Class B, 80 degrees C, temperature rise at rated conditions above an ambient of 40°C and shall have Class F moisture resistant insulation. This temperature rise shall be for continuous operation unless otherwise specified or approved.

W-47.04 Operating Types:

Motors of 1/2 HP or larger shall be of the squirrel-cage induction type, designed for 3-phase, 60-Hertz, 460-volt operation, unless shown or specified otherwise. Smaller motors shall be of the capacitor induction type designed for single-phase, 115-volt, 60-Hertz operation unless otherwise noted or approved.

All motors, except where the driven equipment presents unusual requirements, shall have torque and locked rotor characteristics as outlined in the NEMA Standards for Design B.

All gear motors and speed reducers shall be designed for correct mounting position and rated in accordance with the application practice outlined in the Standards of the American Gear Manufacturers Association, for Class II service.

W-47.05 Bearings:

All motor bearings shall be of the antifriction type except where otherwise shown or specified. All antifriction bearings shall have a minimum rating life of 100,000 hours, based on a reliability of 90 percent in accordance with ANSI B3.15. All motor bearings shall be oil or grease lubricated with convenient provisions for inspecting and servicing.

W-47.06 Mechanical Protection:

Motors shall be of the totally enclosed, corrosion resistant, and suitable for Class 1, Division 1, explosion proof, hazardous area service. Vertical motors shall have solid shafts with high ring bases having ample space for coupling adjustments.

All motors shall be fan cooled except for smaller sizes (approximately 2 HP and less). All totally enclosed motors shall be tapped at a low point and fitted with an Appleton ECD 1/4-inch drain fitting.

W-47.07 Installation:

Motors shall be of the right or left hand assembly, as required, so that the conduit box and nameplate will be readily accessible.

W-47.08 Performance Data:

Motor make, type and rating, speed-torque curves, along with the outline dimensions and the guaranteed full load and locked rotor amperes at full voltage, shall be presented with the equipment details for review and approval.

Motors shall have the following minimum full load efficiency and uncorrected power factor ratings (efficiencies and power factor of motors at other speeds shall be as specified with driver equipment):

Motor Efficiency and Power Factor - Minimum Percent

	At 1800 RPM		At 1200 RPM	
Horsepower	Efficiency	Power Factor	Efficiency	Power Factor
1	81.5	74.3	78.5	69.7
1-1/2	82.5	76.5	84.0	62.0
2	82.5	70.3	85.5	70.1
3	86.5	79.9	86.5	73.7
5	87.0	83.8	86.5	75.8
7-1/2	88.5	82.4	88.5	78.2
10	88.5	85.0	88.5	76.4
15	90.2	85.0	89.5	81.1
20	90.2	84.6	89.5	81.9
25	91.7	84.5	91.0	82.0
30	91.7	84.2	91.0	82.5
40	92.4	84.2	92.4	83.3
50	92.4	85.0	92.4	84.9
60	93.0	86.8	93.0	85.7
75	93.6	86.6	93.0	86.0
100	94.1	88.3	93.6	86.4
125	94.1	89.3	93.6	85.8
150	94.5	88.5	94.5	87.5

The machine noise of the motors shall not exceed the following sound power levels when measured in accordance with IEEE Standard 85:

Overall Sound Power Level, Decibels, A-Weighted

Horsepower	At 1800 RPM	At 1200 RPM
1 - 2	70	67
3 - 5	74	71
7-1/2 - 10	77	74
15 - 20	81	78
25 - 30	85	80
40 - 50	89	84
60 - 75	90	88

100 - 150	90	93

W-47.09 Test Reports:

Unless the equipment specifications stipulate shop tests reports on the actual motors used the test data shall be on a representative motor of the same horsepower and speed. They shall show the motor full load and locked rotor amperes and full load efficiency and power factor rating, and be recorded on standard test forms as outlined in the NEMA Standards.

W-47.10 Painting:

Painting shall meet the requirements of the Workmanship and Materials section headed "Painting." All steel parts shall be chemically treated to insure clean surfaces, then given a rust-resistant undercoat. Screws, nuts, bolts and similar items shall be of nonferrous metal or have an approved rust-resistant finish.

– END OF SECTION –

SECTION 62 - CONTROL AND WIRING FOR PACKAGED UNITS

W-62.01 General:

The electrical requirements for packaged equipment shall be supplied as complete factory assembled units that require only external connections for installation. They shall include all electrical features necessary for the proper functioning of the units.

W-62.02 Standards:

All control components shall comply with the latest ANSI, IEEE, and NEMA standards wherever applicable. The assemblies shall be listed as complying with the requirements of U.L., Inc., or other recognized testing organizations, for the particular service to be encountered, where possible.

The conduit and wiring on each unit shall be in accordance with the Workmanship and Materials section headed “Conduit, Wire and Grounding,” unless otherwise shown or directed.

The Contractor shall be responsible for providing conduits and wires for field wiring of all the control devices to the packaged units whether such control devices are specifically shown or not. The Contractor shall include in his bid cost for installation and connections of all electrical equipment like control panels, switches, auxiliary control devices, conduit and wires, and all other appurtenances as required.

W-62.03 Electrical Characteristics:

Controls for each unit having motors of 1/2 horsepower or larger, except as noted, shall consist of combination circuit breaker and magnetic starter, along with all required control transformers, relays, timers, heaters, and other necessary incidentals to provide a complete functioning unit. Motors shall be designed for 480-volt, 3-phase, 60-Hertz operation with all controls at 115 volts or less.

Controls for each unit having motors of less than 1/2 horsepower shall be provided with 120-volt, single phase, toggle type thermal manual motor starter with neon pilot light.

Push buttons, pilot lights, etcetera, shall be 30mm in diameter and rated NEMA 4X. Pilot light lamp assemblies shall be full voltage (120VAC) LED type.

W-62.04 Enclosures:

Principal control components shall be installed in NEMA rated enclosures as follows:

AREA	ENCLOSURE
All areas listed Class I, Group C, D	NEMA 7 - Explosion-proof
Outdoor and below grade elevation indoor	NEMA 4X - Watertight
Above grade indoor	NEMA 12 - Industrial

W-62.05 Auxiliary Control Devices:

Float switches, pressure switches, limit switches, thermo-stats, and other auxiliary control devices shall be of the heavy-duty type and rugged enough to satisfy the intended service. All contacts shall be rated at 10 amperes, 120 volts, 60 Hertz a-c, unless otherwise specified. Where adjustable, the devices shall be conveniently set and the setting secured firmly. Limit switches shall function in accordance with contact development charts.

W-62.06 Painting:

Enclosures for electrical controls and connecting conduit shall be finished in accordance with Workmanship and Materials section headed “Painting.”

– END OF SECTION –

SECTION 76 - CONDUIT, WIRE, AND GROUNDING

W-76.01 General

Conduit, wire, and grounding includes furnishing and installing all conduits, underground ducts, bus ducts, wires, cables, and grounding systems as shown, specified, and required for a complete installation. The work includes the furnishing and installation of wires and cables in flexible and rigid conduits, underground ducts, all as required, shown, and specified.

Descriptive literature and technical information relative to conduits, wires, and grounding shall be submitted by the Contractor in conformance with the requirements of the General Provisions.

The Contractor shall, with reference to approved drawings of equipment being installed, prepare detailed plans showing the layout and size of all conduits, ducts, bus ducts, cables and wires, connections between the point of service connection and all utilizing equipment. These plans shall be in sufficient detail to serve as working drawings for the installing electricians. The drawings shall be to scale not less than the Plans and be prepared as the work develops with approval by the Engineer before major steps of work are undertaken.

During construction, careful notes shall be kept of all deviations or changes in the layout or connection diagrams. Upon completion of the work, all working drawings shall be corrected and then marked “Record Drawings”. Four sets of final prints, along with an equal number of bound instruction manuals and parts lists shall be given to the Engineer at the end of the job.

Excavation, backfill, form work, concrete, and reinforcing shall be in accordance with the applicable Workmanship and Materials sections.

W-76.02 Underground Ducts

In general, underground ducts for feeders and control wiring shall be plastic conduit. The plastic conduit shall be PVC, Schedule 80, and U.L. Inc. listed for direct burial, as manufactured by Carlon, Triangle, Allied Tube, or equal. The conduit shall be buried a minimum of 18 inches below grade. Manufactured fitted plastic duct spacers shall be used for installation spacing.

Ducts installed under streets, roads, alleys, driveways, and parking lots; and conduits leading from the wet well to junction boxes; shall be rigid aluminum conduit covered with no less than 40 mils of PVC, as manufactured by Plasti-Bond, Perma-Cote, KorKap, or equal. The PVC material shall conform to the applicable ASTM standards and UL 6A. The conduit shall be buried a minimum of 24 inches below grade unless otherwise noted or allowed by the NEC.

Each duct shall be carefully cleaned before and after installation. All inside surfaces shall be free from imperfections likely to injure the cable. After installation of complete duct runs in sizes 2 inches and larger, ducts shall be snaked with an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the duct. Ducts through which the mandrel will not pass shall not be incorporated in the work. After snaking, the ends of dead-ended ducts shall be protected with standard conduit caps to prevent the entrance of water or other foreign matter.

Where ducts enter buildings or at stub-ups to equipment, transitions to aluminum conduits

shall be made as noted and detailed. Where it is not otherwise shown, all ducts entering buildings and structures shall have transitions to aluminum conduit at least 5 feet from the outermost edge of the pile cap or footing supporting the outermost vertical wall of the building or structure.

Transitions from above-grade rigid aluminum conduit to nonmetallic conduit shall be accomplished with a threaded adapter. Rigid aluminum conduit installed above grade and extending below grade shall include the first 90° elbow. All rigid aluminum conduits extending below grade shall be coated with two coats of an asphaltum-type paint along its entire length below grade and extending 6" above grade or above the top of the finished slab. The asphaltum-type paint shall conform to Fed. Spec. TT-V-51 and equivalent to Koppers Bitumastic Super Service Black.

W-76.03 Liquidtight Flexible Nonmetallic Conduit (Size 2 Inch or Less)

All flexible conduits size 2 inch or less in non-classified areas shall be nonmetallic, liquidtight, and have a circular cross section. The conduit shall be resistant to oil, water, heat, sunlight, corrosion, most acids, ozone, alkali, strains, abrasions, and crushing. The conduit shall be rated for continuous use at 140°F and be U.L. Inc. listed. Compatible liquidtight nonmetallic fittings shall be used for conduit installation. The flexible conduit and fittings shall be as manufactured by Carlon, Kellems, K-Flex, or equal.

W-76.03(a) Liquidtight Flexible Metallic Conduit (Greater Than 2 Inch)

All flexible conduits greater than 2 inch in non-classified areas shall be metallic, liquidtight, and have a circular cross section. The conduit shall be of a light-weight aluminum core, coupled with a PVC jacket. The conduit shall be resistant to sunlight, acid, and oil. The conduit shall be rated for a working temperature between -20°C to 80°C and U.L. Inc. listed. Compatible liquidtight metallic fittings shall be used for conduit installation. The flexible conduit and fittings shall be as manufactured by Thomas & Betts or equal.

W-76.04 Metallic Conduit and Boxes

All conduit shall comply with the requirements of the U.L. Inc. Standards. Conduit shall be delivered to the job site in standard bundles having each length suitably marked with the manufacturer's name or trademark and bearing the label of the U.L. Inc. inspection service. The minimum size conduit service shall be 3/4 inch.

All exposed conduit within buildings and exposed on outdoor structures shall be rigid heavy wall, 6063 alloy, T-1 temper, aluminum conduit. Aluminum conduit shall conform to Fed. Spec. WW-C-540 and ANSI C80.5.

All conduit encased in building structures, exposed in the screen room/wet well area, or otherwise noted, shall be rigid aluminum covered with not less than 40 mils of PVC outside, and 2 mils of urethane inside, as manufactured by Plasti-Bond, Perma-Cote, KorKap, or equal. The physical properties of the PVC and urethane materials shall conform to the applicable ASTM standards and UL 6A.

Cast aluminum shall be used for outlet boxes and fittings in aluminum conduit systems. Outlet and junction boxes shall be of proper dimensions for each application. Cast metal boxes shall have watertight gaskets and covers secured with nonferrous screws.

PVC coated boxes and fittings shall be used in PVC coated conduit systems.

Conduit fittings, such as elbows, tees, couplings, caps, bushings, nipples, and locknuts shall be threaded to provide watertight connections.

Where it is necessary to use electrical unions, Universal, Erikson, or equal conduit couplings shall be used.

W-76.05 Conduit Installation

All conduits shall be installed as required. The conduit system shall be installed complete with all accessories, fittings, and boxes, in an approved and workmanlike manner to provide proper raceways for electrical conductors.

The Contractor shall note that conduit runs shown are for the purpose of outlining the general method of routing the conduits to avoid interferences.

All other conduit shall be run exposed, except where shown otherwise.

Sizes not shown shall be one size larger than indicated in Tables 1 or 4, Chapter 9, of the NEC. Exposed conduit shall be run parallel to or at right angles from walls or beams and plumb on columns and on walls. Conduit shall not be run through beams except where approved by the Engineer or specifically detailed. Where possible, conduit shall be pitched slightly to drain to the outlet boxes or otherwise installed to avoid trapping of condensate. Where necessary to ensure drainage, Appleton Type ECD, Crouse-Hinds, or equal, 1/4-inch drain fitting shall be installed in the trapped conduit at low points.

Factory made bends or elbows shall be used wherever possible. Field bends shall be carefully made to prevent conduit damage or reduction in the internal area. The bending radius shall be not less than six times the nominal diameters of the conduit with carefully matched bends on parallel runs to present a neat appearance. The number of crossovers shall be kept to a minimum.

All conduits shall be reamed to remove burrs before installation. Aluminum conduit shall be cut with a saw to prevent reduction in internal area. Threads on aluminum conduit shall be given a coat of graphite or other approved compound. All connections and joints in all conduit runs shall be watertight and ensure a low resistance ground path in the conduit system. All conduit runs shall be swabbed to remove foreign matter before wires are pulled in. Conduit terminations in boxes, panels, switchboards, motor control centers, and other sheet metal enclosures shall be bonded together for grounding and be fitted with insulating bushings, O.Z./Gedney Type A, Thomas and Betts, or equal. Where grounding bushings are required by code or shown, O.Z./Gedney Type SBLG, Thomas and Betts, or equal shall be furnished.

Conduit shall be neatly grouped where several lines follow a parallel course, and shall be well supported, using stainless steel clips or hangers of the ring or trapeze type. Clips, hangers, and support rods shall be held by self-drilling anchors, power-driven fasteners, or stainless steel channel insets in the concrete ceilings or walls. Perforated strap hangers will not be accepted.

Conduit runs that enter the building from outdoors, or that pass through refrigerated or air conditioned areas, are subject to moisture accumulation due to condensation. A pull box shall be provided in the conduit run near the point of temperature change to prevent trapping of moisture within the conduit system. A 1/4-inch weep hole shall be drilled in the bottom of the pull box. After the wires and cables are installed, the end of the conduit continuing into the warmer area shall

be packed with a non-setting sealing compound.

All PVC coated aluminum conduit shall be installed using specialized tools and equipment as recommended by manufacturer. The Contractor shall ensure those installing PVC coated aluminum conduit are certified by the manufacturer prior to beginning installation. Installation of PVC coated aluminum conduit shall not begin until a copy of an unexpired Certified Installer Card for each installer is submitted and approved by Engineer.

W-76.06 Conduit Connections to Equipment

The conduit system shall terminate at the terminal box or at the conduit connection point of electric motors, devices, and equipment. Terminations of conduits at such locations shall permit direct wire connections to the motors, devices, or equipment.

Conduit connections shall be made with rigid conduit if the equipment is fixed and not subject to adjustment, mechanical movement, or vibration. Myers water-tight /dust-tight hubs shall be used for outdoor, below grade, or wash down areas. Rigid conduit connections shall have union fittings to permit removal of equipment without cutting or breaking the conduit.

Conduit connections shall be made with approved flexible nonmetallic conduit if the equipment is subject to adjustment, mechanical movement, or vibration. Flexible conduit connections shall be watertight.

W-76.07 Expansion Fittings

Expansion fittings shall be installed at all expansion joints and where required by codes. Conduit expansion fittings shall be Crouse-Hinds Type XD, O.Z./Gedney Type DX, or equal.

W-76.08 Terminal, Junction, and Pull Boxes

Junction and pull boxes shall be installed as shown and as required.

Surface-mounted junction and pull boxes, unless specified otherwise herein, shall be of cast aluminum complete with mounting lugs, threaded entry bosses and flange or rabbeted gasketed covers.

Surface-mounted junction and pull boxes which would exceed 50 pounds weight if cast or which are shown as fabricated sheet metal boxes shall be made of 1/8-inch sheet aluminum with sides return channel flanged around the cover opening or with approved welded angle or channel supporting frames. Sheet aluminum boxes shall be provided with mounting lugs or channels and with conduit termination hubs. All seams in sheet aluminum boxes shall be continuously welded and ground smooth. All surface boxes larger than 6 inches square shall be mounted a minimum of 3/4 inch clear of the mounting surface by means of offset lugs or support channels.

Fabricated junction and pull boxes which are partially or fully encased in concrete shall be made of 10-gauge sheet stainless steel and fabricated in a similar manner to the sheet aluminum pull boxes specified herein, complete with mounting lugs or channels and conduit termination hubs. Cast steel boxes shall be provided in smaller sizes where required for full or partial encasement in concrete.

All junction and pull boxes shall be provided with covers or doors as shown or required. Covers and doors shall be fabricated of materials equal in weight, gauge, structure, and metallic composition as the basic box. All covers shall be gasketed and held in place with nonferrous captive knurled head screw slot bolts. All pull and junction boxes shall be provided with hinged doors. Doors shall have continuous hinges, and 3-point catches with external handles and hasps for padlocks. All doors shall be gasketed.

All boxes shall be provided with partitions as shown and as required.

Fabricated boxes shall be rated NEMA 12 for indoor, above grade areas; rated NEMA 4X for outdoor areas; and manufactured by Hoffman, Hope, or equal.

W-76.09 Hazardous Areas

All conduit and equipment installed in or routed through hazardous areas, as well as other electrical appurtenances installed therein, shall be installed to conform in every respect to Chapter 5 of the NEC for Class I, Division 1, Group D hazardous locations. All material installed in hazardous areas shall be listed as complying with the requirements of the U.L. Inc. for use in Class I, Group D atmospheres. Terminal Boxes and Enclosures mounted in Hazardous Areas shall be NEMA 7, cast aluminum. Flexible conduits for Class 1, Division 1 locations shall be of stainless steel construction.

Sealing shall be provided for all conduits within and leaving hazardous areas as required.

W-76.10 Grounding System

A complete grounding system shall be in accordance with applicable ANSI, IEEE, and NEC Standards and local codes.

All noncurrent-carrying metal parts of the electrical wiring system shall be grounded. The grounding system shall include, but not be limited to, the following:

1. Motor control center controllers, ground bus, and enclosures.
2. All motor frames.
3. All conduit systems.
4. All mechanical equipment and structures.
5. Distribution and lighting panelboards.
6. Control, relay, and instrumentation panels.
7. Lighting fixtures and receptacles.
8. Fans, blowers, pumps, and similar equipment.
9. Hoist beams, cranes, and similar items.

A grounding connection from the transformer to the City water pipe shall be provided. The wire and conduit shall be attached to the City water pipe with a U.L. Inc. listed cast bronze U-bolt connector with silicon bronze bolts and nuts.

Motor frames shall be grounded by means of stranded, 600-volt insulated copper cables installed within the motor feeder conduit system. The cable shall be lug bolted to the motor terminal box and the ground bus of the motor control center serving the motor.

An equipment grounding conductor shall be installed in all electrical raceways, and shall be sized in accordance with Article 250.95 of the National Electrical Code (NEC).

Exposed or buried ground conductors shall be bare copper wires or bars of the proper sizes.

All exposed ground cables or bars shall be firmly and neatly supported in place at proper intervals. Where subjected to mechanical abuse, protective enclosures shall be provided.

Grounding conductors run in conduits with circuit conductors shall be stranded cable with 600-volt green XHHW, TW, THW, THWN, or RHW Code insulation.

Stainless steel ground rods shall be 5/8-inch diameter with the length as required and made up of a 10-foot section with 5-foot sections added as required. Rods shall be driven to permanently moist soil.

Connections to ground rods, transformer case ground bus bars, case grounds, bare ground grid conductors, and the like, shall be made by an exothermic welding process or by clamps specifically designed for this application.

Ground conductor connections to ground bus bars in motor control centers, and the like, shall be cable lug bolted terminations equal to line conductor terminations specified hereinafter.

Welds embedded in the ground or concrete shall be cleaned and painted with an asphaltum base paint.

Tests shall be conducted by the Contractor and witnessed by the Engineer to determine the ground impedance for the entire system. The test shall be accomplished by using a ground loop impedance tester. The result shall not exceed 2 ohms at any point of test. If necessary, additional ground rods shall be installed at locations approved by the Engineer.

Care shall be exercised to ensure good electrical connections between the conduits and metallic enclosures of switchgear, control centers, and the like. Grounding jumpers shall be installed where necessary to accomplish this purpose.

W-76.11 Wires and Cables - General

Wires and cables required for all systems shall be complete, connecting all equipment and control components. Conductors shall be of ample size, with suitable insulation as specified hereinafter.

W-76.12 600-Volt Wire and Cable - Conductors

All ground conductors and power, control, and lighting conductors shall be soft-drawn or annealed stranded copper wire meeting the requirements of ASTM B 3 or B 33. For lighting fixture and convenience outlet wiring only, conductors No. 10 AWG and smaller may be solid conductor. Conductors shall be sized to limit the maximum conductor temperature to less than 75°C, except where specifically stated otherwise. Table 310.16 of the NEC shall be the guide in determining 600-volt conductor sizes. The minimum size of conductor for power and lighting wiring shall be No. 12 AWG.

W-76.13 600-Volt Power and Control Cable - Insulation

Low voltage circuits shall be wired with 600-volt insulated conductors, sized as shown, or as required by the actual load to be served, whichever is larger.

Single Conductor: Insulation for single 600-volt copper conductors shall be cross-linked polyethylene compound, U.L. Inc. listed, NEC Type XHHW-2, with surface print cable identification; as manufactured by Okonite, American, Southwire or equal.

Multiconductor Cables: Individual conductors shall be insulated with 15 mils of polyethylene or PVC and 4-mil nylon jacket. The bundle of conductors shall be wrapped with tape binder and an outer jacket of not less than 45 mils of PVC. Use ICEA Method 1 for color coding wires.

W-76.14 Instrumentation / Data Cables - Insulation

4-20 mA Analog: Shielded two-conductor No. 16 AWG cables for instrumentation shall be properly stranded 600-volt insulated copper wire twisted cables as shown. Conductor insulation shall be polyethylene. Shields shall be overlapped metalized tape providing 100% coverage with tinned copper drain wire. Cable outer jacketing shall be of polyvinyl chloride. Cables shall be Belden #8719, or equal.

Three Conductor: Stranded No. 16 wire, 600 volt polyethylene insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of PVC. Belden Cat. No. 8618.

Category 5: Provide cable having third party verification to TIA/EIA 568-A Category 5 requirements and constructed of four pair of stranded No. 24 AWG solid copper wire, polyethylene or polypropylene insulation, stranded No. 24 AWG tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and outer jacket of gray PVC. Belden Cat. No. 1624R.

Twinaxial (Data Highway): Provide stranded No. 20 AWG tinned copper wire (9.5 ohms/mile), 78 ohm nominal impedance, 300 volt polyethylene insulation, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and 55 percent tinned copper braid shield (4.1 ohms/mile) and outer jacket of blue PVC. Belden Cat. No. 9463.

1 Pair (RS-485): Provide two stranded No. 22 AWG tinned copper wires with 300 volt FHDPE insulation, a tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage, 65 percent tinned copper braid shield and a PVC outer jacket. Insulated wires shall be configured as one twisted pair— 120 Ohms characteristic impedance. Belden Cat. No. 3105A. Cable specifications shall be approved/coordinated with Xylem, Inc.

15 Conductor (MAS): Provide fifteen stranded (7 x 30) No. 22 AWG tinned copper wires with 300 volt FHDPE insulation, a tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage, 65 percent tinned copper braid shield and a PVC outer jacket. Belden Cat. No. 9947. Cable specifications shall be approved/coordinated with Xylem, Inc.

W-76.15 600-Volt Wire and Cable - Installation

The 600-volt wires and cables pulled into ducts and conduit shall be installed without the use of lubricants, except where such use is necessary and approved by the cable manufacturers and the Engineer. Wires and cables shall be carefully handled to avoid twists and kinks in the conductors or damage to the insulation. All trapped conduit and duct lines shall be swabbed to remove any accumulated moisture or debris before wires or cables are pulled in.

Cable reels shall be stored on concrete or other hard surface, or shall be lagged with 2 x 4 wood laggings providing 100% coverage.

No splicing will be permitted, except in junction boxes.

Lug bolting at terminals, devices, or bus bars shall be made up with a flat washer, a Belleville washer, and a locknut.

Lines of nylon or polypropylene, propelled by carbon dioxide or compressed air, shall be used to snake or pull wire and cable into conduits. Flat steel tapes or steel cables shall not be used.

W-76.16 600-Volt Wire and Cable - Splices and Terminations

Splices between copper conductors, size no. 10 AWG and smaller, shall be made up with compression type butt connections. Splices between copper conductors, size no. 8 AWG and larger, shall be made up with U.L. Inc. listed compression type tube connectors. Lug bolting at devices or bus bars shall be made up with a flat washer, a Belleville washer, and a locknut.

Splices and pigtail connections for lighting and receptacle wiring inside the buildings, no. 10 AWG and smaller, shall be made with a pre-insulated spring connectors, or equal.

Splices and lug terminations in 600-volt insulated cables shall be carefully taped and covered, using materials recommended by the cable manufacturer, to provide watertight insulation equal to that of the conductors.

Splices shall not be made within manholes unless specifically approved by the Engineer.

W-76.17 600-Volt Wire and Cable - Tests

The 600-volt insulated cables shall be factory tested prior to shipment in accordance with IPCEA standards for the insulation specified.

The following 600-volt wires and cable shall be tested after installation but before final connections are made up:

1. All feeders from motor control centers to motors 30 horsepower and larger.
2. All feeders from variable speed drive units.
3. All feeders from motor control centers to lighting panels and dry-type transformers.

For the above listed cables, a test voltage of 1,500 volts AC shall be applied for a period of 1 minute between all conductors in the same conduit, and between each conductor and ground.

All tests shall be made at the Contractor’s expense, and certification of the tests shall be submitted to the Engineer. If any failures occur during the tests, the Contractor shall replace the cable.

W-76.18 Identification of Circuits

All wires and cables shall be banded with an identifying number and color code at each end termination and at each splice point in junction boxes. The identifying number of each wire shall be determined at the point of circuit origin, and shall continue unchanged to the point of circuit termination. In each conduit system, the wire identifying numbers shall include the conduit designation with a numeral suffix. The numeral suffix shall start with No. 1 and continue as required.

Where conduits enter motor control centers, switchgear terminal cabinets, and the like, the identification tag shall be fastened to the wire bundle near the conduit termination. The tag shall be held by an adjustable, self-locking nylon "Ty-Rap" as manufactured by Thomas and Betts Co., or equal. The identifying tag shall be of aluminum, brass, rigid fiber, and shall be engraved, stamped, or painted with the scheduled conduit number.

The wire identifying numbers and color code shall be applied as PVC slip-on sleeves, properly fitted to the wire diameter. The sleeves shall be as manufactured by Brady Co., Thomas and Betts Co., or equal.

Color Coding:

240/120 VOLTS	**PHASE**	**480Y/277 VOLTS**
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray or White
Green	Ground	Green

W-76.19 Wire and Cable Connections to Equipment

Electrical connections shall be made to all equipment in strict accordance with the manufacturer's approved wiring diagrams, the Plans, or as approved by the Engineer. The Contractor shall be responsible for the accuracy of his work, and shall repair any damage and replace any damaged equipment resulting from erroneous connections.

W-76.20 Painting

Conduit and boxes shall be painted in accordance with the Workmanship and Materials section headed "Painting."

Where aluminum surfaces such as boxes, conduit, or structural supports come in contact with incompatible metals, lime, mortar, concrete, or other masonry materials, the contact areas shall be given one field coat of Koppers Metal Passivator No. 40 and one coat of Koppers Bitumastic Super Service Black or two coats of asphalt varnish conforming to Fed. Spec. TT-V-51.

End of Section

SECTION 01090 - REFERENCE STANDARDS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Titles of Sections and Paragraphs: Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.

B. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date of the opening of bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

C. Specialists, Assignments: In certain instances, Specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the specifications, all work specified herein shall conform to or exceed the requirements of all applicable codes.

B. References herein to "Building Code" shall mean the Florida Building Code (FBC). The latest edition of the code as approved and used by the local agency as of the date of the Notice to Proceed, as adopted by the agency having jurisdiction, shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, Drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall follow the most stringent requirements.

D. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and Specifications listed herein.

E. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

F. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test, and place in acceptable operation all mechanical equipment and all necessary accessories as specified herein, as shown on the Drawings, and as required for a complete and operable system.

B. The mechanical equipment shall be provided complete with all accessories, special tools, spare parts, mountings, and other appurtenances as specified, and as may be required for a complete and operating installation.

C. It is the intent of these Specifications that the Contractor shall provide the Owner complete and operational equipment/systems. To this end, it is the responsibility of the Contractor to coordinate all interfaces with related mechanical, structural, electrical, instrumentation and control work and to provide necessary ancillary items such as controls, wiring, etc., to make each piece of equipment operational as intended by the Specifications.

D. The complete installation shall be free from excessive vibration, cavitation, noise, and oil or water leaks.

E. The requirements of this section shall apply to equipment furnished under Divisions 11 and 15.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. All equipment, materials, and installations shall conform to the requirements of the most recent editions with latest revisions, supplements, and amendments of the specifications, applicable codes, and applicable standards including those listed in Section 01090, Reference Standards.

1.03 PERFORMANCE AFFIDAVITS

A. When required in the individual equipment Specifications, the Contractor shall submit manufacturer's Performance Affidavits for equipment to be furnished.

B. By these affidavits, each manufacturer must certify to the Contractor and the Owner, jointly, that he has examined the Contract Documents and that the equipment, apparatus, or process he offers to furnish will meet in every way the performance requirements set forth or implied in the Contract Documents.

C. The Contractor must transmit to the Engineer three (3) original copies of the affidavit given him by the manufacturer or supplier along with the initial Shop Drawing submittals.

D. The Performance Affidavit must be signed by an officer of the basic corporation, partnership, or company manufacturing the equipment and witnessed by a notary public.

E. The Performance Affidavit shall have the following format:

1. Addressed to:(Contractor) and City of Tampa (COT)

2. Reference: Grit Washer Replacement Contract

3. Text: (Manufacturer's Name) has examined the Contract Documents and hereby state that the (Product) meets in every way the performance requirements set forth or implied in Section of the Contract Documents.

4. Signature: Corporate Officers shall be Vice President, or higher. (Unless statement authorizing signature is attached.)

1.04 SHOP DRAWINGS

A. Shop Drawings shall be submitted to the Engineer for all equipment in accordance with the Specific Provisions, Submittals and shall include the following information in addition to the requirements of the Specific Provisions:

1. Performance characteristics and descriptive data.

2. Detailed equipment dimensional drawings and setting plans.

3. General lifting, erection, installation, and adjustment instructions, and recommendations.

4. Complete information regarding location, type, size, and length of all field welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society. Special conditions shall be fully explained by notes and details.

5. The total uncrated weight of the equipment plus the approximate weight of shipped materials. Support locations and loads that will be transmitted to bases and foundations. Exact size, placement, and embedment requirements of all anchor bolts.

6. Details on materials of construction of all components including applicable ASTM designations.

7. Information on bearing types and bearing life.

8. Gear box design and performance criteria and AGMA service factor.

9. Piping schematics.

10. Motor data sheet indicating motor horsepower; enclosure type; voltage; insulation class; temperature rise and results of dielectric tests; service-rating; rotative speed; motor speed-torque relationship; efficiency and power factor at 1/2, 3/4 and full load; slip at full load; running, full load, and locked rotor current values; and safe running time-current curves.

11. Equipment and motor protective device details. Connection diagrams for motor and all protective devices.

12. Equipment shop coating systems, interior and exterior.

13. Panel layout drawings, schematic wiring diagrams, and component product data sheets for control panels.

14. Any additional information required to show conformance with the equipment specifications.

    a. A list of wear parts, expected life of wear parts, and recommended spare parts.

15. Warranty documentation including statement of duration of warranty period and contact phone numbers and addresses for warranty issues.

B. SHOP DRAWINGS ON ITEMS REQUIRING PERFORMANCE AFFIDAVITS WILL NOT BE REVIEWED UNTIL ACCEPTABLE PERFORMANCE AFFIDAVITS ARE RECEIVED.

1.05 OPERATION AND MAINTENANCE INSTRUCTION/MANUALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with the Specific Provisions.

1.06 GENERAL INFORMATION AND DESCRIPTION

A. All parts of the equipment furnished shall, be designed and constructed for the maximum stresses occurring during fabrication, transportation, installation, testing, and all conditions of operation. All materials shall be new, and both workmanship and materials shall be entirely suitable for the service to which the units are to be subjected and shall conform to all applicable sections of these Specifications.

B. All parts of duplicate equipment shall be interchangeable without modification. Manufacturer's design shall accommodate all the requirements of these Specifications.

C. Equipment and appurtenances shall be designed in conformity with ASTM, ASME, AIEE, NEMA, and other generally accepted applicable standards.

D. All bearings and moving parts shall be adequately protected by bushings or other approved means against wear, and provision shall be made for accessible lubrication by extending lubrication lines and fittings to approximately 30 inches above finished floor elevation.

E. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers, etc., shall be finished in appearance. All exposed welds on machinery shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

F. Machinery parts shall conform within allowable tolerances to the dimensions shown on the working drawings.

G. All machinery and equipment shall be safeguarded in accordance with the safety codes of the USA and the State in which the project is located.

H. All rotating shafts, couplings, or other moving pieces of equipment shall be provided with suitable protective guards of sheet metal or wire mesh, neatly and rigidly supported. Guards shall be removable as required to provide access for repairs.

I. All equipment greater than 100 pounds shall have lifting lugs, eyebolts, etc., for ease of lifting, without damage or undue stress exerted on its components.

J. All manufactured items provided under this Section shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.

1.07 EQUIPMENT WARRANTIES

A. Warranty requirements may be added to or modified in the individual equipment specifications.

B. The equipment furnished under this Contract shall be guaranteed to be free from defects in workmanship, design and/or materials for a period of one (1) year from date of start-up/final

acceptance, unless otherwise specified in the individual equipment specifications. The period of such warranties shall start on the date the particular equipment is accepted for completion by the Engineer, provided that the equipment demonstrates satisfactory performance during the thirty day operational period after the equipment startup and provided that the corresponding start-up certification provided by the manufacturer's technical representative as specified herein is submitted and approved by the Engineer. If the equipment does not perform satisfactorily during the thirty day operational period, the start of the warranty period will be delayed until the equipment demonstrates proper operation over a thirty day period. The Equipment Supplier shall repair or replace without charge to the Owner any part of equipment which is defective or showing undue wear within the guarantee period, or replace the equipment with new equipment if the mechanical performance is unsatisfactory; furnishing all parts, materials, labor, etc., necessary to return the equipment to its performance level required by the Specifications and industry standards. Repairs made during the warranty period shall include any required re-balancing and related equipment adjustments.

C. The Contractor shall provide an equipment warranty log book prepared specifically for this project and submit two (2) copies of the document to the Engineer prior to final payment. The equipment warranty log book shall include a summary listing of all equipment warranties provided, date received, and start date and end date of warranty period. A copy of each equipment warranty and equipment start-up certification shall also be provided in the document.

D. The Equipment Supplier shall guarantee to the Owner that all equipment offered under these specifications, or that any process resulting from the use of such equipment in the manner stated is not the subject of patent litigation, and that he has not knowingly offered equipment, the installation or use of which is likely to result in a patent controversy, in which the Owner as user is possible to be made the defendant.

E. Where patent infringements are possible to occur, each Equipment Supplier shall submit, as a part of his bid, license arrangements between himself, or the manufacturer of the equipment offered, and the patent City or the controller of the patent, which will permit the use in the specified manner of such mechanical equipment as he may be bidding.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The materials covered by these Specifications are intended to be equipment of proven reliability, and as manufactured by reputable manufacturers having experience in the production of such equipment. The Contractor shall, upon request of the Engineer, furnish the names of not less than 5 successful installations of the manufacturer's equipment of the same size and model of that offered under this contract. The equipment furnished shall be designed, constructed, and installed in accordance with the industry accepted practices and shall operate satisfactorily when installed as shown on the Drawings and operated per manufacturer's recommendations.

2.02 ANCHORS AND SUPPORTS

A. The Contractor shall furnish, install, and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of the devices included in the equipment specified. Working Drawings for installation shall be furnished by the equipment manufacturer, and suitable templates shall be used by the Contractor when required in the detailed equipment Specifications.

B. Anchor bolts and fasteners shall be furnished in accordance with individual equipment Specifications. All anchor bolts shall be a minimum of 1/2 inch diameter. All anchor bolts, handrail bolts, washers, clips, clamps, and fasteners of any type shall be constructed of 316 stainless steel, unless otherwise specified in the individual equipment Specifications.

C. The Contractor shall provide all concrete pads or pedestals required for equipment furnished. All concrete equipment pads shall be a minimum of 6” high, unless otherwise shown on the Drawings and shall be doweled.

D. Pipe sleeves or other means of adjusting anchor bolts shall be provided where indicated or required. Equipment shall be leveled by first using sitting nuts on the anchor bolts, and then filling the space between the equipment base and concrete pedestal with non shrink grout, unless alternate methods are recommended by the manufacturer and are acceptable to the Engineer (such as shim leveling pumps, or chemical grout). Pipe sleeves or other means of adjusting anchor bolts shall be supplied by others.

2.03 STRUCTURAL STEEL

A. Structural steel used for fabricating equipment shall conform to the requirements of Section W-9.

B. All materials shall conform to applicable provisions of the AISC Specifications for the design and fabrication of structural steel, and to pertinent ASTM Standard Specifications.

2.04 DISSIMILAR METALS

A. All dissimilar metals shall be properly isolated to the satisfaction of the Engineer.

2.05 STANDARDIZATION OF GREASE FITTINGS

A. The grease fittings on all mechanical equipment shall be such that they can be serviced with a single type of grease gun. Fittings shall be “Zerk” type.

2.06 ELECTRICAL REQUIREMENTS

A. All electrical equipment and appurtenances, including but not limited to motors, panels, conduit and wiring, etc., specified in the equipment specifications shall comply with the applicable requirements of the Division 16 specifications and the latest National Electric Code.

B. Motors shall conform to the applicable requirements of Section W-47.

2.07 ACCESSORIES, SPARE PARTS, AND SPECIAL TOOLS

A. Spare parts for equipment shall be furnished where indicated in the equipment Specifications or where recommended by the equipment manufacturer.

B. Spare parts shall be identical and interchangeable with original parts.

C. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

D. Painting requirements for spare parts shall be identical to those for original, installed parts. Where no painting or protective coating is specified, suitable provisions shall be made to protect against corrosion.

E. Spare parts shall be delivered at the same time as the equipment to which they pertain. Spare parts shall be stored separately in a locked area, maintained by the Contractor, and shall be turned over to the Owner in a group prior to substantial completion. All of these materials shall be properly packed, labeled, and stored where directed by the Owner and Engineer.

F. The Contractor shall furnish all special tools necessary to operate, disassemble, service, repair, and adjust the equipment in accordance with the manufacturers operation and maintenance manual.

G. The Contractor shall furnish a one year supply of all recommended lubricating oils and greases. The manufacturer shall submit a list of at least four manufacturer's standard lubricants which may be used interchangeably for each type of lubricant required. All of these materials shall be properly packed, labeled and stored where directed by the Engineer.

2.08 EQUIPMENT IDENTIFICATION

A. All mechanical equipment shall be provided with a substantial stainless steel nameplate, mechanically fastened with stainless steel hardware in a conspicuous place, and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

B. All equipment provided under Divisions 11 through 15, including pneumatic actuated and manual valves (aboveground), shall also be identified as to the equipment name and number by a suitable stainless steel nameplate mechanically fastened with stainless steel hardware; for example, "GRIT FEED VALVE No. 1". Equipment names and equipment tag numbers shall match the names provided for the equipment as identified on the Drawings and in the Specifications. Equipment names and tag numbers not currently identified in the Drawings and Specifications shall be provided to the Contractor prior to the fabrication of the nameplates. Coordinate name and number with same on remotely located controls, control panel, and other related equipment. Nameplates shall not be painted over.

PART 3 – EXECUTION

3.01 SHOP TESTING

A. All equipment shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents and that it will operate in the manner specified or implied.

B. No equipment shall be shipped to the project until the Engineer has been furnished a certified copy of test results and has notified the Contractor, in writing, that the results of such tests are acceptable.

C. Five (5) certified copies of the manufacturer's actual test data and interpreted results thereof shall be forwarded to the Engineer for review.

3.02 STORAGE OF EQUIPMENT AND MATERIALS

A. Contractor shall store his equipment and materials at the job site in strict accordance with the manufacturer's recommendations and as directed by the Owner or Engineer, and in conformity to applicable statutes, ordinances, regulations, and rulings of the public authority having jurisdiction. Equipment and materials shall not be delivered to the site prior to 90 days in advance of the scheduled installation. Partial payment requests will not be processed for materials delivered prior to 90 days before installation or for materials that are not properly stored.

B. Material or equipment stored on the job site is stored at the Contractor's risk. Any damage sustained of whatever nature shall be repaired to the Engineer's satisfaction at no expense to the Owner. Stored electrical equipment shall be protected from the elements and shall have space heaters energized by the Contractor.

C. Contractor shall not store unnecessary materials or equipment on the job site and shall take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.

D. Contractor shall observe all regulatory signs for loadings on structures, fire safety, and smoking areas.

E. Contractor shall not store materials or encroach upon private property without the written consent of the owner of such private property.

3.03 MANUFACTURER'S FIELD SERVICES

A. The Contractor shall arrange for a qualified Technical Representative from each manufacturer or supplier of equipment who is regularly involved in the inspection, installation, start up, troubleshooting, testing, maintenance, and operation of the specified equipment. Qualification of the Technical Representative shall be appropriate to the type of equipment furnished and subject to the approval of the Engineer and the Owner. Where equipment furnished has significant process complexity, furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment. When necessary, the Contractor shall schedule multiple Technical Representatives to be present at the same time for the purpose of coordinating the operation of multiple pieces of related equipment.

B. For each site visit, the Technical Representative shall submit jointly to the Owner, the Engineer, and the Contractor a complete signed report of the results of his inspection, operation, adjustments, and testing. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified.

C. The manufacturer's Technical Representative shall provide the following services.

1. Installation: The Technical Representative shall inspect the installed equipment to verify that installation is in accordance with the manufacturer's requirements. Where required by individual equipment specifications, the Technical Representative shall also supervise the installation of the equipment.

2. Testing: After installation of the equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the Technical Representative shall inspect, operate, test, and adjust the equipment as required to prove that the equipment is in proper condition for satisfactory operation under the conditions specified. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment conforms to the requirements of the Contract and is ready for startup and that nothing in the installation will render the manufacturer's warranty null and void. The report shall include date of final acceptance field test, as well as a listing of all persons present during tests.

3. Startup: The Technical Representative shall start up the equipment for actual service with the help of the Contractor. In the event that equipment or installation problems are experienced, the Contractor and the representative shall provide the necessary services until the equipment is operating satisfactorily and performing according to the specifications at no additional cost to the Owner. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment

conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

4. Training: The Technical Representative shall instruct the Owner's operating personnel in correct operation and maintenance procedures. The instruction shall demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment. Such training instruction shall be scheduled at a time arranged with the Owner at least 2 weeks in advance of the training and shall be provided while the respective Technical Representative's equipment is fully operational. The Contractor shall have submitted, and had accepted by the Engineer, the O&M Manuals prior to commencement of training. Training shall be provided to three separate shifts of the Owner's personnel between the hours of 6:00 A.M. and 6:00 P.M. as necessary. The Contractor shall provide professional video recordings of all training sessions. Completed, labeled recordings shall be provided to the Owner for each type of training session.

5. Services after Startup: Where required by the individual equipment specifications, the Technical Representative shall return to the project site one hundred and eighty (180) days after the start-up date to review the equipment performance, correct any equipment problems, and conduct operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of Technical Representative prior to and during equipment startup. At this time, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the equipment is operating incorrectly, the Technical Representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful thirty (30) days operating period.

D. Services of the Technical Representative will require a minimum of two (2) site visits, one for installation and testing and one for startup and training, and will be for the minimum number of days recommended by the manufacturer and approved by the Engineer but will not be less than the number of days specified in individual equipment sections.

E. The Contract amount shall include the cost of furnishing the Technical Representative for the minimum number of days specified, and any additional time required to achieve successful installation and operation. The times specified for services by the Technical Representative in the equipment Specifications are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

F. The Contractor shall notify the Engineer at least fourteen (14) calendar days in advance of each equipment test or Owner training session.

G. The Technical Representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day he is at the project.

3.04 INSTALLATION

A. The Contractor shall obtain written installation manuals from the equipment manufacturer prior to installation. Equipment shall be installed strictly in accordance with recommendations of the manufacturer. A copy of all installation instructions shall be furnished to the Engineer's field representative one week prior to installation.

B. The Contractor shall have on hand sufficient personnel, proper construction equipment, and machinery of ample capacity to facilitate the work and to handle all emergencies normally

encountered in work of this character. To minimize field erection problems, mechanical units shall be factory assembled insofar as practical.

C. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Drawings.

D. All equipment sections and loose items shall be match-marked prior to shipping.

E. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the manufacturer's qualified mechanic, millwright, or machinist, to align the pump and motor prior to making piping connections or anchoring the pump base. Alignment shall be as specified in the Contract Documents.

F. The Contractor shall furnish oil and grease for initial operation and testing. The manufacturer and grades of oil and grease shall be in accordance with the recommendations of the equipment manufacturer.

3.05 ALIGNMENT

A. Set equipment to dimensions shown on drawings. Dimensions shall be accurate to +/- 1/16 inch unless otherwise noted on the drawings. Wedges shall not be used for leveling, aligning, or supporting equipment.

B. General Equipment Leveling: Shims shall be used unless equipment is furnished with leveling feet. Set shims flush with equipment baseplate edges. When grouting is required, equipment shall be shimmed to allow a minimum of one inch grout thickness. Grout shall cover shims at least 3 inches. Final level check shall be held for inspection and approval by Engineer before proceeding.

C. Grouting

1. Fill anchor bolt holes or sleeves with grout, after bolt alignment is proven, and prior to placing grout under equipment bases.

2. Surface Preparation. Roughen surface by chipping, removing laitance, and unsound concrete. Clean area of all foreign material such as oil, grease, and scale. Saturate area with water at least 4 hours prior to grouting, removing excess water ponds.

3. Application. Place grout after the equipment base has been set and its alignment and level have been approved. Form around the base, mix grout, and place in accordance with the grout manufacturers published instructions. Eliminate all air or water pockets beneath the base using a drag chain or rope.

4. Finishing. Point the edges of the grout to form a smooth 45 degree slope.

5. After grout has cured (not before 3 days after placement) paint exposed surfaces of grout with shellac.

6. Level Verification. After grout has cured, and immediately prior to drive alignment, recheck equipment for level and plumb. Re-level and square as necessary. Hold final checks for inspection and approval by Engineer.

D. Inspect for and remove all machining burrs or thread pulls in female holes on mating surfaces of mounting frame and machine feet.

E. Inspect and clean equipment mounting base pads, feet, and frames to remove all grease, rust, paint and dirt.

3.06 FIELD TESTING

A. All equipment shall be set, aligned and assembled in conformance with the manufacturer's drawings and instructions. Provide all necessary calibrated instruments to execute performance tests. Submit report certified by the equipment manufacturer’s representative.

B. Preliminary Field Tests, Yellow Tag

1. As soon as conditions permit, after the equipment has been secured in its permanent position, the Contractor shall:

a. Verify that the equipment is free from defects.

b. Check for alignment as specified herein.

c. Check for direction of rotation.

d. Check motor for no load current draw.

2. Contractor shall flush all bearings, gear housings, etc., in accordance with the manufacturer's recommendations, to remove any foreign matter accumulated during shipment, storage or erection. Lubricants shall be added as required by the manufacturer's instructions.

3. When the Contractor has demonstrated to the Engineer that the equipment is ready for operation, a yellow tag will be issued. The tag will be signed by the Engineer, or his assigned representative and attached to the equipment. The tag shall not be removed.

4. Preliminary field tests, yellow tag, must be completed before equipment is subjected to final field tests, blue tag.

C. Final Field Tests, Blue Tag

1. Upon completion of the above, and at a time approved by the Engineer, the equipment will be tested by operating it as a unit with all related piping, ducting, electrical and controls, and other ancillary facilities.

2. The equipment will be placed in continuous operation as prescribed or required and witnessed by the Engineer or his assigned representative and the Owner or his assigned representative.

3. The tests shall prove that the equipment and appurtenances are properly installed, meet their operating cycles and are free from defects such as overheating, overloading, and undue vibration and noise. Operating field tests shall consist of the following:

a. Check equipment for excessive vibration and noise as specified herein.

b. Check motor current draw under load conditions. The rated motor nameplate current shall not be exceeded.

c. Recheck alignment with dial indicators where applicable, after unit has run under load for a minimum of 24 hours.

D. Until final field tests are acceptable to the Engineer, the Contractor shall make all necessary changes, readjustments and replacements at no additional cost to the Owner.

E. Upon acceptance of the field tests, a blue tag will be issued. The tag will be signed by the Engineer and attached to the unit. The tag shall not be removed and no further construction work will be performed on the unit, except as required during start up operations and directed by the Engineer.

F. Defects which cannot be corrected by installation adjustments will be sufficient grounds for rejection of any equipment.

G. All costs in connection with field testing of equipment such as lubricants, temporary instruments, labor, equipment, etc., shall be borne by the Contractor. Power, fuel, chemicals, water, etc. normally consumed by specific equipment shall be supplied by the Owner unless otherwise specified in the individual equipment specifications.

H. 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 Owner formally takes over the operation thereof.

I. Field testing of electric motors shall be in accordance with Section W-47.

3.07 FAILURE OF EQUIPMENT TO PERFORM

A. Any defects in the equipment or failure to meet the guarantees or performance requirements of the Specifications shall be promptly corrected by the Contractor by replacements or otherwise.

B. If the Contractor fails to make these corrections, or if the improved equipment shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture of said equipment, may reject said equipment and order the Contractor to remove it from the premises at the Contractor's expense.

C. The Contractor shall then obtain specified equipment to meet the contract requirements.

3.08 PAINTING

A. All surface preparation, shop painting, field repairs, finish painting, and other pertinent detailed painting specifications shall conform to applicable sections of Section W-36.

B. All shop coatings shall be compatible with proposed field coatings.

C. All inaccessible surfaces of the equipment, which normally require painting, shall be finished painted by the manufacturer. The equipment and motor shall be painted with a high quality epoxy polyamide semi-gloss coating specifically resistant to chemical, solvent, moisture, water and acid environmental conditions, unless otherwise specified.

D. Gears, bearing surfaces, and other unpainted surfaces shall be protected prior to shipment by a heavy covering of rust-preventive compound sprayed or hand applied which shall be maintained until the equipment is placed in operation. This coating shall be easily removable by a solvent.

3.09 WELDING

A. The Equipment Manufacturer's shop welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirement of AWS D1.1 "Structural Welding Code - Steel" or AWS D1.2 "Structural Welding Code - Aluminum" of the American Welding Society, as applicable.

B. The Contractor's welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirements of AWS D1.1 "Structural Welding Code - Steel" or AWS D1.2 "Structural Welding Code - Aluminum" of the American Welding Society, as applicable.

C. The Contractor shall perform all field welding in conformance with the information shown on the Equipment Manufacturer's drawings regarding location, type, size, and length of all welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society, and special conditions, as shown by notes and details.

- END OF SECTION –

SECTION 11412 - GRIT WASHERS – BUILDING 2

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test and place in satisfactory operation, new grit washers in Building 2, complete with all necessary accessories as specified herein, as shown on the Drawings, and as required for a complete and operational installation.

B. Equipment shall be provided in accordance with the requirements of Section 11000.

1.02 CONDITIONS OF SERVICE AND PERFORMANCE REQUIREMENTS

A. Two grit washers shall be supplied. The units shall be designed to handle grit slurry underflow from the existing grit collectors. Each grit washer shall include dual grit classifiers (Slurry Cups) which shall be characterized by a dominant strong free vortex which utilizes centrifugal and gravitation forces, and secondary boundary layer velocities to affect the separation, collection and classification of grit from the unit's inflow. The grit classifier shall discharge washed (low organic) grit to the grit dewatering escalator.

B. The grit dewatering escalators (Grit Snails) shall be designed to capture and dewater concentrated, washed grit slurry from the washing/classification unit. There shall be one (1) escalator per two (2) grit classification units. Flow discharged to the clarifier pool shall be escalated on a slow moving cleated belt and dewatered before discharging into a dumpster.

C. At the feed conditions specified below, each grit washer shall be capable of removing at least 95 percent of the grit (containing up to 1 percent solids) entering the feed inlet that is larger than 75 micron and has a specific gravity of 2.65 or greater.

D. At the feed conditions specified below, the material removed by the grit dewatering unit shall have a minimum total solids concentration of 60% and maximum volatile solids concentration of 20%.

E. Grit Separation/Classification (Slurry Cup) Schedule

1.	Number of Units:	4 (2 duty, 2 standby), 2 per Grit Escalator
2.	Size:	32" diameter
3.	Capture Rate:	95% removal of all grit ≥75 microns or larger
4.	Influent Solids Concentration:	≤ 1.5 %
5.	Design Flow/Unit:	330 gpm with 88“ of headloss
6.	Minimum Flow/Unit:	280 gpm with 63“ of headloss
7.	Maximum Flow/Unit:	400 gpm with 128“ of headloss
8.	Discharged Grit Dry Solids	≥60%
9.	Discharged Grit Volatile Solids	≤20%
10.	Influent Connection:	6” flanged pipe
11.	Effluent Drain Connection:	8” flanged pipe
12.	Underflow Connection:	3” NPT pipe
13.	Effluent Water Connection:	1.5” NPT

14. Material of Construction: 316 SS

15. Operation: Continuous / Intermittent minimum 10-15 minutes

F. The CONTRACTOR, through a single Supplier, shall have unit responsibility for the furnishing and function operation of the grit washing and dewatering escalator units. The designated single Supplier, however, need not manufacture more than one part of the unit, but shall coordinate the design, assembly, testing, and erection of the unit(s) as specified herein.

G. The grit washer supplier shall have unit responsibility for coordinating mounting system with the CONTRACTOR to ensure no vibrations and specified performance.

H. The system to be furnished hereunder shall be made by a manufacturer regularly engaged in such work and who has furnished similar installations and had them in successful and continuous operation for a minimum period of ten years.

I. Data on performance testing, service history and operation of existing installations using the submitted equipment shall be made available to the Engineer, upon request, for use in determining that the Grit Washing and Dewatering System offered meets the intent of the contract, performance requirements and criteria stated in these specifications.

J. Grit screw classifiers, grasshoppers, reciprocating rakes and similar type of units shall not be accepted.

K. Units using Apex valves shall not be accepted.

1.03 SUBMITTALS

A. The grit classifier and dewatering system manufacturer must certify to the CONTRACTOR and CITY OF TAMPA, jointly, that the manufacturer has examined the Contract Documents and that the equipment and apparatus the manufacturer offers to furnish will meet in every way the performance requirements set forth or implied in the Contract Documents.

B. A Performance Affidavit shall be submitted in accordance with Section 11000, Equipment General Provisions. The CONTRACTOR shall transmit to the ENGINEER three (3) original copies of the affidavit given by the manufacturer along with the initial Shop Drawing submittals.

1. The Performance Affidavit must be signed by an officer of the Basic Corporation, partnership, or company manufacturing the equipment and witnessed by a notary public. The Performance Affidavit shall contain the following:

a. Addressed to: CONTRACTOR and CITY OF TAMPA

b. Reference: CITY OF TAMPA – GRIT WASHER REPLACEMENT

c. Text: (Manufacturer's Name) has examined the Contract Documents and hereby state that the (Product) meets in every way the performance requirements set forth or implied in Section of the Contract Documents.

d. Signature: Corporate Officers shall be Vice President, or higher (Unless statement authorizing signature is attached).

C. Submit the following information on the proposed equipment:

1. Complete listing of any deviations, revisions, or exceptions to these specifications or requirements indicated on the Drawings.

2. Complete catalog information, layout drawings with dimensions and weights, bill of materials, shipping and handling instructions, and installation instructions for the grit washers.

3. Cut sheets for individual components mounted on the grit washers including valves, solenoids, rotameters, anchor bolts, gear reducer, motor, and proximity switch and other sensors.

4. Complete wiring diagram and panel elevations for the control panel along with cut sheets for all individual panel components including the panel itself, PLC components, breakers, VFDs, OIU, UPS, network switch, louvers and fans, phase and load monitors, control devices, surge devices, terminal blocks, relays, etc.

5. Spare parts list

6. Programming description, sample OIU display showing proposed operator interface features, and complete PLC address/register listing for interface with the Grit Removal System Main Control Panel.

7. Proposed testing procedures for factory, field, and performance tests.

8. As-built drawings and O&M materials upon startup.

1.04 QUALITY ASSURANCE

A. All degritting equipment furnished under this Section shall be of a design and Manufacturer that has been used in similar applications. Manufacturers shall provide evidence of at least ten (10) installations in which grit washing and dewatering equipment has provided satisfactory performance for a minimum of five (5) years in a similar application.

1.05 SHIPMENT, STORAGE, AND HANDLING

A. Ship, store, and handle the equipment in strict accordance with manufacturer's instructions. The grit washers for Building 2 are to be installed first and therefore shipped first, separately from those specified in Section 11413.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Each grit washer unit shall be the Slurry Cup / Grit Snail as manufactured by Eutek Systems of Hydro International or approved equal. The Contractor is responsible for adhering to the General Conditions and Supplementary Conditions. The Contractor shall be responsible for all work required by the Contract Documents and shall include additional costs for work associated with this equipment in the lump sum bid.

2.02 GRIT SEPARATION/CLASSIFICATION

A. Four grit separation/classification units will be supplied. Each unit shall capture and dewater all grit removed by up to two of the existing grit collectors. Two grit separation/classification units will discharge to one grit escalator.
B. The Grit Separation/Classification unit shall be characterized by a dominant strong free vortex and secondary boundary layer velocities as defined below:

1. Dominating increasing tangential velocity profile toward the center of the unit.

2. The ability to handle increasing flows with no loss of the specified grit removal efficiency and with increasing headloss requirements.

3. The ability to classify (wash) the grit from lighter organic material to meet the specified organic solids content.

4. No requirements for electrical or mechanical components, flow deflecting / guiding weirs or baffles, or compressed air lines within the unit to meet the specified performance.

5. Continuous removal of washed, clean grit.

C. The washing unit shall be 32 inches in diameter and fabricated of 316 stainless steel acid passivated to a uniform finish. The dished and flanged heads shall be 1/4 inch thick. The vessel walls shall be 3/16 inch thick. Welding shall conform to the most current standards of the American Welding Society. All stainless steel surfaces shall be acid washed.

D. A 32 inch diameter access manhole shall be provided in the top of each grit washing/classification unit. All internal elements shall be removable from inside the unit.

E. The grit separation/classification unit shall be all-hydraulic with no moving parts within the unit.

F. The pair of grit separation/classification units shall be mounted on a support structure to provide clearance between the bottom of the grit underflow pipes and the dewatering unit surface. The grit underflow from the separation/classification unit shall be transported by gravity to the grit escalator unit.

G. The Grit Separation / Classification unit shall include a Hydraulic Valve (HV) to deliver a continuous flow of “washed” grit slurry to the dewatering unit. The HV shall have no mechanical or moving parts.

H. To measure the fluidizing water, a stainless steel King 35 gpm flowmeter with 1.5” NPT connection shall be used.

I. A coating of Belzona shall be applied to the inside bottom part of the Grit Separation / Classification body to add a secondary layer of abrasion resistance.

J. Each Grit Separation/Classification unit shall have the following piping connections:

1. The Grit Separation / Classification Unit shall have a single 1-1/2 inch NPT pipe stub for connection of the system water.

2. One (1) 6” inlet connection with a 6” rotatable flange.

3. One (1) 8” outlet connection with an 8” rotatable flange.

4. One (1) 1.5" grit underflow connection.

5. One (1) 3" threaded drain connection.
6. One (1) 1.5" NPT fluidizing water connection for the Hydraulic Valve supply and Hydraulic Valve backwash.

K. The Grit Separation / Classification unit shall be designed to withstand a maximum working pressure of 14.7 psig. The actual maximum pressure at the inlet shall be no more than 14.7 psig.

2.03 GRIT DEWATERING ESCALATOR

A. The Grit Dewatering Escalator unit shall have a capacity of 6 CY/hour and the housing shall consist of a minimum 72 inch square clarifier with a 36 inch wide escalating belt inclined at 30 degrees. The housing for the Grit Dewatering Escalator belt shall be fitted under the clarifier which shall provide at least 3 inches of freeboard.

B. The Grit Dewatering Escalator unit support structure shall be as shown on the general arrangement drawing and anchored to the existing concrete floor. Anchors shall be sized and provided by the manufacturer and shall be epoxy set, Type 316 stainless steel concrete anchor bolts, nuts, and washers set with Type 316 leveling nuts on a minimum of 1" grout below the equipment base plates.

C. The Grit Dewatering Escalator discharge shall include a manufacturer-supplied, mechanically connected, replaceable, flexible rubber boot to divert collected grit into the Contractor supplied aluminum discharge chute indicated on the drawings. Rubber boot material shall be as recommended by the manufacturer for compatibility with contact to the collected grit, sized and shaped to fit snuggly within the discharge chute.

D. The Grit Dewatering Escalator shall be enclosed with stainless steel (type 316) detachable covers without a connection to odor control.

E. The Grit Dewatering Escalator unit clarifier shall be designed based on a settling rate not to exceed 3.2 gpm per square foot.

F. The clarifier and belt housing shall be Type 316 stainless steel.

G. All stainless steel surfaces shall be glass bead blasted (to a uniform finish) and acid washed or acid washed and passivated. All surfaces shall be free of sharp edges, weld spatter, and residue. All welds shall be ground smooth.

H. All stainless steel shall conform to the following standards:

1. Plate and Sheet: ASTM A 167 and ASTM A 240

2. Bar: ASTM A 276 and ASTM A 479

3. Tube: ASTM A 312

I. The dewatering belt shall be made of 1/8 inch x 1/32 inch two-ply polyester reinforced continuous conductor belting. The belt cleats shall be 3-3/8" X 4-9/16" of molded 60 Durometer neoprene and aluminum reinforced and shall be vulcanized on the belt. The cleats shall attach to the belt with minimum 5/32 inch thick neoprene hinges.

J. The grit dewatering escalator shall be provided with head and tail rolls of Type 316 stainless steel.

1. The Grit Dewatering Escalator unit belt shall be provided with 2-inch openings to allow transfer of fine solids internal to the belt to the underside of each cleat.

2. The belt housing shall be provided with clean out plates and one (1) flanged drain

.

3. The 9-3/4 inch diameter lagged headroll shall be designed for adjustable take-up without affecting the headroll retainer plate, scraper, or drive unit. The tailroll shall be designed to mount internally to the unit belt housing with external sealed bearings.

4. The Grit Dewatering Escalator unit shall be provided with a headroll scraper having 1/4 inch thick high density polyethylene (HDPE) contact surfaces with a 1/4 inch thick HDPE retainer plate. Both retainer plate and scraper shall be loaded to keep belt cleats closed tightly around the headroll during operation.

K. The grit dewatering escalator unit shall be supplied with a factory installed rinse bar system. The system shall include:

1. Two spray bars located above the belt and below the clarifier liquid level to enhance grit washing.

2. One spray bar located at the bottom of the clarifier as a tailroll area rinse.

L. Drive Unit:

1. The Grit Dewatering Escalator drive unit shall consist of the motor and the helical

gear reducer, mounted as a single integrated unit. All Bearings shall be anti-friction, ball, or roller type bearings.

2. The motor shall be ½ hp, 3 phase, 230/460 VAC, 60 Hz, NEMA Design B, XPFC enclosure, suitable for a Class 1, Division 1, Group D, explosion hazard area.

3. The helical gear reducer shall have hardened alloy steel gears accurately cut to shape. A mechanical torque-limiting clutch shall be mounted on the headroll gear assembly to prevent an accidental overload of the drive unit and belt.

M. The unit shall be driven by a variable frequency drive (VFD) that shall be housed in the control panel. The belt speed shall be adjustable from 1-5 ft/min.

N. A mechanical torque-limiting clutch shall be mounted on the headroll gear assembly to prevent an accidental overload of the drive unit and belt.

2.04 WATER REQUIREMENTS

A. Each Grit Separation / Classification Unit and Grit Dewatering Escalator combination shall require clarified non-potable water supplied at a regulated 50 psig ± 5 psi. The water requirements are as follows:

1. A continuous supply of 30 gpm is required for normal operation of each Grit Separation / Classification unit.

2. An intermittent supply of 47 gpm is required for a periodic short duration during backwash cycle for the Grit Separation / Classification unit.

3. A continuous supply of 30 gpm for normal operation of the Grit Dewatering Escalator unit.

2.05 ELECTRICAL REQUIREMENTS

A. In addition to the requirements specified herein, comply with the City's technical specification SECTION 47 – ELECTRIC MOTORS. If there is a conflict, assume the more stringent requirement until otherwise directed and bring such conflicts to the City's project manager for clarification. All electrical appurtenances furnished by the Manufacturer in and around the Grit Washing / Classification Units and Grit Dewatering Escalators, including the motors, solenoid valves, and motion sensors, shall be rated for installation in a Class I, Division 1, Group D,

hazardous location where such classified areas are indicated on the Drawings or specified herein.

B. Electrical Requirements

1. Solenoid valves shall operate on 120VAC, single phase power. Two-way solenoid valves shall be normally closed, open when energized. The valve shall be of Type 316 stainless steel body and bonnet with a BUNA "N" diaphragm and screwed ends. The solenoid's internal parts shall be of 300 and 400 series stainless steel. The valve shall have a safe body working pressure of 125 psi, and shall be as manufactured by JD Gould, or equal, for 120 volt, 60 Hz, single phase operation. Solenoid enclosure shall be watertight, explosion proof, rated for Class 1, Div 1 hazardous areas.

2. Motors shall operate on 480VAC, 3 phase electrical power. The Grit Dewatering Escalator shall be provided with a drive unit motor consisting of the motor and the helical gear reducer, mounted as a single integrated unit. All Bearings shall be anti-friction, ball, or roller type bearings.

Motors	**Grit Dewatering**
Rating	460V, 3 ph, 60 Hz
Horsepower	½
Speed, rpm	1735
Enclosure	XPFC
Insulation	Class H
Service Factor	1.00
Rating	Inverter Duty
Space Heater	No
Motor Winding Temperature Switches	No

2.06 CONTROLS AND INSTRUMENTATION

A. GRIT WASHER / DEWATERING UNIT CONTROL: In addition to the requirements specified herein, comply with the City's technical specification SECTION 62 - CONTROL AND WIRING FOR PACKAGED UNITS. If there is a conflict, assume the more stringent requirement until otherwise directed and bring such conflicts to the City's project manager for clarification. Each Grit Washer Unit shall be supplied with a control panel as specified herein controlled through a manufacturer supplied programmable controller (PLC) in coordination with the Grit Removal System Main Control Panel PLC supplied under Division 17. Each Grit Washer Unit shall operate in coordination with the existing grit system isolation gates, grit collectors, grit pumps and associated valves, and grit washer feed valves as described in the control logic described in Section 17000 for the grit removal process. The Grit Washer Unit's escalator shall essentially run continuously at a set speed when enabled to run, with periodic cycling of the backwash and blow down valves as described herein. The Grit Washer Unit PLC shall be sent an enable signal from the Grit Removal System PLC over an Ethernet link. The unit's PLC shall then control the escalator motor to run continuously at the set speed (if no alarms are present) and periodically operate the unit's backwash and blowdown solenoids through timers resident in the unit's PLC. The unit's PLC shall send a pump interrupt signal to the Grit Removal System Main Control Panel PLC to temporarily stop the associated grit pump during an individual SlurryCup blowdown sequence. The Grit Washer Unit manufacturer shall review and approve the proposed Grit Removal System PLC programming before final programming is made.

B. CONTROL PANEL CONSTRUCTION: Each panel shall be a wall-mounted panel, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosure shall be NEMA 12 painted steel enclosure,

minimum 14 gauge suitable for mounting in the ventilated, non-classified electrical room as shown on the Drawings. Panel enclosure shall be pre-fabricated enclosure as provided by EXM Manufacturing, Hoffman, or approved equal. Enclosure shall have a hinged outer door with suitable latching mechanisms. The enclosures shall have a hinged inner dead front door fabricated from 5052-H32, 0.080 inch thick-brushed marine alloy aluminum. The inner door shall be completely removable for ease of service. The inner door shall be held closed by mechanical latches. The enclosure shall have a 12-ga steel, formed, removable subpanel. The panel enclosure and subpanel shall be degreased, cleaned, treated with a phosphatizing process, then primed and painted with 1-2 mil industrial grade baked enamel, grey for panel enclosure inside and out and white for the subpanel.

C. CONTROL PANEL MOUNTING: The Contractor shall mount the panel on the concrete block wall of the electrical room, anchored using Type 316 stainless steel concrete epoxy anchors. Anchors for the control panel shall be supplied by the Contractor.

D. PANEL FABRICATION:

1. Enclosures shall provide mounting for power supplies, motor drives, control equipment, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling.

2. Enclosures shall be constructed so that no screws or bolt heads are visible when viewed from the front. Penetrations for instruments and other devices shall be clean and smoothly finished with rounded edges.

3. All wiring shall be bundled with nylon cable ties when exposed (leaving in conduits, at bends, etc.) but otherwise shall be routed and enclosed in vented plastic wireway as required. Wireways shall be oversized by a minimum of 10%; overfilled wireways shall not be acceptable. DC power, analog signal and discrete signals shall be run in separate wireways from AC signal and power wiring.

4. Spare field wiring shall be bundled, tied, and labeled as specified above, and shall be neatly coiled in the bottom of the cabinet.

5. A copper ground bus shall be installed in each cabinet, and shall be connected to the building power ground.

6. Interior panel wiring shall be tagged at all terminations with machine-printed self-laminating labels. Labeling system shall be Brady TLS 2200 Printer with TLS 2200®/TLS PC Link™ labels, or equivalent system by Seton or Panduit.

7. Main breaker and branch breaker sizes shall be coordinated such that an overload in a branch circuit will trip only the branch breaker but not the main breaker.

8. Enclosure shall be provided with a 120-volt duplex receptacle and an LED service light with manual on/off switch.

9. As applicable, enclosures shall be furnished with red laminated plastic warning signs in each section. The sign shall be inscribed to read, "WARNING - This Device Is Connected to Multiple Sources of Power." Letters in the word "WARNING" shall be 0.75 inch high, white.

E. CONTROL PANEL COMPONENTS: The panel shall consist of the following components:

1. Manual Main Breaker handle mounted on the panel interior dead front door to disconnect the 480V incoming power to the panel and prevent the dead front door from being opened when in the ON position unless manually bypassed.

2. Variable Frequency Drives: The panel shall include a VFD suitable for the grit escalator 480V motor. VFD shall be as supplied by Yaskawa (City's standard product). VFD shall have contacts for running and fault status monitoring and shall directly interface with the panel PLC over an Ethernet link. Provide input line filters to minimize harmonic interference with outside power circuits and output load filters to prevent voltage spikes on the power feed cable to the motor.

3. Motor Power and Control Circuit Breakers: Provide breakers for the 480V motor power circuit to the VFD. Provide a control power transformer within the panel, suitably sized for all 120V circuits powered through the panel; fused primary power from the 480V incoming source and fused secondary 120V single phase control power. Provide branch circuit breakers for the panel receptacle and light, panel fan(s), and UPS supply power. Provide branch circuit breakers off the UPS load side to feed the PLC, OIU, and control power (for all other circuits powered through the 120V UPS output). The circuit breakers shall be quick-make, quick-brake and trip free. The thermal and magnetic elements shall operate independently and be designed with a common trip bar breaking all poles when a fault is received on any pole. The circuit breakers shall be as manufactured by Square D, Allen Bradley or Phoenix Contact for both 120V and 460V service.

4. Programmable Controller (PLC): Each panel shall include a PLC for all control logic. The PLC shall be GE Intelligent Platforms RX3i (City's standard product). CPU, Power Supply, Network Interface, and all I/O modules are to match City's standard modules for input voltage, number of channels, and spare capacity. City's standard PLC components include:

    - Rx3i Analog Output – GE IC694ALG392 AO, 4-20mA, 8 channel
    - Rx3i Analog Input – GE IC694ALG221 AI, 4-20mA, 4 channel – or –
    - Rx3i Analog Input – GE IC695ALG616 AI, 4-20mA option, 16 SE - AWTP Warehouse item
    - Rx3i Digital Output – GE IC694MDL940 DO 0-125VDC/0-256VAC, 16 point
    - Rx3i Digital Input – GE IC694MDL240, DI 120V
    - Rx3i Network – GE IC695ETM001 Ethernet Module, 10 Base T
    - Rx3i Power Supply – GE IC695PSA140 PS, 40W, 120V
    - Rx3i Base – GE695CH012 Rack, 12-slot, high speed base – or –
    - Rx3i Base – GE695CH016 Rack, 16-slot (12 slot is preferred)
    - Rx3i CPU – GE695CPE305 CPU, 5 MB User Memory, Ethernet port

5. Operator Interface Unit (OIU): Each panel shall include an OIU mounted on the panel front face for entering setpoints for the system such as adjustable timers. OIU shall be a 7-inch color TFT LCD touch screen, backlit, with text-style display interface, that communicates with the PLC through the local network switch. OIU shall operate on 24Vdc power from an internal panel supply and shall be Maple Systems HMI5070LB (City's standard product).

6. Uninterrupted Power Supply (UPS): The PLC, OIU, and all control components shall operate on 120V power from a UPS securely mounted inside the panel (loose installation at bottom of panel not acceptable). The UPS shall be as manufactured by APC

Schneider Electric, or approved equal, with Ethernet communications directly with the panel PLC for full status monitoring of UPS (battery life, running on battery, faults, etc.). UPS shall be sized, and panel shall be wired, to power all components within the panel other than the panel light, receptacle, and ventilation fans. Panel ventilation shall be sized to dissipate the heat generated by the UPS when running on battery, full load. Provide a manual bypass switch around the UPS to allow control power to be directly connected to the UPS load side to facilitate UPS maintenance.

7. Ethernet Interface: The panel PLC shall communicate with the Grit Removal System Main Control Panel PLC (located in the same building) over a copper local Ethernet PoE link connected through a PLC communications module. Ethernet cable to the panel shall be furnished and supplied under Division 17. The conduit for the cable shall be supplied under Division 16. The Ethernet cable shall be Allen Bradley 1585-C8CB-S600 with LAPP Group PN 2170060 Connectors, or equivalent, to protect against interference from 480V power within the panel. Wireways and layout within the panel shall accommodate this type of cable for thickness and bending radius. Ethernet interface shall be through a local area network switch, Stratix 5700 or approved equal. The network switch shall provide communications to, using City-assigned IP addresses for, the panel PLC, Grit Removal System PLC interface, panel OIU, panel UPS, and panel VFD.

8. Louvers and Fans: Panel shall be equipped with 120V internal fan(s) and louvers to dissipate heat generated by equipment mounted inside the panel, including both VFDs at maximum heat output. Provide louvered openings near the bottom and top of the panel on opposite sides to promote complete ventilation of the panel. All air-flow openings shall be fitted with dust filters and activated carbon filters to filter out residual wastewater gases that may be present in extremely low concentrations in the electrical room environment. Provide thermostatically controlled, low-noise cooling fans to circulate outside air into the enclosure through the top louvered opening, exhausting through the bottom louvered opening. Air velocities through the enclosure shall be minimized to assure quiet operation.

9. Power/Phase Monitor: A power monitor relay shall be installed and connected to the panel main 480V feed. When the relay is deactivated, it shall disconnect control power. The relay shall be deactivated in the event of phase loss, phase reversal, or low voltage. The phase monitor relay shall be as manufactured by Phoenix Contact.

10. Load Monitors: Provide 480V power load monitors on the power feed to the escalator motor to detect a high current load on the motor. Load monitoring current transformers shall be as manufactured by Phoenix Contact.

11. Remote mounted Local/Off/Remote (LOR) selector switches for the escalator motor shall directly interface with the VFD for manual override start when in LOCAL or stop when in OFF. When in REMOTE, control of the escalator motor shall be through the panel PLC. The remote mounted switches shall be supplied under Division 17.

12. Remote mounted Open/Close/Remote (OCR) selector switches for the backwash, blowdown, and water supply solenoid valves shall directly interface with the 120V power supply from the associated Grit Washer control panel for manual override open and close commands. When in REMOTE, control of each valve shall be through the panel PLC. The remote mounted switches shall be supplied under Division 17.

13. Remote mounted emergency stop furnished under Division 17 shall directly disconnect control power and stop the associated motor when engaged (normally closed enable contacts at pushbutton).

14. Panel indicator lights as noted herein shall be mounted on the panel front door. Indicator lights shall be NEMA 12, 1.2" (30 mm) dia. mounting hole, SPDT, red for running indication, amber for fault lights, white for power and shall be Allen Bradley Type 800H or equivalent by Square D or General Electric. Indicating lights shall be LED type and wired for individual lamp push-to-test operation.

15. Reset pushbuttons mounted on panel's front face shall be NEMA 12, 1.2" (30 mm) dia. mounting hole, black, push-to-reset, pushbuttons with contacts wired in parallel with PLC reset output to unlatch and reset equipment alarms if condition is cleared. Pushbuttons shall be Allen Bradley Type 800H or equivalent by Square D or General Electric.

16. Surge Suppression: Provide a surge arrestor installed on the line side of the main breaker in accordance with manufacturer's instructions. Provide surge suppression devices on all signal and power leads on all circuits that have any part of the control or power circuit that extends past the limits of the building housing the control panel. Surge devices shall be as manufactured by Phoenix Contact:
    - for 110VAC Signal use Phoenix Contact 2794987
    - for 120VAC Power use Phoenix Contact 2856812
    - for 4-20mA signals use Phoenix Contact 2838186
    - for 480VAC power use Phoenix Contact 2800718

17. As-built Drawings: A laminated "As Built" copy of the panel wiring diagrams shall be provided and placed in the panel print pocket for all panels. All panel drawings shall be developed using AutoCad®. The drawings shall have a complete Bill of Materials, panel exterior and interior layouts, and show all electrical wiring. As-built drawings shall be submitted with the O&M materials on a CD in both AutoCad® (.dwg) and Adobe Acrobat® (.pdf).

18. Terminals: Terminal blocks shall be as follows:

    a. Terminal blocks shall be assembled on non-current carrying aluminum DIN mounting rails securely bolted to the cabinet subpanel. Terminals shall be of the screw down pressure plate type as manufactured by Allen Bradley or Phoenix Contact.

    b. Power terminal blocks for both 120 VAC and 24 VDC power shall be single tier with a minimum rating of 600 volts, 30 amps.

    c. Discrete signal terminal blocks shall be 2-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal.

    d. Analog signal terminal blocks shall be 3-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal and the shield/drain wire shall be installed on the bottom or right-most terminal.

    e. Only one wire shall be terminated under a single wire clamp or screw.

    f. Terminal blocks for field wire connections shall be added as needed in 10-pole increments. Terminal blocks shall be mounted with a minimum of 2" from both enclosure sides and from the bottom of the enclosure for easy access to terminal screws.

g. Terminals shall be marked with a permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field incoming conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

h. Separate terminal strips shall be provided for each type of power and signal used within each cabinet. Where applicable, terminal strips for different voltages of discrete signal wiring shall also be separated. Terminal strips shall be labeled as to voltage and function.

19. Wiring: All wiring shall be color-coded using tinned copper MTW #14 AWG minimum for power and control wiring and #16 twisted pair for analog signal wiring. Wiring and cables shall be numbered at each end. Wire numbers shall be printed on non-removable heat-shrink tags. Wires shall be color coded as follows:

Equipment Ground - GREEN

480 VAC, Phase A – Brown
480 VAC, Phase B – Orange
480 VAC, Phase C – Yellow
480 VAC, Neutral - Grey

120 VAC Power - BLACK
120 VAC Power Neutral - WHITE

120 VAC Control (Internally Powered) - RED
120 VAC Control (Externally Powered) - YELLOW

24 VAC Control - ORANGE

DC Power (+) - BLUE
DC Power (-) - GRAY

Analog Signal – BLACK/WHITE

20. Component Labels: All interior panel components shall be individually labeled on the back plate with a custom engraved plastic tag with adhesive back (see Section 17000 for nameplates). The tags shall be white with black letters and match the nomenclature indicated on the as-built wiring diagrams.

21. Mounting Hardware: All mounting hardware such as screws or bolts used in the manufacturing of the control panel shall be Type 316 stainless steel. All holes in the back plate and dead front shall be drilled and tapped. No self-tapping screws, adhesive tapes, or Velcro will be accepted for the mounting of any hardware.

22. Isolation and interposing relays shall be provided on all discrete inputs and outputs to and from the PLC and shall be DIN rail mounting type, DPDT, minimum 10 amp, 120 VAC contact rating. Relay coils shall be 120 VAC or 24 VDC as required. Relays shall have a flag indicator to show relay status, a pushbutton to allow manual operation of the relay, and an internal pilot light to indicate power to the coil. Relays shall be as manufactured by Phoenix Contact or Allen Bradley.

23. Corrosion Protection: Panel interior components shall be treated with a corrosion inhibiting spray on all exposed metallic surfaces, particularly terminations, contacts, and wire ends. After installation, furnish corrosion inhibiting capsules that emit molecular level coating on metallic surfaces throughout the panel that provide specific corrosion

barrier toward hydrogen sulfide and/or subsequent formation of sulfuric acid when combined with ambient moisture.

24. Panel Seal-Offs: Installing Contractor shall furnish and install panel seal-offs on all conduits leading to equipment installed in ambient outside air or process areas to prohibit exposure to corrosive gasses. Panel seal-offs shall be mounted near the equipment and shall be provided with terminations on either side of the epoxy-based seal-off material to allow for replacement of cable without breaking the seal. All conduits entering a panel or enclosure shall be sealed at the conduit entry point with a removable, expandable conduit seal material to further prohibit outside air or process gasses from entering the panel.

F. CONTROL OPERATION

1. The system shall be controlled to provide automatic or manual operation, and system shut down when a fault is detected. Control of each Grit Washer system shall be through a dedicated control panel located in the Electrical Room furnished with the equipment, with interface to a Grit Removal System Main Control Panel furnished under Division 17 (also located in the Electrical Room), and through local control switches for the escalator and solenoid valves on the unit as described herein. PLC programming shall be manufacturer's standard control algorithms modified to reflect standard City practices for such things as tagname conventions, file management, commenting, and messaging transfer blocks.

2. Grit Separation / Classification unit: When a grit dewatering escalator is running (whether in LOCAL at the LOR or in REMOTE and enabled by the Grit System Main Control Panel PLC), the associated grit separation/classification units (Slurry Cups) shall operate as follows when the unit's associated solenoid valve Open/Close/Remote local switches are in REMOTE:

   a. Grit slurry from the Grit Pumps shall be pumped to the Grit Grit Separation / Classification unit continuously at a controlled rate.

   b. During operation, a small volume of washed/classified grit slurry shall continuously underflow from the Grit Separation / Classification unit. Control of the grit slurry underflow rate is via the HYDRAULIC VALVE mounted on the bottom of the unit. A portion of the system water is continuously introduced to the HYDRAULIC VALVE.

   c. Periodically, (typically twice per hour during heavy grit loads and typically once per hour during light grit loads), a backwash sequence is initiated, by cycling solenoid valves, which flushes the grit underflow gap inside the unit. Frequency and duration of backwash cycle timers shall be adjustable in the PLC from the panel mounted OIU.

   d. Periodically, (typically once every 4 backwashes), a blowdown sequence is initiated to flush accumulations of debris inside the unit. Blowdown is accomplished by stopping the associated grit pump to the Grit Separation / Classification unit (via a pump enable signal over the Ethernet link to the Grit Removal System Main Control Panel), cycling solenoid valves, and resuming operation. Frequency and duration of blowdown cycles is adjustable from the OIU.

   e. Manual control of the operation of the Grit Separation / Classification units can be done through the local Open/Close/Remote switches located near the units for each unit's solenoid valves.

3. Grit Dewatering Escalator unit: When a grit dewatering escalator is in LOCAL at the Local/Off/Remote (LOR) switch near the unit, the escalator shall run continuously with no PLC interface and shall run at the speed set at the control panel's manual speed potentiometer. When the LOR is in REMOTE and enabled by the Grit System Main Control Panel PLC, and the unit's wash solenoid valve's Open/Close/Remote (OCR) switch is in REMOTE, the associated grit dewatering escalator shall operate as follows:

    a. The Grit Dewatering Escalator belt shall run and the water supply solenoid shall open in continuous operation with the belt running at a set speed. When the belt stops, the water solenoid valve shall close after an adjustable time delay.

    b. While the dewatering unit is running, water shall be directed to the tail roll self cleaning mechanism and grit rinse system.

    c. The belt speed shall be adjustable through a remote signal via the Ethernet link from the Grit Removal System Main Control Panel PLC.

    d. A motion sensor shall be installed on the side of the Grit Dewatering Escalator takeup frame and shall detect movement of the headroll scraper arm. Lack of motion of the headroll scraper arm shall indicate lack of belt movement, drive unit failure and/or scraper arm overload. Lack of belt movement or scraper arm overload shall interrupt signal from the motion sensor to the timer. If the motion sensor fails to reset the timer, the Grit Dewatering Escalator shall stop and the failure light illuminate.

    e. After the enable signal from the Grit Removal System PLC is de-energised, the Grit Dewatering Escalator shall continue to operate for a pre-determined amount of time to allow for the removal and dewatering of all grit accumulated in the clarifier. The off delay timer shall be adjustable from OIU.

    f. The escalator shall stop immediately when an emergency stop input is received and upon a VFD fault condition (in both LOCAL and REMOTE).

G. PHYSICAL CONTROL INTERFACE – Provide devices and interface signals on the panel front face as follows:

1. Power On indicating light

2. System Alarm Reset push button

3. Backwash and Blowdown water valve three position OCA switches

4. System RUNNING indicating light

5. Escalator water SUPPLY OPEN light

6. BACKWASH in operation light

7. BLOWDOWN in operation light

8. Escalator FAULT indicating light

9. Emergency stop indicating light

10. Escalator manual speed setting potentiometer

11. Escalator LOCAL/REMOTE switch for escalator speed control

H. SOFTWARE INPUT/OUTPUTS – Provide the following internal and external I/O to/from the panel PLC:

1. Internal registers across the Ethernet link for system enable. Register/Address signals to/from the Grit Removal System Main Control Panel PLC from each Grit Washer PLC shall include, as a minimum, the following:

- Individual SlurryCup enable/call to run for both units from the main PLC
- Individual SlurryCup ready for both units (permissive to operate associated grit pump) to the main PLC.
- SlurryCup running for both units
- SlurryCup in blowdown for both units (interlocked to stop associated grit pump during blowdown sequence)
- SlurryCup in backwash for both units
- UPS status as noted below
- VFD status/control as noted below
- PLC and network switch faults

2. Internal registers from the OIU for adjusting all system timer settings

3. Internal registers for UPS running on battery, % battery life left value, and fault

4. Internal registers for VFD running input, speed output, speed input, run command output, and fault

5. External inputs for:
   a. emergency stop
   b. panel 120V normal power available
   c. unit in REMOTE (remote LOR switch)
   d. Escalator water supply in REMOTE from local OCR switch
   e. Grit washer backwash water in REMOTE from local OCR switch
   f. Grit washer blowdown water in REMOTE from local OCR switch
   g. in REMOTE (panel speed setting LR switch)
   h. motion sensor alarm
   i. alarm reset

6. External outputs for indicating lights and solenoid operation:
   a. System RUNNING light
   b. Escalator water SUPPLY OPEN light and 120V power to solenoid
   c. BACKWASH in operation light and 120V power to solenoid
   d. BLOWDOWN in operation light and 120V power to solenoid
   e. Escalator FAULT indicating light
   f. EMERGENCY STOP indicating light

I. PANEL CONTROL and POWER INTERFACE: Provide terminals and dry contacts rated 10A at 120V for interface with local control devices and instruments located outside the control panel, as well as terminals for motors, as follows:

1. Emergency stop hard-wired direct input from remote emergency stop pushbuttons (one for each unit) with separate alarm signal to the PLC.

2. Control signal inputs from the local LOR switch.

3. Control signal inputs from the three local valve OCR switches.

4. 120V control signal outputs to the backwash, blowdown, and escalator water supply solenoids.

5. 480V power to the escalator motor from the panel VFD

6. 480V power source from the existing MCC

2.07 SPARE PARTS

A. Provide the following spare parts in addition to the lubricants identified in Section 11000:

Slurry Cup	
Quantity	Description
4	Baffles
2	1.5" Solenoid Valve
2	0-30 psi Pressure Gauges
1	0-100 psi Pressure Gauges
1	1.5" Flowmeter
Grit Snail	
Quantity	Description
1	Set of Gaskets
1	Set of Bearings
1	Set of Scrapers
1	Motor
1	Gearbox
1	1" Solenoid Valve
1	1" Flowmeter
1	Proximity Switch

B. Pack spare parts in carboard boxes; label with manufacturer's name and local representative's name, address, and telephone number; and attach list of materials contained therein.

PART 3 -- EXECUTION

3.01 MANUFACTURER'S FIELD SERVICES

A. Unless otherwise authorized by the Engineer, the Manufacturer's representative shall be a direct employee of the Manufacturer, with at least five (5) years experience in the installation, testing and start-up of equipment of the type provided under this Specification. The Manufacturer's sales and marketing personnel will not be accepted as Manufacturer's representatives.

3.02 FIELD TESTING

A. Prior to start-up, all equipment shall be inspected for proper alignment, operation, connection, and satisfactory operation by means of a functional test. It is the CONTRACTOR's

responsibility to duly notify the Manufacturer of any inabilities to perform functional testing prior to operator training.

B. Upon completion of the installation, each piece of equipment and each system shall be tested for satisfactory operation without excessive noise, vibration, overheating, etc. All equipment must be adjusted and checked for misalignment, clearances, supports, and adherence to safety standards.

C. Field tests shall be conducted with the grit collector tank full.

D. The CONTRACTOR shall submit a statement from the Manufacturer certifying that each grit washer / classifier has been installed in accordance with its recommendations and will meet the performance specified in Paragraph 1.02 of this Section.

E. The system shall also be tested as part of the complete plant control system tests to verify all required communications between the panel PLC and the plant control system are fully functional. This shall include communications and control for both washer / classifiers and grit pumps. The system shall not be fully accepted for release of final retainage until these tests are completed successfully.

F. The Contractor shall test the grit equipment installation after startup of the equipment. The Contractor shall retain Black Dog Analytical, LLC (Contact Jimmie Griffiths (815) 715-3123 or info@blackdoganalytical.com) to conduct the performance testing. The performance test is in addition to the normal mechanical testing and adjustments required for attaining equipment acceptance. The performance test may be run in conjunction with start-up after approval of satisfactory installation and start-up by the system supplier. The cost for the testing by Black Dog Analytical shall be borne by the OWNER using the allowance indicated on the bid form. All other costs associated with testing shall be borne by the Contractor. The testing shall be as described below.

1. Personnel in charge of the tests shall be competent, authorized representatives of the independent testing firm who are familiar with operation of the equipment furnished and who have previous satisfactory experience in conducting tests of the type specified. Qualified personnel shall perform the tests, record the data, make the required calculations, and prepare a report on the results.

2. Representatives of the Engineer will observe the tests and collect a copy of the recorded data. The information collected will be used as a basis for determining acceptability of the Equipment Supplier's results. In case of conflict, interpretations and calculations made by the Engineer will govern.

3. The independent testing firm shall provide all equipment necessary to properly conduct the tests. Contractor shall supply the facilities to support the system supplier in conducting the tests.

G. Performance Testing

1. Complete performance testing for each washer / classifier installation. After startup, the CONTRACTOR will conduct a performance test under normal plant flow conditions to determine the actual system operating conditions and verify that the unit meets the requirements specified in 1.02. Tests shall begin once functional testing has been completed to the OWNER’s satisfaction, the manufacturer has determined that the washer / dewater units are acclimated to the actual operating conditions, and the units are operating at optimal conditions. However, tests shall begin within at least 4 weeks of initial startup.

2. Dry Solids Content – The independent testing firm shall obtain a representative sample of the washed grit at the discharge into the dumpster. Samples shall be tested using an oven-drying technique to measure the wet weight of the sample as compared to the dry weight of the sample to determine the dry solids content of the screenings. A

minimum of three separate samples, taken over a week's time, at times selected by the OWNER, will be collected and tested.

3. Volatile Solids Content – The independent testing firm shall obtain representative samples of the grit immediately after the washer / dewater units during operation. Samples will be tested by measuring the weight of the sample before and after heating to 550 °C per Standard Method 1684. A minimum of three separate samples, taken over a week's time, at times selected by the OWNER, will be collected and tested.

4. Capture Rate – The independent testing firm shall obtain representative samples of the grit stream prior to washing, the grit stream leaving the washing and dewatering system, and dewatering grit in the dumpster. If there is insufficient endemic grit in the influent feed, seeding may be used. Seed material shall be Ganusil 5010. The seed sand shall be wetted prior to introduction into the flow. A minimum seed sand concentration of 250 lb/MG shall be used. Sampling of the grit stream prior to washing shall be completed via a 1-inch sampling port located as shown on the drawings. The exact location of the sample port shall be recommended by the equipment manufacturer and installed by the CONTRACTOR. Sampling of the plant return flow shall be as shown on the drawings. Transparent hoses will be used for all sample lines when necessary. Samples shall be tested using an oven-drying technique to measure the wet weight of the sample as compared to the dry weight of the sample to determine the total dry solids content of the samples. The samples will then be wet sieved with a U.S. Sieve Size No. 140 (or Tyler Equivalent 150 mesh) sieve to determine the portion greater than 0.105 mm in size. Solids capture efficiency (% TS 0.105mm in size or larger) will be based on dry weight of solids in effluent grit divided by calculated weight of solids processed, as follows.

   Solids Capture Efficiency = EG (IG-PR) / IG (EG-PR) x 100

   EG = Effluent Grit Solids (% Total Solids 0.21mm in size or larger)

   IG = Influent Grit Solids (% Total Solids 0.21mm in size or larger)

   PR = Plant Return Solids (% Total Solids 0.21mm in size or larger).

   A minimum of three separate samples, taken over a week's time, at times selected by the OWNER, will be collected and tested.

5. Test methods shall be reviewed with the manufacturer prior to taking samples. All test results shall meet or exceed the criteria listed under 1.02.

6. Should the washer / dewater system fail to meet requirements of 1.02, manufacturer shall, at their own expense, make all necessary modifications to the equipment until three consecutive tests, taken over a week's time, for each of the three parameters, can satisfactorily meet the performance criteria.

7. Performance testing shall be performed with a manufacturer's representative present.

8. A maximum of 10% of the cost of the equipment shall be set as the value for completion of the performance test. This is in addition to any retainage made by the OWNER on the CONTRACTOR's progress payments. Such value of the performance test will not be paid until successful completion of the test to the OWNER's satisfaction which will allow for a 5% margin of error to apply to the measured capture efficiency (i.e. results ≥90% would be considered passing) to allow for testing irregularities.

Percent Volatile Solids	Percent Solids	Percent Removal of Grit Washing and Dewatering System	Percentage of Purchase Price
<25% and >20%	≥50% and <60%	≥90%and <95%	2.5%

<30% and ≥25%	≥45% and <50%	≥85% and <90%	5%
<35% and ≥30%	≥40% and <45%	≥80% and <85%	7.5%
>35%	<40%	<80%	10%

3.03 START-UP, TRAINING AND MANUFACTURER'S SERVICES

A. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 11000, Equipment General Provisions. Training will need to be repeated three times. These include a Tuesday afternoon and Thursday morning to get all shifts of operations staff. The third training session will need to be at another time and will include maintenance and instrumentation staff. For services after startup refer to Section 11000 3.03 C. 5. Field services shall include the following site visits:

Service	**Number of Trips**	**Number of Days/Trip**
Installation and Testing	1	2
Startup and Training	1	3 minimum
Performance Testing	1	5
Services after Startup	1	1

3.04 MANUFACTURER'S CERTIFICATE(S)

A. Provide MANUFACTURER'S certificate of installation and commissioning following functional testing and startup.

B. Provide MANUFACTURER'S OEM Software Licensing Agreement following acceptance and final payment.

- END OF SECTION –

SECTION 11413 - GRIT WASHERS – BUILDING 1

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test and place in satisfactory operation, new grit washers in Building 1, complete with all necessary accessories as specified herein, as shown on the Drawings, and as required for a complete and operational installation.

B. Equipment shall be provided in accordance with the requirements of Section 11000.

1.02 CONDITIONS OF SERVICE AND PERFORMANCE REQUIREMENTS

A. Two grit washers shall be supplied. The units shall be designed to handle grit slurry underflow from the existing grit collectors. Each grit washer shall include dual grit classifiers (Slurry Cups) which shall be characterized by a dominant strong free vortex which utilizes centrifugal and gravitation forces, and secondary boundary layer velocities to affect the separation, collection and classification of grit from the unit's inflow. The grit classifier shall discharge washed (low organic) grit to the grit dewatering escalator.

B. The grit dewatering escalators (Grit Snails) shall be designed to capture and dewater concentrated, washed grit slurry from the washing/classification unit. There shall be one (1) escalator per two (2) grit classification units. Flow discharged to the clarifier pool shall be escalated on a slow moving cleated belt and dewatered before discharging into a dumpster.

C. At the feed conditions specified below, each grit washer shall be capable of removing at least 95 percent of the grit (containing up to 1 percent solids) entering the feed inlet that is larger than 75 micron and has a specific gravity of 2.65 or greater.

D. At the feed conditions specified below, the material removed by the grit dewatering unit shall have a minimum total solids concentration of 60% and maximum volatile solids concentration of 20%.

E. Grit Separation/Classification (Slurry Cup) Schedule

1.	Number of Units:	4 (2 duty, 2 standby), 2 per Grit Escalator
2.	Size:	32" diameter
3.	Capture Rate:	95% removal of all grit ≥75 microns or larger
4.	Influent Solids Concentration:	≤ 1.5 %
5.	Design Flow/Unit:	330 gpm with 88“ of headloss
6.	Minimum Flow/Unit:	280 gpm with 63“ of headloss
7.	Maximum Flow/Unit:	400 gpm with 128“ of headloss
8.	Discharged Grit Dry Solids	≥60%
9.	Discharged Grit Volatile Solids	≤20%
10.	Influent Connection:	6” flanged pipe
11.	Effluent Drain Connection:	8” flanged pipe
12.	Underflow Connection:	3” NPT pipe
13.	Effluent Water Connection:	1.5” NPT
14.	Material of Construction:	316 SS

15. Operation: Continuous / Intermittent minimum 10-15 minutes

F. The CONTRACTOR, through a single Supplier, shall have unit responsibility for the furnishing and function operation of the grit washing and dewatering escalator units. The designated single Supplier, however, need not manufacture more than one part of the unit, but shall coordinate the design, assembly, testing, and erection of the unit(s) as specified herein.

G. The grit washer supplier shall have unit responsibility for coordinating mounting system with the CONTRACTOR to ensure no vibrations and specified performance.

H. The system to be furnished hereunder shall be made by a manufacturer regularly engaged in such work and who has furnished similar installations and had them in successful and continuous operation for a minimum period of ten years.

I. Data on performance testing, service history and operation of existing installations using the submitted equipment shall be made available to the Engineer, upon request, for use in determining that the Grit Washing and Dewatering System offered meets the intent of the contract, performance requirements and criteria stated in these specifications.

J. Grit screw classifiers, grasshoppers, reciprocating rakes and similar type of units shall not be accepted.

K. Units using Apex valves shall not be accepted.

1.03 SUBMITTALS

A. The grit classifier and dewatering system manufacturer must certify to the CONTRACTOR and CITY OF TAMPA, jointly, that the manufacturer has examined the Contract Documents and that the equipment and apparatus the manufacturer offers to furnish will meet in every way the performance requirements set forth or implied in the Contract Documents.

B. A Performance Affidavit shall be submitted in accordance with Section 11000, Equipment General Provisions. The CONTRACTOR shall transmit to the ENGINEER three (3) original copies of the affidavit given by the manufacturer along with the initial Shop Drawing submittals.

1. The Performance Affidavit must be signed by an officer of the Basic Corporation, partnership, or company manufacturing the equipment and witnessed by a notary public. The Performance Affidavit shall contain the following:

a. Addressed to: CONTRACTOR and CITY OF TAMPA

b. Reference: CITY OF TAMPA – GRIT WASHER REPLACEMENT

c. Text: (Manufacturer's Name) has examined the Contract Documents and hereby state that the (Product) meets in every way the performance requirements set forth or implied in Section of the Contract Documents.

d. Signature: Corporate Officers shall be Vice President, or higher (Unless statement authorizing signature is attached).

C. Submit the following information on the proposed equipment:

1. Complete listing of any deviations, revisions, or exceptions to these specifications or requirements indicated on the Drawings.

2. Complete catalog information, layout drawings with dimensions and weights, bill of materials, shipping and handling instructions, and installation instructions for the grit washers.

3. Cut sheets for individual components mounted on the grit washers including valves, solenoids, rotameters, anchor bolts, gear reducer, motor, and proximity switch and other sensors.

4. Complete wiring diagram and panel elevations for the control panel along with cut sheets for all individual panel components including the panel itself, PLC components, breakers, VFDs, OIU, UPS, network switch, louvers and fans, phase and load monitors, control devices, surge devices, terminal blocks, relays, etc.

5. Spare parts list

6. Programming description, sample OIU display showing proposed operator interface features, and complete PLC address/register listing for interface with the Grit Removal System Main Control Panel.

7. Proposed testing procedures for factory, field, and performance tests.

8. As-built drawings and O&M materials upon startup.

1.04 QUALITY ASSURANCE

A. All degritting equipment furnished under this Section shall be of a design and Manufacturer that has been used in similar applications. Manufacturers shall provide evidence of at least ten (10) installations in which grit washing and dewatering equipment has provided satisfactory performance for a minimum of five (5) years in a similar application.

1.05 SHIPMENT, STORAGE, AND HANDLING

A. Ship, store, and handle the equipment in strict accordance with manufacturer's instructions. The grit washers for Building 1 are not to be installed until the units specified in Section 11412 are installed and in successful operation. Therefore shipment is not to be made to the job site until the work in Building 2 is complete and the work in Building 1 has begun and ready for the new grit washers for this building. At Contractor's option, the washers under this section may be shipped and stored in a Contractor's covered, dry, storage area until ready for installation.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Each grit washer unit shall be the Slurry Cup / Grit Snail as manufactured by Eutek Systems of Hydro International or approved equal. The Contractor is responsible for adhering to the General Conditions and Supplementary Conditions. The Contractor shall be responsible for all work required by the Contract Documents and shall include additional costs for work associated with this equipment in the lump sum bid.

2.02 GRIT SEPARATION/CLASSIFICATION

A. Four grit separation/classification units will be supplied. Each unit shall capture and dewater all grit removed by up to two of the existing grit collectors. Two grit separation/classification units will discharge to one grit escalator.

B. The Grit Separation/Classification unit shall be characterized by a dominant strong free vortex and

secondary boundary layer velocities as defined below:

1. Dominating increasing tangential velocity profile toward the center of the unit.

2. The ability to handle increasing flows with no loss of the specified grit removal efficiency and with increasing headloss requirements.

3. The ability to classify (wash) the grit from lighter organic material to meet the specified organic solids content.

4. No requirements for electrical or mechanical components, flow deflecting / guiding weirs or baffles, or compressed air lines within the unit to meet the specified performance.

5. Continuous removal of washed, clean grit.

C. The washing unit shall be 32 inches in diameter and fabricated of 316 stainless steel acid passivated to a uniform finish. The dished and flanged heads shall be 1/4 inch thick. The vessel walls shall be 3/16 inch thick. Welding shall conform to the most current standards of the American Welding Society. All stainless steel surfaces shall be acid washed.

D. A 32 inch diameter access manhole shall be provided in the top of each grit washing/classification unit. All internal elements shall be removable from inside the unit.

E. The grit separation/classification unit shall be all-hydraulic with no moving parts within the unit.

F. The pair of grit separation/classification units shall be mounted on a support structure to provide clearance between the bottom of the grit underflow pipes and the dewatering unit surface. The grit underflow from the separation/classification unit shall be transported by gravity to the grit escalator unit.

G. The Grit Separation / Classification unit shall include a Hydraulic Valve (HV) to deliver a continuous flow of “washed” grit slurry to the dewatering unit. The HV shall have no mechanical or moving parts.

H. To measure the fluidizing water, a stainless steel King 35 gpm flowmeter with 1.5” NPT connection shall be used.

I. A coating of Belzona shall be applied to the inside bottom part of the Grit Separation / Classification body to add a secondary layer of abrasion resistance.

J. Each Grit Separation/Classification unit shall have the following piping connections:

1. The Grit Separation / Classification Unit shall have a single 1-1/2 inch NPT pipe stub for connection of the system water.

2. One (1) 6” inlet connection with a 6” rotatable flange.
3. One (1) 8” outlet connection with an 8” rotatable flange.

4. One (1) 1.5" grit underflow connection.

5. One (1) 3" threaded drain connection.

6. One (1) 1.5" NPT fluidizing water connection for the Hydraulic Valve supply and Hydraulic Valve backwash.

K. The Grit Separation / Classification unit shall be designed to withstand a maximum working pressure of 14.7 psig. The actual maximum pressure at the inlet shall be no more than 14.7

psig.

2.03 GRIT DEWATERING ESCALATOR

A. The Grit Dewatering Escalator unit shall have a capacity of 6 CY/hour and the housing shall consist of a minimum 72 inch square clarifier with a 36 inch wide escalating belt inclined at 30 degrees. The housing for the Grit Dewatering Escalator belt shall be fitted under the clarifier which shall provide at least 3 inches of freeboard.

B. The Grit Dewatering Escalator unit support structure shall be as shown on the general arrangement drawing and anchored to the existing concrete floor. Anchors shall be sized and provided by the manufacturer and shall be epoxy set, Type 316 stainless steel concrete anchor bolts, nuts, and washers set with Type 316 leveling nuts on a minimum of 1" grout below the equipment base plates.

C. The Grit Dewatering Escalator discharge shall include a manufacturer-supplied, mechanically connected, replaceable, flexible rubber boot to divert collected grit into the Contractor supplied aluminum discharge chute indicated on the drawings. Rubber boot material shall be as recommended by the manufacturer for compatibility with contact to the collected grit, sized and shaped to fit snuggly within the discharge chute.

D. The Grit Dewatering Escalator shall be enclosed with stainless steel (type 316) detachable covers without a connection to odor control.

E. The Grit Dewatering Escalator unit clarifier shall be designed based on a settling rate not to exceed 3.2 gpm per square foot.

F. The clarifier and belt housing shall be Type 316 stainless steel.

G. All stainless steel surfaces shall be glass bead blasted (to a uniform finish) and acid washed or acid washed and passivated. All surfaces shall be free of sharp edges, weld spatter, and residue. All welds shall be ground smooth.

H. All stainless steel shall conform to the following standards:

1. Plate and Sheet: ASTM A 167 and ASTM A 240

2. Bar: ASTM A 276 and ASTM A 479

3. Tube: ASTM A 312

I. The dewatering belt shall be made of 1/8 inch x 1/32 inch two-ply polyester reinforced continuous conductor belting. The belt cleats shall be 3-3/8" X 4-9/16" of molded 60 Durometer neoprene and aluminum reinforced and shall be vulcanized on the belt. The cleats shall attach to the belt with minimum 5/32 inch thick neoprene hinges.

J. The grit dewatering escalator shall be provided with head and tail rolls of Type 316 stainless steel.

1. The Grit Dewatering Escalator unit belt shall be provided with 2-inch openings to allow transfer of fine solids internal to the belt to the underside of each cleat.

2. The belt housing shall be provided with clean out plates and one (1) flanged drain

.

3. The 9-3/4 inch diameter lagged headroll shall be designed for adjustable take-up without affecting the headroll retainer plate, scraper, or drive unit. The tailroll shall be designed to

mount internally to the unit belt housing with external sealed bearings.

4. The Grit Dewatering Escalator unit shall be provided with a headroll scraper having 1/4 inch thick high density polyethylene (HDPE) contact surfaces with a 1/4 inch thick HDPE retainer plate. Both retainer plate and scraper shall be loaded to keep belt cleats closed tightly around the headroll during operation.

K. The grit dewatering escalator unit shall be supplied with a factory installed rinse bar system. The system shall include:

1. Two spray bars located above the belt and below the clarifier liquid level to enhance grit washing.

2. One spray bar located at the bottom of the clarifier as a tailroll area rinse.

L. Drive Unit:

1. The Grit Dewatering Escalator drive unit shall consist of the motor and the helical gear reducer, mounted as a single integrated unit. All Bearings shall be anti-friction, ball, or roller type bearings.

2. The motor shall be ½ hp, 3 phase, 230/460 VAC, 60 Hz, NEMA Design B, XPFC enclosure, suitable for a Class 1, Division 1, Group D, explosion hazard area.

3. The helical gear reducer shall have hardened alloy steel gears accurately cut to shape. A mechanical torque-limiting clutch shall be mounted on the headroll gear assembly to prevent an accidental overload of the drive unit and belt.

M. The unit shall be driven by a variable frequency drive (VFD) that shall be housed in the control panel. The belt speed shall be adjustable from 1-5 ft/min.

N. A mechanical torque-limiting clutch shall be mounted on the headroll gear assembly to prevent an accidental overload of the drive unit and belt.

2.04 WATER REQUIREMENTS

A. Each Grit Separation / Classification Unit and Grit Dewatering Escalator combination shall require clarified non-potable water supplied at a regulated 50 psig ± 5 psi. The water requirements are as follows:

1. A continuous supply of 30 gpm is required for normal operation of each Grit Separation / Classification unit.
2. An intermittent supply of 47 gpm is required for a periodic short duration during backwash cycle for the Grit Separation / Classification unit.

3. A continuous supply of 30 gpm for normal operation of the Grit Dewatering Escalator unit.

2.05 ELECTRICAL REQUIREMENTS

A. In addition to the requirements specified herein, comply with the City's technical specification SECTION 47 – ELECTRIC MOTORS. If there is a conflict, assume the more stringent requirement until otherwise directed and bring such conflicts to the City's project manager for clarification. All electrical appurtenances furnished by the Manufacturer in and around the Grit Washing / Classification Units and Grit Dewatering Escalators, including the motors, solenoid valves, and motion sensors, shall be rated for installation in a Class I, Division 1, Group D, hazardous location where such classified areas are indicated on the Drawings or specified herein.

B. Electrical Requirements

1. Solenoid valves shall operate on 120VAC, single phase power. Two-way solenoid valves shall be normally closed, open when energized. The valve shall be of Type 316 stainless steel body and bonnet with a BUNA "N" diaphragm and screwed ends. The solenoid's internal parts shall be of 300 and 400 series stainless steel. The valve shall have a safe body working pressure of 125 psi, and shall be as manufactured by JD Gould, or equal, for 120 volt, 60 Hz, single phase operation. Solenoid enclosure shall be watertight, explosion proof, rated for Class 1, Div 1 hazardous areas.
2. Motors shall operate on 480VAC, 3 phase electrical power. The Grit Dewatering Escalator shall be provided with a drive unit motor consisting of the motor and the helical gear reducer, mounted as a single integrated unit. All Bearings shall be anti-friction, ball, or roller type bearings.

Motors	**Grit Dewatering**
Rating	460V, 3 ph, 60 Hz
Horsepower	½
Speed, rpm	1735
Enclosure	XPFC
Insulation	Class H
Service Factor	1.00
Rating	Inverter Duty
Space Heater	No
Motor Winding Temperature Switches	No

2.06 CONTROLS AND INSTRUMENTATION

A. GRIT WASHER / DEWATERING UNIT CONTROL: In addition to the requirements specified herein, comply with the City's technical specification SECTION 62 - CONTROL AND WIRING FOR PACKAGED UNITS. If there is a conflict, assume the more stringent requirement until otherwise directed and bring such conflicts to the City's project manager for clarification. Each Grit Washer Unit shall be supplied with a control panel as specified herein controlled through a manufacturer supplied programmable controller (PLC) in coordination with the Grit Removal System Main Control Panel PLC supplied under Division 17. Each Grit Washer Unit shall operate in coordination with the existing grit system isolation gates, grit collectors, grit pumps and associated valves, and grit washer feed valves as described in the control logic described in Section 17000 for the grit removal process. The Grit Washer Unit's escalator shall essentially run continuously at a set speed when enabled to run, with periodic cycling of the backwash and blow down valves as described herein. The Grit Washer Unit PLC shall be sent an enable signal from the Grit Removal System PLC over an Ethernet link. The unit's PLC shall then control the escalator motor to run continuously at the set speed (if no alarms are present) and periodically operate the unit's backwash and blowdown solenoids through timers resident in the unit's PLC. The unit's PLC shall send a pump interrupt signal to the Grit Removal System Main Control Panel PLC to temporarily stop the associated grit pump during an individual SlurryCup blowdown sequence. The Grit Washer Unit manufacturer shall review and approve the proposed Grit Removal System PLC programming before final programming is made.

B. CONTROL PANEL CONSTRUCTION: Each panel shall be a wall-mounted panel, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosure shall be NEMA 12 painted steel enclosure, minimum 14 gauge suitable for mounting in the ventilated, non-classified electrical room as shown on the Drawings. Panel enclosure shall be pre-fabricated enclosure as provided by EXM Manufacturing, Hoffman, or approved equal. Enclosure shall have a hinged outer door with suitable latching mechanisms. The enclosures shall have a hinged inner dead front door fabricated from 5052-H32, 0.080 inch thick-brushed marine alloy aluminum. The inner door shall be completely removable for ease of service. The inner door shall be held closed by mechanical latches. The enclosure shall have a

12-ga steel, formed, removable subpanel. The panel enclosure and subpanel shall be degreased, cleaned, treated with a phosphatizing process, then primed and painted with 1-2 mil industrial grade baked enamel, grey for panel enclosure inside and out and white for the subpanel.

C. CONTROL PANEL MOUNTING: The Contractor shall mount the panel on the concrete block wall of the electrical room, anchored using Type 316 stainless steel concrete epoxy anchors. Anchors for the control panel shall be supplied by the Contractor.

D. PANEL FABRICATION:

1. Enclosures shall provide mounting for power supplies, motor drives, control equipment, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling.

2. Enclosures shall be constructed so that no screws or bolt heads are visible when viewed from the front. Penetrations for instruments and other devices shall be clean and smoothly finished with rounded edges.

3. All wiring shall be bundled with nylon cable ties when exposed (leaving in conduits, at bends, etc.) but otherwise shall be routed and enclosed in vented plastic wireway as required. Wireways shall be oversized by a minimum of 10%; overfilled wireways shall not be acceptable. DC power, analog signal and discrete signals shall be run in separate wireways from AC signal and power wiring.

4. Spare field wiring shall be bundled, tied, and labeled as specified above, and shall be neatly coiled in the bottom of the cabinet.

5. A copper ground bus shall be installed in each cabinet, and shall be connected to the building power ground.

6. Interior panel wiring shall be tagged at all terminations with machine-printed self-laminating labels. Labeling system shall be Brady TLS 2200 Printer with TLS 2200®/TLS PC Link™ labels, or equivalent system by Seton or Panduit.
7. Main breaker and branch breaker sizes shall be coordinated such that an overload in a branch circuit will trip only the branch breaker but not the main breaker.

8. Enclosure shall be provided with a 120-volt duplex receptacle and an LED service light with manual on/off switch.

9. As applicable, enclosures shall be furnished with red laminated plastic warning signs in each section. The sign shall be inscribed to read, "WARNING - This Device Is Connected to Multiple Sources of Power." Letters in the word "WARNING" shall be 0.75 inch high, white.

E. CONTROL PANEL COMPONENTS: The panel shall consist of the following components:

1. Manual Main Breaker handle mounted on the panel interior dead front door to disconnect the 480V incoming power to the panel and prevent the dead front door from being opened when in the ON position unless manually bypassed.
2. Variable Frequency Drives: The panel shall include a VFD suitable for the grit escalator 480V motor. VFD shall be as supplied by Yaskawa (City's standard product). VFD shall have contacts for running and fault status monitoring and shall directly interface with the panel PLC over an Ethernet link. Provide input line filters to minimize harmonic interference with outside power circuits and output load filters to prevent voltage spikes on the power feed cable to the motor.

3. Motor Power and Control Circuit Breakers: Provide breakers for the 480V motor power circuit to the VFD. Provide a control power transformer within the panel, suitably sized for all 120V circuits powered through the panel; fused primary power from the 480V incoming source and fused secondary 120V single phase control power. Provide branch circuit breakers for the panel receptacle and light, panel fan(s), and UPS supply power. Provide branch circuit breakers off the UPS load side to feed the PLC, OIU, and control power (for all other circuits powered through the 120V UPS output). The circuit breakers shall be quick-make, quick-brake and trip free. The thermal and magnetic elements shall operate independently and be designed with a common trip bar breaking all poles when a fault is received on any pole. The circuit breakers shall be as manufactured by Square D, Allen Bradley or Phoenix Contact for both 120V and 460V service.

4. Programmable Controller (PLC): Each panel shall include a PLC for all control logic. The PLC shall be GE Intelligent Platforms RX3i (City's standard product). CPU, Power Supply, Network Interface, and all I/O modules are to match City's standard modules for input voltage, number of channels, and spare capacity. City's standard PLC components include:

    - Rx3i Analog Output – GE IC694ALG392 AO, 4-20mA, 8 channel
    - Rx3i Analog Input – GE IC694ALG221 AI, 4-20mA, 4 channel – or –
    - Rx3i Analog Input – GE IC695ALG616 AI, 4-20mA option, 16 SE - AWTP Warehouse item
    - Rx3i Digital Output – GE IC694MDL940 DO 0-125VDC/0-256VAC, 16 point
    - Rx3i Digital Input – GE IC694MDL240, DI 120V
    - Rx3i Network – GE IC695ETM001 Ethernet Module, 10 Base T
    - Rx3i Power Supply – GE IC695PSA140 PS, 40W, 120V
    - Rx3i Base – GE695CH012 Rack, 12-slot, high speed base – or –
    - Rx3i Base – GE695CH016 Rack, 16-slot (12 slot is preferred)
    - Rx3i CPU – GE695CPE305 CPU, 5 MB User Memory, Ethernet port

5. Operator Interface Unit (OIU): Each panel shall include an OIU mounted on the panel front face for entering setpoints for the system such as adjustable timers. OIU shall be a 7-inch color TFT LCD touch screen, backlit, with text-style display interface, that communicates with the PLC through the local network switch. OIU shall operate on 24Vdc power from an internal panel supply and shall be Maple Systems HMI5070LB (City's standard product).

6. Uninterrupted Power Supply (UPS): The PLC, OIU, and all control components shall operate on 120V power from a UPS securely mounted inside the panel (loose installation at bottom of panel not acceptable). The UPS shall be as manufactured by APC Schneider Electric, or approved equal, with Ethernet communications directly with the panel PLC for full status monitoring of UPS (battery life, running on battery, faults, etc.). UPS shall be sized, and panel shall be wired, to power all components within the panel other than the panel light, receptacle, and ventilation fans. Panel ventilation shall be sized to dissipate the heat generated by the UPS when running on battery, full load. Provide a manual bypass switch around the UPS to allow control power to be directly connected to the UPS load side to facilitate UPS maintenance.

7. Ethernet Interface: The panel PLC shall communicate with the Grit Removal System Main Control Panel PLC (located in the same building) over a copper local Ethernet PoE link connected through a PLC communications module. Ethernet cable to the panel shall be furnished and supplied under Division 17. The conduit for the cable shall be supplied under Division 16. The Ethernet cable shall be Allen Bradley 1585-C8CB-S600 with LAPP Group

PN 2170060 Connectors, or equivalent, to protect against interference from 480V power within the panel. Wireways and layout within the panel shall accommodate this type of cable for thickness and bending radius. Ethernet interface shall be through a local area network switch, Stratix 5700 or approved equal. The network switch shall provide communications to, using City-assigned IP addresses for, the panel PLC, Grit Removal System PLC interface, panel OIU, panel UPS, and panel VFD.

8. Louvers and Fans: Panel shall be equipped with 120V internal fan(s) and louvers to dissipate heat generated by equipment mounted inside the panel, including both VFDs at maximum heat output. Provide louvered openings near the bottom and top of the panel on opposite sides to promote complete ventilation of the panel. All air-flow openings shall be fitted with dust filters and activated carbon filters to filter out residual wastewater gases that may be present in extremely low concentrations in the electrical room environment. Provide thermostatically controlled, low-noise cooling fans to circulate outside air into the enclosure through the top louvered opening, exhausting through the bottom louvered opening. Air velocities through the enclosure shall be minimized to assure quiet operation.

9. Power/Phase Monitor: A power monitor relay shall be installed and connected to the panel main 480V feed. When the relay is deactivated, it shall disconnect control power. The relay shall be deactivated in the event of phase loss, phase reversal, or low voltage. The phase monitor relay shall be as manufactured by Phoenix Contact.

10. Load Monitors: Provide 480V power load monitors on the power feed to the escalator motor to detect a high current load on the motor. Load monitoring current transformers shall be as manufactured by Phoenix Contact.

11. Remote mounted Local/Off/Remote (LOR) selector switches for the escalator motor shall directly interface with the VFD for manual override start when in LOCAL or stop when in OFF. When in REMOTE, control of the escalator motor shall be through the panel PLC. The remote mounted switches shall be supplied under Division 17.

12. Remote mounted Open/Close/Remote (OCR) selector switches for the backwash, blowdown, and water supply solenoid valves shall directly interface with the 120V power supply from the associated Grit Washer control panel for manual override open and close commands. When in REMOTE, control of each valve shall be through the panel PLC. The remote mounted switches shall be supplied under Division 17.

13. Remote mounted emergency stop furnished under Division 17 shall directly disconnect control power and stop the associated motor when engaged (normally closed enable contacts at pushbutton).

14. Panel indicator lights as noted herein shall be mounted on the panel front door. Indicator lights shall be NEMA 12, 1.2” (30 mm) dia. mounting hole, SPDT, red for running indication, amber for fault lights, white for power and shall be Allen Bradley Type 800H or equivalent by Square D or General Electric. Indicating lights shall be LED type and wired for individual lamp push-to-test operation.
15. Reset pushbuttons mounted on panel’s front face shall be NEMA 12, 1.2” (30 mm) dia. mounting hole, black, push-to-reset, pushbuttons with contacts wired in parallel with PLC reset output to unlatch and reset equipment alarms if condition is cleared. Pushbuttons shall be Allen Bradley Type 800H or equivalent by Square D or General Electric.

16. Surge Suppression: Provide a surge arrestor installed on the line side of the main breaker in accordance with manufacturer’s instructions. Provide surge suppression devices on all signal and power leads on all circuits that have any part of the control or power circuit that extends past the limits of the building housing the control panel. Surge devices shall be as manufactured by Phoenix Contact:

- for 110VAC Signal use Phoenix Contact 2794987
- for 120VAC Power use Phoenix Contact 2856812
- for 4-20mA signals use Phoenix Contact 2838186
- for 480VAC power use Phoenix Contact 2800718

17. As-built Drawings: A laminated "As Built" copy of the panel wiring diagrams shall be provided and placed in the panel print pocket for all panels. All panel drawings shall be developed using AutoCad®. The drawings shall have a complete Bill of Materials, panel exterior and interior layouts, and show all electrical wiring. As-built drawings shall be submitted with the O&M materials on a CD in both AutoCad® (.dwg) and Adobe Acrobat® (.pdf).

18. Terminals: Terminal blocks shall be as follows:

    a. Terminal blocks shall be assembled on non-current carrying aluminum DIN mounting rails securely bolted to the cabinet subpanel. Terminals shall be of the screw down pressure plate type as manufactured by Allen Bradley or Phoenix Contact.
    b. Power terminal blocks for both 120 VAC and 24 VDC power shall be single tier with a minimum rating of 600 volts, 30 amps.

    c. Discrete signal terminal blocks shall be 2-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal.

    d. Analog signal terminal blocks shall be 3-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal and the shield/drain wire shall be installed on the bottom or right-most terminal.

    e. Only one wire shall be terminated under a single wire clamp or screw.

    f. Terminal blocks for field wire connections shall be added as needed in 10-pole increments. Terminal blocks shall be mounted with a minimum of 2" from both enclosure sides and from the bottom of the enclosure for easy access to terminal screws.

    g. Terminals shall be marked with a permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field incoming conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

    h. Separate terminal strips shall be provided for each type of power and signal used within each cabinet. Where applicable, terminal strips for different voltages of discrete signal wiring shall also be separated. Terminal strips shall be labeled as to voltage and function.

19. Wiring: All wiring shall be color-coded using tinned copper MTW #14 AWG minimum for power and control wiring and #16 twisted pair for analog signal wiring. Wiring and cables shall be numbered at each end. Wire numbers shall be printed on non-removable heat-shrink tags. Wires shall be color coded as follows:

    Equipment Ground - GREEN

    480 VAC, Phase A – Brown
    480 VAC, Phase B – Orange
    480 VAC, Phase C – Yellow
    480 VAC, Neutral - Grey

120 VAC Power - BLACK
120 VAC Power Neutral - WHITE

120 VAC Control (Internally Powered) - RED
120 VAC Control (Externally Powered) - YELLOW

24 VAC Control - ORANGE

DC Power (+) - BLUE
DC Power (-) - GRAY

Analog Signal – BLACK/WHITE

20. Component Labels: All interior panel components shall be individually labeled on the back plate with a custom engraved plastic tag with adhesive back (see Section 17000 for nameplates). The tags shall be white with black letters and match the nomenclature indicated on the as-built wiring diagrams.
21. Mounting Hardware: All mounting hardware such as screws or bolts used in the manufacturing of the control panel shall be Type 316 stainless steel. All holes in the back plate and dead front shall be drilled and tapped. No self-tapping screws, adhesive tapes, or Velcro will be accepted for the mounting of any hardware.

22. Isolation and interposing relays shall be provided on all discrete inputs and outputs to and from the PLC and shall be DIN rail mounting type, DPDT, minimum 10 amp, 120 VAC contact rating. Relay coils shall be 120 VAC or 24 VDC as required. Relays shall have a flag indicator to show relay status, a pushbutton to allow manual operation of the relay, and an internal pilot light to indicate power to the coil. Relays shall be as manufactured by Phoenix Contact or Allen Bradley.

23. Corrosion Protection: Panel interior components shall be treated with a corrosion inhibiting spray on all exposed metallic surfaces, particularly terminations, contacts, and wire ends. After installation, furnish corrosion inhibiting capsules that emit molecular level coating on metallic surfaces throughout the panel that provide specific corrosion barrier toward hydrogen sulfide and/or subsequent formation of sulfuric acid when combined with ambient moisture.

24. Panel Seal-Offs: Installing Contractor shall furnish and install panel seal-offs on all conduits leading to equipment installed in ambient outside air or process areas to prohibit exposure to corrosive gasses. Panel seal-offs shall be mounted near the equipment and shall be provided with terminations on either side of the epoxy-based seal-off material to allow for replacement of cable without breaking the seal. All conduits entering a panel or enclosure shall be sealed at the conduit entry point with a removable, expandable conduit seal material to further prohibit outside air or process gasses from entering the panel.

F. CONTROL OPERATION

1. The system shall be controlled to provide automatic or manual operation, and system shut down when a fault is detected. Control of each Grit Washer system shall be through a dedicated control panel located in the Electrical Room furnished with the equipment, with interface to a Grit Removal System Main Control Panel furnished under Division 17 (also located in the Electrical Room), and through local control switches for the escalator and solenoid valves on the unit as described herein. PLC programming shall be manufacturer's standard control algorithms modified to reflect standard City practices for such things as tagname conventions, file management, commenting, and messaging transfer blocks.

2. Grit Separation / Classification unit: When a grit dewatering escalator is running (whether in LOCAL at the LOR or in REMOTE and enabled by the Grit System Main Control Panel

PLC), the associated grit separation/classification units (Slurry Cups) shall operate as follows when the unit's associated solenoid valve Open/Close/Remote local switches are in REMOTE:

a. Grit slurry from the Grit Pumps shall be pumped to the Grit Grit Separation / Classification unit continuously at a controlled rate.

b. During operation, a small volume of washed/classified grit slurry shall continuously underflow from the Grit Separation / Classification unit. Control of the grit slurry underflow rate is via the HYDRAULIC VALVE mounted on the bottom of the unit. A portion of the system water is continuously introduced to the HYDRAULIC VALVE.

c. Periodically, (typically twice per hour during heavy grit loads and typically once per hour during light grit loads), a backwash sequence is initiated, by cycling solenoid valves, which flushes the grit underflow gap inside the unit. Frequency and duration of backwash cycle timers shall be adjustable in the PLC from the panel mounted OIU.

d. Periodically, (typically once every 4 backwashes), a blowdown sequence is initiated to flush accumulations of debris inside the unit. Blowdown is accomplished by stopping the associated grit pump to the Grit Separation / Classification unit (via a pump enable signal over the Ethernet link to the Grit Removal System Main Control Panel), cycling solenoid valves, and resuming operation. Frequency and duration of blowdown cycles is adjustable from the OIU.

e. Manual control of the operation of the Grit Separation / Classification units can be done through the local Open/Close/Remote switches located near the units for each unit's solenoid valves.

3. Grit Dewatering Escalator unit: When a grit dewatering escalator is in LOCAL at the Local/Off/Remote (LOR) switch near the unit, the escalator shall run continuously with no PLC interface and shall run at the speed set at the control panel's manual speed potentiometer. When the LOR is in REMOTE and enabled by the Grit System Main Control Panel PLC, and the unit's wash solenoid valve's Open/Close/Remote (OCR) switch is in REMOTE, the associated grit dewatering escalator shall operate as follows:

a. The Grit Dewatering Escalator belt shall run and the water supply solenoid shall open in continuous operation with the belt running at a set speed. When the belt stops, the water solenoid valve shall close after an adjustable time delay.
b. While the dewatering unit is running, water shall be directed to the tail roll self cleaning mechanism and grit rinse system.

c. The belt speed shall be adjustable through a remote signal via the Ethernet link from the Grit Removal System Main Control Panel PLC.

d. A motion sensor shall be installed on the side of the Grit Dewatering Escalator takeup frame and shall detect movement of the headroll scraper arm. Lack of motion of the headroll scraper arm shall indicate lack of belt movement, drive unit failure and/or scraper arm overload. Lack of belt movement or scraper arm overload shall interrupt signal from the motion sensor to the timer. If the motion sensor fails to reset the timer, the Grit Dewatering Escalator shall stop and the failure light illuminate.

e. After the enable signal from the Grit Removal System PLC is de-energised, the Grit Dewatering Escalator shall continue to operate for a pre-determined amount of time to allow for the removal and dewatering of all grit accumulated in the clarifier. The

off delay timer shall be adjustable from OIU.

f. The escalator shall stop immediately when an emergency stop input is received and upon a VFD fault condition (in both LOCAL and REMOTE).

G. PHYSICAL CONTROL INTERFACE – Provide devices and interface signals on the panel front face as follows:

1. Power On indicating light

2. System Alarm Reset push button

3. Backwash and Blowdown water valve three position OCA switches

4. System RUNNING indicating light

5. Escalator water SUPPLY OPEN light

6. BACKWASH in operation light

7. BLOWDOWN in operation light

8. Escalator FAULT indicating light

9. Emergency stop indicating light

10. Escalator manual speed setting potentiometer

11. Escalator LOCAL/REMOTE switch for escalator speed control

H. SOFTWARE INPUT/OUTPUTS – Provide the following internal and external I/O to/from the panel PLC:

1. Internal registers across the Ethernet link for system enable. Register/Address signals to/from the Grit Removal System Main Control Panel PLC from each Grit Washer PLC shall include, as a minimum, the following:
   - Individual SlurryCup enable/call to run for both units from the main PLC
   - Individual SlurryCup ready for both units (permissive to operate associated grit pump) to the main PLC.
   - SlurryCup running for both units
   - SlurryCup in blowdown for both units (interlocked to stop associated grit pump during blowdown sequence)
   - SlurryCup in backwash for both units
   - UPS status as noted below
   - VFD status/control as noted below
   - PLC and network switch faults

2. Internal registers from the OIU for adjusting all system timer settings

3. Internal registers for UPS running on battery, % battery life left value, and fault
4. Internal registers for VFD running input, speed output, speed input, run command output, and fault

5. External inputs for:
   a. emergency stop
   b. panel 120V normal power available

c. unit in REMOTE (remote LOR switch)
d. Escalator water supply in REMOTE from local OCR switch
e. Grit washer backwash water in REMOTE from local OCR switch
f. Grit washer blowdown water in REMOTE from local OCR switch
g. in REMOTE (panel speed setting LR switch)
h. motion sensor alarm
i. alarm reset

6. External outputs for indicating lights and solenoid operation:
   a. System RUNNING light
   b. Escalator water SUPPLY OPEN light and 120V power to solenoid
   c. BACKWASH in operation light and 120V power to solenoid
   d. BLOWDOWN in operation light and 120V power to solenoid
   e. Escalator FAULT indicating light
   f. EMERGENCY STOP indicating light

I. PANEL CONTROL and POWER INTERFACE: Provide terminals and dry contacts rated 10A at 120V for interface with local control devices and instruments located outside the control panel, as well as terminals for motors, as follows:

1. Emergency stop hard-wired direct input from remote emergency stop pushbuttons (one for each unit) with separate alarm signal to the PLC.

2. Control signal inputs from the local LOR switch.

3. Control signal inputs from the three local valve OCR switches.

4. 120V control signal outputs to the backwash, blowdown, and escalator water supply solenoids.

5. 480V power to the escalator motor from the panel VFD

6. 480V power source from the existing MCC

2.07 SPARE PARTS

A. Provide the following spare parts in addition to the lubricants identified in Section 11000:

Slurry Cup	
Quantity	Description
4	Baffles
2	1.5" Solenoid Valve
2	0-30 psi Pressure Gauges
1	0-100 psi Pressure Gauges
1	1.5" Flowmeter
Grit Snail	
Quantity	Description
1	Set of Gaskets
1	Set of Bearings
1	Set of Scrapers
1	Motor
1	Gearbox
1	1" Solenoid Valve

1	1" Flowmeter
1	Proximity Switch

B. Pack spare parts in carboard boxes; label with manufacturer's name and local representative's name, address, and telephone number; and attach list of materials contained therein.

PART 3 -- EXECUTION

3.01 MANUFACTURER'S FIELD SERVICES

A. Unless otherwise authorized by the Engineer, the Manufacturer's representative shall be a direct employee of the Manufacturer, with at least five (5) years experience in the installation, testing and start-up of equipment of the type provided under this Specification. The Manufacturer's sales and marketing personnel will not be accepted as Manufacturer's representatives.

3.02 FIELD TESTING

A. Prior to start-up, all equipment shall be inspected for proper alignment, operation, connection, and satisfactory operation by means of a functional test. It is the CONTRACTOR's responsibility to duly notify the Manufacturer of any inabilities to perform functional testing prior to operator training.

B. Upon completion of the installation, each piece of equipment and each system shall be tested for satisfactory operation without excessive noise, vibration, overheating, etc. All equipment must be adjusted and checked for misalignment, clearances, supports, and adherence to safety standards.

C. Field tests shall be conducted with the grit collector tank full.

D. The CONTRACTOR shall submit a statement from the Manufacturer certifying that each grit washer / classifier has been installed in accordance with its recommendations and will meet the performance specified in Paragraph 1.02 of this Section.

E. The system shall also be tested as part of the complete plant control system tests to verify all required communications between the panel PLC and the plant control system are fully functional. This shall include communications and control for both washer / classifiers and grit pumps. The system shall not be fully accepted for release of final retainage until these tests are completed successfully.

F. The Contractor shall test the grit equipment installation after startup of the equipment. The Contractor shall retain Black Dog Analytical, LLC (Contact Jimmie Griffiths (815) 715-3123 or info@blackdoganalytical.com) to conduct the performance testing. The performance test is in addition to the normal mechanical testing and adjustments required for attaining equipment acceptance. The performance test may be run in conjunction with start-up after approval of satisfactory installation and start-up by the system supplier. The cost for the testing by Black Dog Analytical shall be borne by the OWNER using the allowance indicated on the bid form. All other costs associated with testing shall be borne by the Contractor. The testing shall be as described below.

1. Personnel in charge of the tests shall be competent, authorized representatives of the independent testing firm who are familiar with operation of the equipment furnished and who have previous satisfactory experience in conducting tests of the type specified. Qualified personnel shall perform the tests, record the data, make the required calculations, and prepare a report on the results.

2. Representatives of the Engineer will observe the tests and collect a copy of the recorded data. The information collected will be used as a basis for determining acceptability of

the Equipment Supplier's results. In case of conflict, interpretations and calculations made by the Engineer will govern.

3. The independent testing firm shall provide all equipment necessary to properly conduct the tests. Contractor shall supply the facilities to support the system supplier in conducting the tests.

G. Performance Testing

1. Complete performance testing for each washer / classifier installation. After startup, the CONTRACTOR will conduct a performance test under normal plant flow conditions to determine the actual system operating conditions and verify that the unit meets the requirements specified in 1.02. Tests shall begin once functional testing has been completed to the OWNER's satisfaction, the manufacturer has determined that the washer / dewater units are acclimated to the actual operating conditions, and the units are operating at optimal conditions. However, tests shall begin within at least 4 weeks of initial startup.

2. Dry Solids Content – The independent testing firm shall obtain a representative sample of the washed grit at the discharge into the dumpster. Samples shall be tested using an oven-drying technique to measure the wet weight of the sample as compared to the dry weight of the sample to determine the dry solids content of the screenings. A minimum of three separate samples, taken over a week's time, at times selected by the OWNER, will be collected and tested.

3. Volatile Solids Content – The independent testing firm shall obtain representative samples of the grit immediately after the washer / dewater units during operation. Samples will be tested by measuring the weight of the sample before and after heating to 550 °C per Standard Method 1684. A minimum of three separate samples, taken over a week's time, at times selected by the OWNER, will be collected and tested.

4. Capture Rate – The independent testing firm shall obtain representative samples of the grit stream prior to washing, the grit stream leaving the washing and dewatering system, and dewatering grit in the dumpster. If there is insufficient endemic grit in the influent feed, seeding may be used. Seed material shall be Ganusil 5010. The seed sand shall be wetted prior to introduction into the flow. A minimum seed sand concentration of 250 lb/MG shall be used. Sampling of the grit stream prior to washing shall be completed via a 1-inch sampling port located as shown on the drawings. The exact location of the sample port shall be recommended by the equipment manufacturer and installed by the CONTRACTOR. Sampling of the plant return flow shall be as shown on the drawings. Transparent hoses will be used for all sample lines when necessary. Samples shall be tested using an oven-drying technique to measure the wet weight of the sample as compared to the dry weight of the sample to determine the total dry solids content of the samples. The samples will then be wet sieved with a U.S. Sieve Size No. 140 (or Tyler Equivalent 150 mesh) sieve to determine the portion greater than 0.105 mm in size. Solids capture efficiency (% TS 0.105mm in size or larger) will be based on dry weight of solids in effluent grit divided by calculated weight of solids processed, as follows.

   Solids Capture Efficiency = EG (IG-PR) / IG (EG-PR) x 100

   EG = Effluent Grit Solids (% Total Solids 0.21mm in size or larger)

   IG = Influent Grit Solids (% Total Solids 0.21mm in size or larger)

   PR = Plant Return Solids (% Total Solids 0.21mm in size or larger).

   A minimum of three separate samples, taken over a week's time, at times selected by the OWNER, will be collected and tested.

5. Test methods shall be reviewed with the manufacturer prior to taking samples. All test results shall meet or exceed the criteria listed under 1.02.

6. Should the washer / dewater system fail to meet requirements of 1.02, manufacturer shall, at their own expense, make all necessary modifications to the equipment until three consecutive tests, taken over a week's time, for each of the three parameters, can satisfactorily meet the performance criteria.

7. Performance testing shall be performed with a manufacturer's representative present.

8. A maximum of 10% of the cost of the equipment shall be set as the value for completion of the performance test. This is in addition to any retainage made by the OWNER on the CONTRACTOR's progress payments. Such value of the performance test will not be paid until successful completion of the test to the OWNER's satisfaction which will allow for a 5% margin of error to apply to the measured capture efficiency (i.e. results ≥90% would be considered passing) to allow for testing irregularities.

9.

Percent Volatile Solids	Percent Solids	Percent Removal of Grit Washing and Dewatering System	Percentage of Purchase Price
<25% and >20%	≥50% and <60%	≥90%and <95%	2.5%
<30% and ≥25%	≥45% and <50%	≥85% and <90%	5%
<35% and ≥30%	≥40% and <45%	≥80% and <85%	7.5%
>35%	<40%	<80%	10%

3.03 START-UP, TRAINING AND MANUFACTURER'S SERVICES

A. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 11000, Equipment General Provisions. Training will need to be repeated three times. These include a Tuesday afternoon and Thursday morning to get all shifts of operations staff. The third training session will need to be at another time and will include maintenance and instrumentation staff. For services after startup refer to Section 11000 3.03 C. 5. Field services shall include the following site visits:

Service	**Number of Trips**	**Number of Days/Trip**
Installation and Testing	1	2
Startup and Training	1	3 minimum
Performance Testing	1	5
Services after Startup	1	1

3.04 MANUFACTURER'S CERTIFICATE(S)

A. Provide MANUFACTURER'S certificate of installation and commissioning following functional testing and startup.

B. Provide MANUFACTURER'S OEM Software Licensing Agreement following acceptance and final payment.

- END OF SECTION –

SECTION 15000 - PIPING, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all piping systems shown and specified, in accordance with the requirements of the Contract Documents. Each system shall be complete with all necessary fittings, hangers, supports, anchors, expansion joints, flexible connectors, valves, accessories, lining and coating, testing, disinfection, excavation, and backfill, to provide a functional installation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 1

B. Painting

C. Piping and Equipment Identification Systems

D. Pipe Supports

E. Pipeline Testing and Disinfection

1.03 SUBMITTALS

A. The Contractor shall submit complete shop drawings and certificates, test reports, affidavits of compliance, of all piping systems, in accordance with the requirements in the Section entitled “Submittals”, and as specified in the individual piping sections.

B. Each shop drawing submittal shall be complete in all aspects incorporating all information and data listed herein and all additional information required to evaluate the proposed piping material's compliance with the Contract Documents. Partial or incomplete submissions will be returned to the Contractor without review.

C. Data to be submitted shall include, but not be limited to:

1. Catalog Data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various piping components and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

2. Complete layout and installation drawings with clearly marked dimensions and elevations. Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked. Piping layout drawings shall indicate the following additional information; pipe supports, location, support type, hanger rod size, insert type and the load on the hanger in pounds.

3. Weight of all component parts.

4. Design calculations when requested.

5. Tabulated pipe layout schedule which shall include the following information for all pipe and fittings: service, pipe size, working pressure, wall thickness and piece number.

D. Certifications: Prior to installation, the Contractor shall furnish an Affidavit of Compliance certified by the pipe manufacturer that the pipe, fittings and specials furnished under this Contract comply with all applicable provisions of AWWA and these specifications. No pipe or fittings will be accepted for use in the Work on this project until the affidavits have been submitted and accepted in accordance with the Section entitled “Submittals”.

E. All expenses incurred in making samples for certification of tests shall be borne by the Contractor.

F. Verification of Existing Pipeline Sizes and locations prior to ordering pipe, fittings or valves. The Contractor shall verify all locations of existing system components to be tied into the new water piping prior to ordering any fittings or other components that must match proper sizes and locations. The Contractor assumes full responsibility for materials ordered prior to verifying required sizes and dimensions in the field.

1.04 QUALITY ASSURANCE

A. Tests: Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards.

B. Welding Requirements: All welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

C. Welder Qualifications: All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, acceptable testing agency not more than 12 months prior to commencing work. Machines and electrodes similar to those used in the Work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders. Furnish welder's qualification papers to the Engineer.

1.05 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Where the assistance of a manufacturer's service representative is advisable, in order to obtain correct pipe joints, supports, or special connections, the Contractor shall furnish such assistance at no additional cost to the Owner.

1.06 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. All piping materials, fittings, valves, and accessories shall be delivered in clean and undamaged conditions and stored off the ground, to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

1.07 CLEANUP

A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

PART 2 -- PRODUCTS

2.01 GENERAL

A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Sections of Division 15 - Mechanical and furnished as specified herein.

B. Pipe Supports: All pipes shall be adequately supported in accordance with the requirements of the Section entitled “Pipe Supports”, and/or as shown.

C. Coating: All requirements pertaining to thickness, application, and curing of pipe coating, are in accordance with the requirements of the applicable Sections of Division 15 - Mechanical, unless otherwise specified. All visible piping shall be painted in accordance with the Section entitled “Painting”

D. Lining: All requirements pertaining to thickness, application, and curing of pipe lining, shall be in accordance with the requirements of the applicable Sections of Division 15 – Mechanical, unless otherwise specified.

E. Pressure Rating: All piping systems shall be designed for the rated working pressure, listed in the piping schedule.

2.02 PIPE FLANGES

A. Flanges: Where the design pressure is 125 psi or less, flanges shall conform to either ANSI/AWWA C115/A21.15 Class D or ANSI B16.1 125-lb class. Where the design pressure is greater than 150 psi, up to a maximum of 250 psi, flanges shall conform to either ANSI/AWWA C115/21.15 or ANSI B16.1 250-lb class. Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA 115/21.15. Flanges for miscellaneous small pipes shall be in accordance with the standards specified for these pipes.

B. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207, or with the standards for miscellaneous small pipes. All blind flanges for pipe sizes 12-inches and over shall be provided with lifting eyes in the form of welded or threaded eye bolts.

C. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

D. Flange Bolts: Machine bolts shall normally be used on all flanged connections and shall be ASTM A276 Type 316 stainless steel, ASTM A193, Grade B8M passivated bolts with ASTM A194, Grade B8M heavy hex nuts coated to prevent galling, and Type 316 stainless steel washers annealed per ASTM A240. If studs are required, they shall be of the same material as the machine bolts and extend through the nuts a minimum of 1/4-inch.

E. Flange Gaskets: Gaskets for flanged joints shall be of materials as specified in piping sections. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted.

F. Flange Gasket Suppliers shall be John Crane, Garlock or equal.

2.03 GROOVED COUPLINGS

A. General: Mechanical-type couplings shall be provided where shown. Buried or submerged couplings shall have Type 316 stainless steel bolts and nuts conforming to the requirements of the Section entitled “Metal Fabrications”.

B. Stainless steel pipe couplings shall conform to Section entitled “Stainless Steel Pipe”. General: Grooved couplings shall be provided where shown on the Drawings. Buried or submerged couplings shall have Type 316 stainless steel bolts and nuts conforming to the requirements of Section entitled “Metal Fastening”.

C. Coatings

1. Aboveground: Factory coated enamel.

D. Ductile Iron Pipe Couplings

1. Suppliers shall be Victaulic Style 31, or equal

2. Gaskets: Shall be Grade “M” halogenated butyl.

2.04 GROOVE FITTING FLANGE ADAPTERS FOR DUCTILE IRON PIPE

A. Grooved/flanged adapters for ductile iron pipe shall be used to facilitate connection from grooved fittings to flanged valves, pumps, pipe, fittings, and other flanged components. The

flange adapters shall be ductile iron conforming to ASTM A-536, Grade 65-45-12, 3 - 24" (DN80 - DN600) size range. Gaskets shall have properties as designated by ASTM D-2000 of the same specially compounded elastomer as the couplings, and shall be suitable for the required service. Grooved/flanged adapters shall be Victaulic, Style 341, or equal.

2.05 MECHANICAL COUPLINGS

A. Construction: Sleeve-type couplings shall be provided where shown, and shall be of similar material as the pipe, without pipe stop, and shall be of sizes to fit the pipe and fittings shown. The middle ring shall be not less than ¼-inch in thickness and shall be either 5 or 7-inches long for standard steel couplings, and 16-inches long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold-expanded as required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to the requirements of the Section entitled "Metal Fabrications".

B. Pipe Preparation: The ends of the pipe, where specified or shown, shall be prepared for sleeve-type couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12-inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to an air test for porosity.

C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. The rubber in the gasket shall meet the following specifications:

1. Color - Jet Black
2. Surface - Nonblooming
3. Durometer Hardness - 74 $\pm$ 5
4. Tensile Strength - 1000 psi Minimum
5. Elongation - 175 percent Minimum

D. The gaskets shall be immune to attack by the material which is being transported. All gaskets shall meet the requirements of ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as noted above.

E. Bolts, nuts and washers shall be ASTM A193, Grade B7 for above-ground applications. Buried applications shall use 316 stainless steel hardware.

F. Coatings: Couplings shall be shop primed with a primer compatible with the painting system specified in the Section entitled "Painting".

G. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

H. Restrained Joints: Where harnesses are required for sleeve-type couplings, they shall be in accordance with the requirements of the appropriate reference standard, or as shown.

I. Supplier shall be Rockwell (Smith-Blair), Style 411, Dresser, Style 38, Ford Meter Box Co., Inc., Style FC1 or FC3 or equal.

2.06 FLANGED COUPLING ADAPTERS

A. Reference Standards:

1.	AWWA C207	Steel Pipe Flanges for Waterworks Service—Sizes 4 In. Through 144 In.
2.	AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
3	AWWA C219	Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe
4.	ASTM A36	Standard Specification for Carbon Structural Steel
5.	ASTM A513	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing

B. Product Standard: Flanged coupling adapters shall comply with AWWA C219.

C. Flange Dimensions: Flanges shall meet the requirements of AWWA C207. Flanges shall be Class D. Bolt circle dimensions shall be compatible with ANSI Class 125 and 150.

D. Pressure Capacity: 150 psi.

E. Materials:

Item	Material
Coupling Body and Flange	Carbon Steel
Follower (a.k.a. end ring)	Carbon Steel
Bolts and Nuts	316 Stainless Steel
Gasket	Material to be selected by manufacturer. Selected material shall be suitable for water service with chloramine residual of 2 mg/L

F. Factory Applied Exterior Coating: Fusion bonded epoxy per AWWA C213 with a minimum 12 mils dry film thickness (DFT). Coating shall be suitable for contact with potable water per NSF International Standard 61.

G. Factory Applied Interior Lining: The lining shall match the coating.

H. Harnessing: All flanged coupling adapters shall be harnessed using 316 stainless steel tie rods, 316 stainless steel nuts and and 316 stainless steel tabs.

I. Manufacturer: Series 2100 MEGAFLANGE Restrained Flange Adapter as produced by EBAA Iron, Inc. or approved equal.

2.07 RESTRAINED FLANGE ADAPTER

A. General: Restrained flange adapters shall be used where shown on the Drawings to connect existing plain end ductile iron pipe to proposed stainless steel flanged piping. The proposed stainless steel flanged piping shall have AWWA C107 Class D flanges.

B. Body Material: The restrained flange adapter ring body shall be made of ductile iron conforming to ASTM A536.

C. Gaskets: Sealing gaskets shall be EPDM.

D. Factory Applied Internal Lining: All internal surfaces of wetted parts shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to AWWA C213 titled “Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines”. Lining shall be suitable for contact with potable water per NSF International Standard 61.

E. Factory Applied Exterior Coating: Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy per AWWA C116 titled “Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fitting”.

F. Flange Bolt Pattern: The adapter shall have flange bolt circles that are compatible with AWWA C107 Class D flanges.

G. Restraint: Restraint for the flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges.

H. Deflection Capability: Restrained flange adapters shall be capable of deflection during assembly, or permit lengths of pipe to be field cut, to allow a minimum of 0.6” gap between the end of the pipe and the mating flange without affecting the integrity of the seal.

I. Manufacturer: SERIES 2100 MEGAFLANGE, as produced by EBAA Iron, Inc., or equal.

2.08 SLEEVES

A. Pipe sleeves shall be provided where shown on the Drawings. All PVC pipe passing through cast-in-place concrete walls or slabs shall be provided with a sleeve whether or not shown on the Drawings.

B. Except for core drilled holes in existing concrete, sleeves shall be equipped with a waterstop centered in the wall penetration.

C. As a minimum, sleeves shall be of the same material as the pipe passing through it.

D. Sleeves shall be of sufficient size to pass the pipe and any required coverings of the pipe and shall extend two (2) inches above finished floor.

E. Sleeves shall be caulked with a fire retardant caulking compound at fire walls and a gas tight compound at gas tight walls.

F. All sleeves penetrating water tanks or wet wells and all below grade walls or floors shall be provided with penetration seals, "Link Seal" as manufactured by Thunderline Corporation, or equal. Penetration seals shall be covered with a two part polysulfide sealant on the earth or wet side of the sleeve and penetration seal as shown on the Drawings.

G. All sleeves in building interiors shall be sealed with foam sealant and caulking as shown on the Drawings.

2.09 WALL PIPES

A. Wall pipes shall be provided where shown on the Drawings. All wall pipes and castings shall be equipped with waterstops and shall be of the same material as the connecting piping. The wall pipes shall have the interior and exterior protection as specified for the connecting piping.

B. Wall pipes shall be of sufficient length to pass through the wall in accordance with the details on the Drawings and shall conform to the details shown on the Drawings. The end of the wall pipes shall be of a type consistent with the piping to be connected to them and shall conform to their standards and specifications.

2.10 SOLID SLEEVE COUPLINGS

A. Solid sleeve couplings shall be used to connect buried service piping where shown on the Drawings. Solid sleeves shall be ductile iron, long body and shall conform to the requirements of ANSI A21.10 (AWWA C110). Unless otherwise shown or specified, solid sleeve couplings shall be Style A11760 as manufactured by American Cast Iron Pipe Co., or equal.

2.11 UNIONS

A. For ductile iron, carbon steel, and grey cast iron pipes assembled with threaded joints and malleable iron fittings, unions shall conform to ANSI B16.39.

B. For copper piping, unions shall have ground joints and conform to ANSI B16.18.

C. For PVC and CPVC piping, unions shall be socket weld type with Viton O-ring.

2.12 VENT AND DRAIN VALVES

A. For liquid pipelines, the Contractor shall install drain valves and vent valves, whether shown on the Drawings or not, at the low points and high points, respectively.

2.13 WATERTIGHT LINK SEALS

A. Application Location: Furnish watertight link type seals where indicated on the Drawings.

B. Type: Interconnected synthetic rubber links shaped and sized to continuously fill annular space between pipe and wall sleeve opening.

C. Materials: Assemble interconnected rubber links with Type 316 stainless steel bolts, nuts, and pressure plates. Elastomeric sealing material shall be as recommended by the manufacturer for the application.

D. Sizing Criteria: Size modular mechanical seals according to manufacturer's instructions for the size of pipes shown to provide a watertight seal between pipe and wall sleeve opening or core drilled opening in existing walls (when sleeves are not indicated on the Drawings).

E. Manufacturers and Products (or Equal:

1. Thunderline/LinkSeal, Div. Of PSI, Houston, TX; Link Seal;

2. Calpico, Inc., South San Francisco, California; Sealing Linx;

3. Advance Products and Systems, Lafayette, Louisiana; Innerlynx.

PART 3 -- EXECUTION

3.01 GENERAL

A. The Contractor shall furnish all labor, tools, materials, and equipment necessary for installation and jointing of the pipe. All piping shall be installed in accordance with the Drawings in a neat workmanlike manner and shall be set for accurate line and elevation. All piping shall be thoroughly cleaned before installation, and care shall be taken to keep the piping clean throughout the installation.

B. Before setting wall sleeves, pipes, castings and pipes to be cast in place, the Contractor shall check the Drawings and equipment manufacturer's drawings which may have a direct bearing on the pipe locations. The Contractor shall verify existing piping tie-in connections and verify size, type, and location before fabricating new piping assemblies.

C. Piping shall be attached to pumps, valves, equipment, etc., in accordance with the respective manufacturers' recommendations. This includes the use of flexible connectors as required.

D. For piping assembled with threaded, solvent cemented, welded or soldered joints, liberal use of unions shall be made. Unions shall be provided close to main pieces of equipment and in branch lines to permit ready dismantling of piping without disturbing main pipe lines or adjacent branch lines. A minimum of one union per straight run of pipe between fitting and/or valves with multiple lengths of pipe shall be used.

E. All changes in directions or elevations shall be made with fittings, unless otherwise shown.

3.02 SHIPPING, HANDLING AND STORAGE

A. Special care in handling shall be exercised during delivery, distribution and storage of pipe to avoid damage and setting up stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

B. No pipe shall be dropped from cars or trucks to the ground. All pipe shall be carefully lowered to the ground by mechanical means. In shipping, pipe and fittings shall be blocked in such manner as to prevent damage to castings or lining. Any broken or chipped lining shall be carefully patched. Where it is impossible to repair broken or damaged lining in pipe because of its size, the pipe shall be rejected as unfit for use.

C. All mechanical joint pipe shall be laid with 1/8-inch space between the spigot and shoulder of pocket.

D. Contractor shall protect all susceptible materials from UV degradation.

3.03 FLANGED JOINTS

A. Flanged joints shall be made up with full face gaskets as specified in the piping paragraphs. Flange faces shall have a uniform bearing on the gaskets. Flanges shall be drawn together uniformly until the joint is tight. No washers shall be permitted for the bolt and nut assemblies. The length of the bolts shall be uniform and in accordance with the standards specified herein. The bolt's maximum projection beyond the end of the nut shall be 0.25-inch and shall not fall short of the end of the nut. All buried flanges shall be installed with Type 316 SS nuts and bolts.

3.04 SOLVENT CEMENTED JOINTS

A. Joints shall be made up in accordance with ASTM D 2855 and the manufacturers' recommendations. The Contractor is advised to handle the solvent cements in accordance with ASTM F 402.

3.05 THRUST RESTRAINT

A. All sleeve type couplings shall be harnessed except where noted specifically on the Drawings. The harnessing shall be as shown on the Drawings or as specified herein.

B. Where the distance between adjacent flanges is in excess of ten feet or where a harness can not be used, the pipe supports adjacent to the coupling shall restrain the piping preventing any linear or angular movement resulting in the pipe separating from the coupling or misalignment in the joint.

C. Where expansion joints are used, control units shall be provided. All tie rods and control units shall be installed in accordance with manufacturer recommended procedures.

D. All tie rods and associated hardware shall be Type 316 stainless steel.

E. In general, all valves and fittings shall be restrained in an acceptable manner such that the unbalanced force developed at them shall be supported independent of the piping system.

3.06 PIPING SCHEDULE

A. This section includes schedule of piping specified in other sections of Division 15 - Mechanical.

B. The following abbreviations are used in the schedule:

1. Material

DIP Ductile Iron Pipe

PVC Polyvinylchloride

SS Stainless Steel

2. Wall Thickness
   - CL Class
   - DR Diameter Ratio
   - Sch Schedule
   - G Gauge
3. Joint Type
   - Grvd Grooved
   - FLG Flanged
   - MJ Mechanical Joint
   - SW Solvent Welded
   - Wld Welded
4. Fitting Type
   - DIP Ductile Iron Pipe
5. Interior Surface Protection
   - EL Epoxy Lined
   - GL Glass Lined
6. Exterior Surface Protective Coating
   - AC Asphalt Coated
   - P Painted

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C. Piping Schedule

Service	Nominal Pipe Diameter (inches)	Material	Thickness	Working Pressure (PSIG)	Joints	Fittings	Protective Coating		Remarks
							Pipe Interior	Pipe Exterior	
DRAIN	All	DIP	Class 53	50	FLG	DI	EL	P	
GRIT WASHER FEED (INFLUENT)	All	DIP	Class 53	100	FLG	DI	GL	P	
NON-POTABLE WATER (EFFLUENT)	≤ 2” > 2”	PVC DIP	Sch 80 Class 53	100 100	SW FLG	DI DI	-- EL	P P	
COMPRESSED AIR SUPPLY TUBING	All	316 SS	Sch 40	200	Per W-30	SS	--	--	

- END OF SECTION -

SECTION 15995 - PIPELINE TESTING AND DISINFECTION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall perform flushing and testing of all pipelines and appurtenant piping, complete, including conveyance of test water from Owner-designated source to point of use and all disposal thereof, all in accordance with the requirements of the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

ANSI/AWWA B300 Hypochlorites

ANSI/AWWA B301 Liquid Chlorine

ANSI/AWWA C651 Disinfecting Water Mains

1.03 SUBMITTALS

A. A testing schedule, including proposed plans for water conveyance, control, disposal, and disinfection shall be submitted in writing for approval a minimum of seven (7) days before testing is to start.

PART 2 -- PRODUCTS

2.01 MATERIALS REQUIREMENTS

A. All test equipment, temporary valves or bulkheads, temporary vents or drains or other water control equipment and materials shall be determined and furnished by the Contractor subject to the Engineer's review. No materials shall be used which would be injurious to the construction or its future function.

PART 3 -- EXECUTION

3.01 GENERAL

A. Unless otherwise provided herein, water for testing pipelines will be furnished by the City; however, the Contractor shall make all necessary provisions for conveying the water from the Owner-designated source to the points of use.

B. All pressure pipelines shall be tested. All testing operations shall be performed in the presence of the Engineer.

3.02 HYDROSTATIC TESTING OF WATER AND PROCESS PIPING

A. Prior to hydrostatic testing, all newly constructed pipelines shall be flushed or blown out as appropriate. The Contractor shall test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar have attained an age of 14 days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Care shall be taken to see that all air vents are open during filling.

B. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the Engineer shall be taken.

C. Hydrostatic Pressure Testing of Aboveground or Exposed Piping:

1. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 4 hours. In general, the test pressure for pipelines shall be nominally 150 percent of the normal operating pressure listed in the schedule in Section 15000.

2. Joints, fittings, valves, and other connections shall be examined for leaks. The piping systems shall show no signs of leaking or weeping. All leaks shall be repaired in a manner acceptable to the Engineer and then retested until no leakage is detected.

- END OF SECTION -

SECTION 16050 – ELECTRICAL EQUIPMENT

PART 1 -- GENERAL

1.01 REQUIREMENT

A. Electrical equipment as shown on the Drawings shall be installed by a State of Florida licensed electrician. All electrical work shall comply with Florida Building Code and the National Electric Code. Electrical subcontractor shall:

1. Reuse existing breakers in the existing motor control centers as shown on the Drawings and provide and install new power cable in new conduit to supply power to new equipment as shown on the Drawings.

2. Provide and install new control signal cable in new conduit to new devices as shown on the Drawings. Reuse and reconnect existing control signal cable in existing conduit for modified controls as shown on the Drawings.

3. Provide all miscellaneous electrical including junction boxes, power panels, terminations, fittings, surge protection, etc., whether or not specifically identified on the Drawings or in these specifications, for complete working systems in place.

4. Perform electrical system tests as specified herein.

5. Coordinate with instrument supplier, Grit Washer/Dewatering Unit supplier, and General Contractor for all required wire, conduit, power and signal requirements, providing all electrical materials and labor as needed that is not otherwise supplied under other divisions of these specifications.

6. Furnish and install temporary construction power as needed to meet the needs of the General Contractor, other subcontractors, and their own work, and be responsible for coordination with potential power source supplier and making arrangements to pay for all power consumption necessary for construction activities.

7. In addition to the specifications herein, comply with all requirements of the City's technical specifications listed below. If there is a conflict, assume the more stringent requirement until directed otherwise and bring such conflicts to the City's project manager's attention for clarification.

    a. SECTION 45 - ELECTRICAL

    b. SECTION 76 - CONDUIT, WIRE, AND GROUNDING

1.02 QUALITY ASSURANCE

A. UL Compliance: Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

B. Hazardous Areas: Materials and devices shall be specifically approved for hazardous areas of the class, division, and group shown and of a construction that will ensure safe performance when properly used and maintained.

1.03 SUBMITTALS

A. Quality Control Submittals to include, but not necessarily limited to, the following:

1. Results of all cable and wire tests as specified herein.

2. Warrantee documents as specified.

B. Submit Shop Drawings, including catalog for:

1. Conduit, cable, panels, breakers, and all other proposed electrical components as specified herein.

1.04 INSPECTION OF THE SITE AND EXISTING CONDITIONS

A. The Electrical Drawings were developed from past record drawings and other information available during design.

B. Before submitting a bid, visit the site and determine conditions at the site and at all existing structures and conduit runs in order to become familiar with all existing conditions and electrical systems which will, in any way or manner, affect the work required under this Contract. No subsequent increase in Contract cost will be allowed for additional work required due to failure to fulfill this requirement.

1.05 SEQUENCING AND SCHEDULING

A. Perform inspection and electrical tests after equipment has been installed.

B. Perform tests with apparatus de-energized whenever feasible.

C. Notify Engineer at least 24 hours prior to performing tests on energized electrical equipment.

PART 2 -- PRODUCTS

2.01 SUPPORT AND FRAMING CHANNELS

A. Material: ASTM A167, Type 316 stainless steel or aluminum Alloy 6061-T6

B. Finish: smooth polished finish for stainless, clear anodized for aluminum

C. Inserts: Continuous.

D. Fasteners, Clamps, and Anchors: Type 316 stainless steel

E. Manufacturers: B-Line, Unistrut.

2.02 WIRING AND CABLE

A. Conductors, include grounding conductors, shall be copper wire. Aluminum conductor wire and cable will not be permitted. Insulation shall bear UL label, the manufacturer's trademark, and identify the type, voltage, and conductor size. All conductors shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity.

B. Power and Control Wire:

1. Wire shall be as specified under City Specification W-76. All conductors/cable shall conform to UL-44 - UL Standard for Thermoset-Insulated Wires and

Cables. All conductors/cables shall be rated for 75 deg C suitable for wet locations.

2. Wiring shall be as manufactured by Okonite X-Olene, American, Southwire or approved equal.

C. Shielded signal cable - Cable shall be as specified under City Specification W-76.

D. Cable Terminations:

1. Compression connectors shall be Burndy "Hi Lug", Thomas & Betts "Sta-Kon,", or approved equal.

2. General purpose insulating tape shall be Scotch No. 33, Plymouth "Slip-knot", or equal. High temperature tape shall be polyvinyl as manufactured by Plymouth, 3M, or approved equal.

3. Labels for coding 600 volt wiring shall be computer printable or pre-printed, self-laminating, self-sticking, as manufactured by W.H. Brady, 3M, or approved equal.

4. Stress cone material for make-up of medium voltage shielded cable shall be as manufactured by Raychem, 3M, or approved equal.

E. Equipment Grounding Conductors: Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.

F. Ethernet Cable: Install Ethernet cable in new conduit (conduit supplied under Division 16, cable supplied under Division 17). Install in accordance with manufacturer's recommendations.

G. Pulling Compound: Nontoxic, non-corrosive, noncombustible, nonflammable, wax-based lubricant; UL listed. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable. Suitable for PVC-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways. Manufacturers and Products: Ideal Co. Yellow 77, Polywater, Inc., Cable Grip Co.

H. Wire Markers: All cable/conductors shall have wire markers at each end using permanent, white plastic heat-shrink sleeves, with legible machine-printed black markings.

2.03 CONDUIT

A. Rigid Non-Metallic Conduit (concealed conduit)

1. Rigid non-metallic conduit shall be Schedule 80 PVC, sunlight resistant.

2. Rigid non-metallic conduit shall be manufactured in accordance with NEMA TC-2 - Electrical Plastic Tubing and Conduit, and UL-651 - Standard for Rigid Non-metallic Conduit.

3. UL listed for concrete encasement, underground direct burial, concealed or direct sunlight exposure, and 90 degrees C insulated conductors

4. Fittings to meet requirements of NEMA TC-3, PVC, slip-on.

5. Manufacturers:

   a. Carlon

   b. Triangle

   c. Allied Tube

   d. Approved equal

B. Rigid PVC Coated and Non-coated Aluminum (RAL) Conduits (exposed conduit)

1. Rigid aluminum conduit shall be used for all above ground and exposed locations and down to and including the first bend when transitioning below grade to PVC conduit.

2. Rigid aluminum conduit shall be manufactured of 6063T-42 aluminum and conform to Federal Specification WW-C-540 and ANSI C80.5.

3. Fittings and junction boxes shall be manufactured of 6063 alloy and be of the same manufacturer as the conduit supplied.

4. For exposed conduit in classified areas (all areas other than the Electrical Room), the conduit shall be PVC-coated aluminum conduit in addition to the specifications listed herein.

5. Manufacturers:
   a. V.A.W. of America

   b. Alcoa

   c. Approved equal

C. Liquid-tight Flexible Conduit (equipment connections)

1. Liquid-tight flexible conduit for equipment connections in non-classified areas shall be nonmetallic, liquidtight, with circular cross section and resistant to oil, water, heat, sunlight, corrosion, most acids, ozone, alkali, strains, abrasions, and crushing.

2. Flexible conduit for equipment connections in classified areas (all areas other than the Electrical Room) shall be entirely constructed of stainless steel (inner flexible core, outer braid, and end fittings) and be listed for use in a Class I, Division 1, Group D, wet environment – Crouse-Hinds Cat. #ECGJHXXX-S516, or equal.

3. Liquid tight flexible conduit shall be UL listed.

4. Fittings shall be compatible liquidtight fittings rated for 140 degrees F.

5. Manufacturers:

   a. Carlon

   b. Kellems

c. K-Flex

d. Approved equal

2.04 DISCONNECTS

A. Provide explosion proof disconnect switch assemblies for Class 1, Div 1, hazardous area electrical systems where shown on the Drawings. Assemblies shall be watertight and corrosion resistant and meet UL Standard 1203, cUL to CSA C22.2 No. 30, and with NEC Article 312 wire bending requirements. Enclosures shall be rated NEMA 7 and constructed of aluminum.

B. Body and Cover shall be copper-free aluminum. Hinges and hardware shall be Type 316 stainless steel. Gasket shall be Neoprene. Units shall have a large, red painted aluminum rotary handle operator mounted on cover assembly to provide rugged, reliable performance and have position of the switch easily identified from a distance. Handles shall provide lockout/tagout capability which complies with OSHA requirements allowing for locking in the OFF position for standard maintenance checks.

C. Units shall have detachable/adjustable mounting feet for no need to replace the entire enclosure if a mounting foot is broken. Units shall have bottom conduit entry with NPT connections.

D. Units shall be Eaton Crouse-Hinds EIDC/EIDD explosion proof disconnects, or approved equal.

2.05 SURGE PROTECTION

A. Install surge protection devices supplied with equipment under Division 11 and as supplied by the integrator under Division 17. Install in accordance with manufacturer's recommendations.

PART 3 -- EXECUTION

3.01 GENERAL

A. Install equipment in accordance with NECA 5055.

3.02 SUPPORT AND FRAMING CHANNEL

A. Furnish epoxy coating for aluminum surfaces in contact with concrete.

B. Install supports where required for mounting and supporting electrical equipment and raceway systems and as shown on the Drawings.

3.03 INSTALLATION OF WIRING AND CABLE

A. Install cable per manufacturer's recommendations.

B. Conductors shall not be pulled into raceway until raceway has been cleared of moisture and debris.

C. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL approved.

D. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals. Tighten screws and terminal bolts in accordance with UL 486A for copper conductors. Ream, remove burrs, and clear interior of installed conduit before pulling wires or cables.

E. Installation of new power wire in existing conduit shall be installed after pulling existing cable out of the existing raceway with attached pull chord installed to pull in new cable. If existing raceway appears to be damaged in any way, bring to the attention of the Engineer before proceeding with pulling of new cable.

F. Splices and Terminations

1. Wire taps and splices shall be properly taped and insulated according to their respective classes.

2. Stranded conductors shall be terminated directly on equipment compression lugs making sure that all conductor strands are confined within lug. In control panels, wire shall be terminated to terminal strips.

3.04 INSTALLATION OF CONDUIT

A. All wiring shall be run in raceway unless indicated otherwise.

B. Raceways shall be installed between equipment as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for this purpose. Factory elbows shall be utilized wherever possible. Crushed or deformed raceways are not permitted. Maintain raceway entirely free of obstructions and moisture. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.

C. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.

D. Where raceway routings are indicated on plan views, follow those routings to the extent possible. Group raceways together installed in same area.

E. Where raceways are indicated but routing is not shown, such as home runs or on conduit developments and schedules, raceway routings shall be the Contractor's choice and in strict accordance with the NEC and customary installation practice. Raceway shall be encased, exposed, concealed, or under floor as indicated, except that conduit in finished areas shall be concealed unless specifically indicated otherwise.

F. Routings shall be adjusted to avoid obstructions. Coordinate between trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be by the Contractor as part of the WORK. Maintain a minimum of 12 inches separation between raceways and heated piping.

G. Exposed raceways shall be installed parallel or perpendicular to structural beams. Follow contours of when running exposed raceways, avoid obstruction of passageways.

H. Install expansion fittings with bonding jumpers wherever raceways cross building expansion joints.

I. Exposed raceways shall be installed at least 1/2-inch from walls or ceilings except that at locations above finished grade where damp conditions do not prevail, exposed raceways shall be installed 1/4-inch minimum from the face of walls or ceilings by the use of clamp backs or struts.

J. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.

K. For motors and electrically operated valves, flexible conduit connection is required to minimize vibration.

L. Install concealed raceways with a minimum of bends in the shortest practical distance.

M. Make bends and offsets of longest practical radius. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.

N. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

3.05 PVC CONDUIT

A. Solvent Welding:

1. Provide manufacturer recommended solvent; apply to all joints.

2. Install such that joint is watertight.

B. Adapters:

1. PVC to Metallic Fittings: PVC terminal type.

2. PVC to Rigid Metal Conduit or IMC: PVC female adapter.

C. Belled-End Conduit: Bevel the un-belled end of the joint prior to joining.

3.06 RIGID ALUMINUM CONDUIT

A. Install in accordance with manufacturer's instructions.

B. Provide epoxy coating for all conduit surfaces exposed to concrete.

3.07 TERMINATIONS AT ENCLOSURES

A. NEMA 3R and NEMA 4X Enclosures: Provide conduit hubs

3.08 IDENTIFICATION DEVICES

A. Raceway Tags: Identify origin and destination.

B. Install at each terminus, near midpoint, and at minimum intervals of every 50 feet of exposed Raceway, whether in ceiling space or surface mounted.

C. Provide nylon strap for attachment.

3.09 PROTECTION OF INSTALLED WORK

A. Protect products from effects of moisture, corrosion, and physical damage during construction.

B. Provide and maintain manufactured watertight and dust-tight seals over all conduit openings during construction.

C. Touch up painted surfaces to cover nicks or scars resulting from installation activities.

- END OF SECTION -

SECTION 17001 – INSTRUMENTATION REQUIREMENTS – BUILDING 2

PART 1 -- GENERAL

1.01 SCOPE

A. Provide, install, and place in operation the new Grit Removal System control panels and associated instruments as listed herein and noted on the Drawings for Building 2. The work under this section shall be provided through a qualified system integrator herein referred to as the INSTRUMENTATION SUBCONTRACTOR. In addition to the specifications herein, comply with all requirements of the City's technical specification W-46 – CONTROLS and W-35 – MAGNETIC FLOW METERS. If there is a conflict, assume the more stringent requirement until directed otherwise and bring such conflicts to the City's project manager's attention for clarification

B. The scope of work to be performed under this Section pertains to the work within Building 2 and includes:

1. The CONTRACTOR shall retain overall responsibility for the control system as specified herein and as supplied by equipment provided under other Divisions of the specifications.

2. The CONTRACTOR shall be responsible to install all new instruments and control panels as specified herein and as indicated on the Drawings.

3. The CONTRACTOR shall furnish and install new instrument supports and mounting hardware as shown on the Drawings.

4. The ELECTRICAL SUBCONTRACTOR shall provide final termination and testing of all instrumentation and control system signal wiring and power supply wiring at all equipment furnished or modified under this project.

5. The INSTRUMENTATION SUBCONTRACTOR shall furnish and install transient voltage surge suppression systems for all new analog instruments and control panels furnished under this section.

6. The INSTRUMENTATION SUBCONTRACTOR shall provide testing, calibration, training and startup services as specified herein.

7. The INSTRUMENTATION SUBCONTRACTOR shall provide the programming as described herein to fully incorporate the instruments and equipment supplied under this project, as well as for the interface with and control of existing equipment as noted herein. Programming shall include operator interface software within, and communications software between, panels furnished under this section as well as panels furnished with equipment supplied under Division 11.

8. The INSTRUMENTATION SUBCONTRACTOR shall fabricate new PLC panels and furnish new instruments and control stations as specified herein.

1.02 ANALOG SIGNAL TRANSMISSION

A. Signal transmission between electric or electronic instruments, controllers, and all equipment and control devices shall be linear 4-20 milliamperes and shall operate at 24 volts D.C. Signal isolation and/or conversion shall be provided where necessary to interface with instrumentation, equipment controls, panels and appurtenances.

B. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating.

C. All cable shields shall be grounded at one end only, at the control panel, with terminals bonded to the panel ground bus.

1.03 DISCRETE INPUTS

A. All discrete inputs from field devices shall be dry contacts in the field device or equipment, powered from the signal source with isolation to the PLC inputs.

B. Sensing power (wetting voltage) shall match existing conventions, in general 120V AC.

1.04 DISCRETE OUTPUTS

A. All discrete outputs to field devices shall be through isolation relays within the new control panels with contacts on the relays rated for the service intended.

1.05 INSTRUMENT AND HARDWARE SUBMITTALS

A. Submit information for all new hardware including, but not limited to, the following:

1. Product (item) name and tag number.

2. Catalog cuts.

3. Manufacturer's complete model number.

4. Location of the device.

5. Input - output characteristics.

6. Range, size, and graduations.

7. Physical size with dimensions, NEMA enclosure classification and mounting details.

8. Materials of construction of all enclosures, wetted parts and major components.

9. Instrument or control device sizing calculations where applicable.

10. Certified calibration data on all flow metering devices.

11. Environmental requirements during storage and operation.

12. Associated surge protection devices.

13. Mounting requirements.

14. Environmental requirements during storage and operation.

15. Complete panel fabrication shop drawings including panel layouts and wiring diagrams.

16. Complete network diagram showing all network communications to PLCs, VFDs, UPSs, OIUs, OITs, remote I/O, network switches, and CAT6 and RS485 cables, protocols used, components used, and conduit sizes between panels. Coordinate with

the grit washer manufacturer to include components supplied within the vendor panels in the submitted network diagram for a complete network description.

1.06 SOFTWARE SUBMITTALS

A. Software submittals shall include the following as a minimum:

1. PLC input/output schedules for interface with values being sent to and received from the existing and new field I/O and internal data registers. List complete addresses and tagnames for each data register.

2. Panel operator interface software (OIS) – use by the Operator Interface Unit (OIT) – and database including OIS tagname, corresponding PLC register cross reference, scales, functions, etc.

3. Written control strategy documentation to describe the proposed control logic interface with the I/O.

4. Upon approval of PLC input/output schedules, new OIS database point list, and written control strategy documentation, submit a complete hard copy of fully commented PLC ladder logic programming and a complete hard copy of proposed OIS display screen modifications.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Provide equipment operation and maintenance manuals for new instruments. The manuals shall contain all illustrations, detailed drawings, wiring diagrams, and instructions necessary for installing, operating, and maintaining the equipment. The illustrated parts shall be numbered for identification. All modifications to manufacturer standard equipment and/or components shall be clearly identified and shown on the drawings and schematics. All information contained therein shall apply specifically to the equipment furnished and shall only include instructions that are applicable. All such illustrations shall be incorporated within the printing of the page to form a durable and permanent reference book.

B. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The maintenance instructions shall include trouble shooting data and full preventive maintenance schedules. The instructions shall be bound in locking 3-D-ring binders with bindings no larger than 3.5 inches and CD's with PDF files shall be provided. The manuals shall include 15% spare space for the addition of future material. The instructions shall include Drawings reduced or folded and shall provide at least the following as a minimum.

1.08 FINAL SYSTEM DOCUMENTATION

A. Provide two copies on CD-ROM for all software for the PLC and OIS systems (actual program files and pdf copies). PLC files shall include all comments. Provide complete control panel as-installed panel fabrication and wiring diagrams for new panels in dwg and pdf format on CD-ROM.

1.09 SHIPPING, HANDLING, AND STORAGE

A. In addition to shipping, handling and storage requirements specified elsewhere in the Contract Documents, air conditioning/heating shall be provided for storage of all new field instrumentation and ancillary devices to maintain temperatures between 20 and 25 degrees C

and relative humidity 40 to 60 percent without condensation. The air shall be filtered and free of corrosive contaminants and moisture.

1.10 INSTALLATION

A. All instrumentation and control system installation work shall conform to all applicable codes and standards and be in accordance with manufacturer's recommendations.

B. All labor shall be performed by qualified craftsmen in accordance with the standards of workmanship in their profession and shall have had a minimum of five years of documented experience on similar projects.

C. All equipment and materials shall fit properly in their installations. Any required work to correct improperly fit installations shall be performed at no additional expense to the Owner.

D. The Contractor shall provide all required cutting, drilling, inserts, supports, bolts, and anchors, and shall securely attach all equipment and materials to their supports. All supports and hardware shall be Type 316 stainless steel.

1.11 OPERATOR TRAINING

A. Provide a minimum of two sessions, each approximately 4 hours in duration, to train operations staff on the new controls and instruments.

1.12 CONTROL SYSTEM SUPPLIER

A. The INSTRUMENTATION SUBCONTRACTOR's scope of work for field work shall be performed by a qualified instrumentation subcontractor experienced with municipal domestic wastewater treatment plant control system work, particularly for work within classified areas for Class 1, Division 1, hazardous rated.

B. The CONTRACTOR shall employ a qualified system integrator to implement the scope of work specified herein. Qualified system integrators are Curry Controls (Lakeland, FL), Automated Integration (Brandon, FL), CC Control Corp (West Palm Beach, FL), C2I (Smyrna, GA), and CEC Controls (Bradenton, FL). Programming shall follow standard City practices for OIS and PLC development and shall provide full interface with the new and existing equipment as specified herein.

C. The selected INSTRUMENTATION SUBCONTRACTOR shall base their work on the understanding that the work within this section is related to Building 2 and is to be completed first. No work shall start on or within Building 1 until the work in Building 2 is complete and accepted by the City.

PART 2 -- PRODUCTS

2.01 CONTROL PANELS

A. Furnish, test, install and place in satisfactory operation the control panels and other enclosures, with all spare parts, accessories, and appurtenances as specified herein and as shown on the Drawings.

Control Panel and Control Station Schedule

Description	Location	PLC	OIT	Qty
Grit Removal System Main Control Panel	Non-Haz	Yes	No	1
Grit Removal System Local Panel (OIT)	Haz	No	Yes	2

Grit Removal System Local Panel (controls)	Haz	No	No	2
Grit Removal System Local Panel (remote I/O)	Hax	I/O	No	2
Grit Feed Valve Control Station	Haz	No	No	1
Grit Escalator Motor Control Station	Haz	No	No	2
Grit Slurry Cup 1 Valve Control Station	Haz	No	No	2
Grit Slurry Cup 2 Valve Control Station	Haz	No	No	2
Slurry Cup Feed Isolation Valve Control Station	Haz	No	No	2

Hazardous (Haz) area control panels and stations shall be rated for Class 1, Division 1, Group D, NEMA 7 for non-intrinsically safe internal components, NEMA 4X for intrinsically safe internal components.

B. Control panels and enclosures shall be assembled, wired, and tested in the INSTRUMENTATION SUBCONTRACTOR's own facilities. All components and all necessary accessories such as power supplies, conditioning equipment, mounting hardware, signal input and output terminal blocks, and plug strips that may be required to complete the system shall be provided.

C. Control panels themselves, and all interior and exterior equipment, shall be identified with nameplates. The equipment shall be mounted such that service can occur without removal of other equipment. Face mounted equipment shall maintain the panel's NEMA rating. All equipment shall be accessible such that adjustments can be made while the equipment is in service and operating. All enclosures shall fit within the allocated space as shown on the Drawings.

D. Hazardous Area Panel Construction, Non-Intrinsically Safe Use: Panels shall be floor, wall, or rack-mounted panels, as scheduled, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosures shall be Explosion Proof, rated for Class 1, Division 1, Group D all cast aluminum enclosures, with stainless steel hinges, pins, latches, and fasteners. The enclosures shall have a hinged outer door with suitable bolted connections and continuous gaskets to be rated explosion proof. The enclosures shall have an aluminum removable subpanel for mounting of internal components.

E. Hazardous Area Panel Construction, Intrinsically Safe Use: Panels shall be floor, wall, or rack-mounted panels, as scheduled, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosures shall be rated NEMA 4X all Type 316 stainless steel enclosures, minimum 14 gauge, including stainless steel hinges, pins, latches, and fasteners. The enclosures shall have a hinged outer door with suitable bolted connections and continuous gaskets to be water and gas tight and keep ambient corrosive gasses from entering the panel when closed. The enclosures shall have a 12-ga steel, formed, removable subpanel. The subpanel shall be degreased, cleaned, treated with a phosphatizing process, then primed and painted with white industrial grade baked enamel.

F. Non-hazardous Area Panel Construction: The panels shall be floor, wall, or rack-mounted panels, as scheduled, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosures shall be NEMA 12 painted steel enclosures, minimum 14 gauge, suitable for indoor, non-air-conditioned, non-corrosive spaces. Enclosures shall have a hinged outer door with suitable latching mechanisms and include continuous gaskets to hinder ambient humidity from entering the panel when closed. The enclosures shall have a 12-ga steel, formed, removable subpanel. The panel enclosure and subpanel shall be degreased, cleaned, treated with a phosphatizing process, then primed and painted with industrial grade baked enamel, grey for panel enclosure inside and out and white for the subpanel.

G. Panel Manufacturer: Panel enclosures shall be pre-fabricated enclosures as provided by EXM Manufacturing, Hoffman, or approved equal.

H. Panel Support Rack: The Contractor shall fabricate and install a suitable aluminum mounting rack for rack-mounted control panels, supports constructed of aluminum alloy 6061-T6 with clear anodized finish using standard structural shapes. Support shall be adequate to provide a rigid support for the supplied panel.

I. Panel Wall and Floor Mounting Supports: The Contractor shall install wall mounted panels using Type 316 stainless steel hardware and suitable spacers to maintain a 1/4" minimum air gap between the back of the panel and the wall. Fasteners shall be suitable for the type of wall used. Floor mounted panels shall be mounted on 4” high concrete house-keeping pads mounted on neoprene rubber gaskets around the panel perimeter, anchored using Type 316 stainless steel concrete anchors.

J. Control Panel Components: Panels shall consist of the following components:

1. Manual main breaker to disconnect all power to the panel other than foreign voltages used to pick up relay contacts. The circuit breakers shall be as manufactured by Phoenix Contact or Allen Bradley for 120V input power.

2. Control Branch Circuit Breakers: Provide branch circuit breakers for a panel receptacle and light, panel fans, UPS power, 120V control power, and for each individual PLC input/output card. The circuit breakers shall be quick-make, quick-brake and trip free. The circuit breakers shall as manufactured by Square D, General Electric, Allen Bradley, or Phoenix Contact for 120V input power.

3. Programmable Controller (PLC): Each panel shall include a PLC for all control logic. The PLC shall be GE Intelligent Platforms RX3i (City’s standard product). CPU, Power Supply, Network Interface, and all I/O modules within the new Main Grit System Control Panel are to match City’s standard modules for input voltage, number of channels, and spare capacity. PLC hardware and software shall be provided to allow operators to make changes to setpoints and control settings within the PLC over an Ethernet link to the plant SCADA system. Software ladder programming shall be set up to allow modifications to the programming either through direct laptop connection at the PLC, through the OIT, or over the Ethernet link from remote work station(s). City’s standard PLC components include:

- Rx3i Analog Output – GE IC694ALG392 AO, 4-20mA, 8 channel
- Rx3i Analog Input – GE IC694ALG221 AI, 4-20mA, 4 channel – or –
- Rx3i Analog Input – GE IC695ALG616 AI, 4-20mA option, 16 SE - AWTP Warehouse item
- Rx3i Digital Output – GE IC694MDL940 DO 0-125VDC/0-256VAC, 16 point
- Rx3i Digital Input – GE IC694MDL240, DI 120V
- Rx3i Network – GE IC695ETM001 Ethernet Module, 10 Base T
- Rx3i Power Supply – GE IC695PSA140 PS, 40W, 120V
- Rx3i Base – GE695CH012 Rack, 12-slot, high speed base – or –
- Rx3i Base – GE695CH016 Rack, 16-slot (12 slot is preferred)
- Rx3i CPU – GE695CPE305 CPU, 5 MB User Memory, Ethernet port

4. Intrinsically Safe Remote I/O: Remote input/output modules within the two new Grit System Intrinsically Safe Local Control Panels shall utilize remote I/O components suitable for use in a Class I, Division I environment without requiring an explosion proof

enclosure. Components shall be intrinsically safe, be hot swappable, suitable for use in ambient conditions of the grit process area, and fully capable of complete interface and communications with the main PLC supplied. Remote I/O shall be Stahl IS1+ Remote I/O or approved equal.

5. Operator Interface Unit (OIT): Provide an OIT for each Grit Removal System local control panel. The OIT units shall be an explosion proof Class 1, Division 1 certified panel mounted industrial grade computer with the following features:

   a. Intel ATOM processor, 1.66 GHz

   b. 10-inch projective capacitance touch screen high resolution full color display

   c. Fanless, Class 1, Division 1, aluminum enclosure with highly efficient heat dissipation capabilities

   d. 667 HHz FSB

   e. 1 MB L2 cache

   f. 2 GB DDR2 RAM

   g. 80 GB SSD Hard Drive

   h. -20^{o}C to 50^{o}C operating temperature in 5 to 95% humidity

   i. Windows 10 operating system

   j. 120V power supply

   k. Fully licensed copy of windows-based software utilized

   OIT's shall be General Atomics HMI3000Ex Panel Mount PCs, 858-964-6830, contact Ron Mucim, latest edition at time of bid, or approved equal.

6. Uninterrupted Power Supply (UPS): The PLC and OITs within panels, as well as all other circuits within a panel other than receptacles, lights, and ventilation equipment, shall operate on 120V power from a UPS securely mounted inside the panel (loose installation at bottom of panel not acceptable). The UPS shall be APC Schneider Electric, or approved equal, with Ethernet/IP communications directly with the panel PLC for full status monitoring of UPS (battery life, running on battery, faults, etc.). UPS shall be sized, and panel shall be wired, to power all components within the panel other than the panel light, receptacle, and ventilation fans. Panel ventilation shall be sized to dissipate the heat generated by the UPS when running on battery, full load. Provide a manual bypass switch around the UPS to allow control power to be directly connected to the UPS load side to facilitate UPS maintenance.

7. Ethernet Interface to Grit Washer Panels: The Grit Removal System Main Control Panel PLC shall communicate with the two Grit Washer Control Panel PLCs (located in the same building) over a copper local Ethernet PoE link connected through a PLC communications module and the local area network switch. The conduit between panels shall be furnished and supplied under Division 16. The Ethernet cable between the panels shall be furnished under this Section and shall be Allen Bradley 1585-C8CB-S600 with LAPP Group PN 2170060 Connectors to protect against interference from 480V power within the Grit Washer panels.

8. Interface to Grit Removal System Local Panel OIT and I/O: Communication between the Grit Removal System Local intrinsically safe Remote I/O and Operator Interface Terminal (OIT) shall be by Ethernet via high quality, shielded CAT6 cable. Communication between the OIT and Grit Removal System Main Control Panel shall be by RS485

physical layer and Modbus RTU application layer via shielded 1-1/2 pair RS485 cable, Belden 3106A or equal. The conduit between panels shall be furnished and installed under Division 16. A separate RS485 cable and conduit shall be provided and installed between each Local OIT and the Main Control Panel. All cables shall be supplied by the INSTRUMENTATION SUBCONTRACTOR, installed under Division 16.

9. Local Area Network Switch and SCADA Interface Network Switch: Ethernet interface components within the Grit Removal Main Control Panel shall be through a local area network switch, Stratix 5700 or equal. The minimum 10-port local area network switch shall provide communications with City-assigned IP addresses for the Grit Washer Control Panel PLC interfaces and the Grit Removal System Main Control Panel PLC and UPS. Cable between the network switch and the PLC and UPS within the panel shall be through industrial grade CAT6 cable and ST connectors. Communications between the Grit Removal System Main Control Panel PLC and the existing SCADA RTU shall be by RS485 physical layer and Modbus RTU application layer via shielded 1-1/2 pair RS485 cable, Belden 3106A or equal. Provide a new 4-port serial communication module #GEIC695CMM004 to replace the existing 2-port #GEIC695CMM002 module in the existing SCADA RTU PLC. The proposed RS485 cable from the Main Grit Control Panel shall be connected to this module. Modifications to the existing RTU PLC will be made by City Personnel. City Personnel will assist the Integrator with the required Modbus Register Mapping for the existing SCADA RTU. The conduit between panels shall be furnished and installed under Division 16. All cables shall be supplied by the INSTRUMENTATION SUBCONTRACTOR, installed under Division 16.

10. Panel Heat Dissipation: Explosion proof panels housing PLC components (CPU or remote I/O) shall be fitted with heat dissipation fins or other suitable means of dissipating heat buildup within the panels that maintain the explosion proof protection.

11. Louvers and Fans: Non-hazardous area panels housing PLC components shall be equipped with internal fans and louvers to dissipate heat generated by equipment mounted inside the panel. Provide louvered openings near the bottom and top of the panel on opposite sides to promote complete ventilation of the panel. All air-flow openings shall be fitted with dust filters. Provide thermostatically controlled, low-noise cooling fans to circulate outside air into the enclosure through the top louvered opening, exhausting through the bottom louvered opening. Air velocities through the enclosure shall be minimized to assure quiet operation.

12. Power/Signal Surge Devices: Provide a surge arrestor installed on the line side of the main breaker in accordance with manufacturer's instructions. Provide surge suppression devices on all signal and power leads on all circuits that have any part of the control or power circuit that extends past the limits of the building housing the control panel. Surge devices shall be as manufactured by Phoenix Contact:
    a. for 110VAC Signal use Phoenix Contact 2794987
    b. for 120VAC Power use Phoenix Contact 2856812
    c. for 4-20mA signals use Phoenix Contact 2838186

13. Field selector switches, including Local/Off/Remote (LOR), Local/Remote (LR), Potentiometers (Pot), or Open/Close/Remote (OCR) as noted on the Drawings, for manual control at the associated equipment, shall be mounted in the aluminum enclosures provided as local control stations (LCS). Switches shall be SPDT, two- or three-position selector switches, Allen Bradley Type 800H rated for XP hazardous areas, or equivalent by Square D or General Electric. Potentiometers shall be Allen Bradley Type 800T, or equivalent by Square D or General Electric, rated for XP hazardous areas. Local control stations shall be:

Local Control Station Devices

Description	LOR	OCR	LR	Pot	E-stop

Grit Escalator Motor Control Stations	1				1
Slurry Cup A Valve Control Stations		2			
Slurry Cup B Valve Control Stations		3			
Slurry Cup Feed Iso Valve Ctrl Station		5			
Grit Feed Valve Control Station			4	4	

14. Field emergency stop, start/stop, or open/close pushbuttons mounted on LCS's or control panels shall be mushroom head, red pushbuttons for emergency stop and black pushbuttons for start/stop and open/close service. Emergency stop pushbuttons shall be normally closed contacts that disconnect control power and stop the associated motor, push-to-stop, pull-to-reset. Start/Stop and Open/Close pushbuttons shall be momentary contact normally open for start and open, normally closed for stop and close. Contacts shall be normally closed enable contacts. Pushbuttons shall be Allen Bradley Type 800H, or equivalent by Square D or General Electric, rated for XP hazardous areas or NEMA 12 for non-hazardous areas.

15. Panel indicator lights as noted herein shall be mounted on the panel front door. Indicator lights shall be NEMA 12, SPDT, red for running indication, amber for fault lights, white for power and shall be Allen Bradley Type 800H, or equivalent by Square D or General Electric. Indicating lights shall be LED type and wired for individual lamp push-to-test operation.

16. As-built Drawings: A laminated "As Built" copy of the panel wiring diagrams shall be provided and placed in the panel print pocket for all panels. All panel drawings shall be developed using AutoCad®. The drawings shall have a complete Bill of Materials, panel exterior and interior layouts, and show all electrical wiring. As-built drawings shall be submitted with the O&M materials on a CD in both AutoCad® (.dwg) and Adobe Acrobat® (.pdf).

17. Terminals: Terminal blocks shall be as follows:

    a. Terminal blocks shall be assembled on non-current carrying aluminum DIN mounting rails securely bolted to the cabinet subpanel. Terminals shall be of the screw down pressure plate type as manufactured by Allen Bradley or Phoenix Contact.

    b. Power terminal blocks for both 120 VAC and 24 VDC power shall be single tier with a minimum rating of 600 volts, 30 amps.

    c. Discrete signal terminal blocks shall be 2-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal.

    d. Analog signal terminal blocks shall be 3-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal and the shield/drain wire shall be installed on the bottom or right-most terminal.

    e. Only one wire shall be terminated under a single wire clamp or screw.

    f. Terminal blocks for field wire connections shall be added as needed in 10-pole increments. Terminal blocks shall be mounted with a minimum of 2" from both enclosure sides and from the bottom of the enclosure for easy access to terminal screws.

g. Terminals shall be marked with a permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field incoming conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

h. Separate terminal strips shall be provided for each type of power and signal used within each cabinet. Where applicable, terminal strips for different voltages of discrete signal wiring shall also be separated. Terminal strips shall be labeled as to voltage and function.

18. Wiring: All wiring shall be color-coded using tinned copper MTW #14 AWG minimum for power and control wiring and #16 twisted pair for analog signal wiring. Wiring and cables shall be numbered at each end. Wire numbers shall be printed on non-removable heat-shrink tags. Wires shall be color coded as follows:

Equipment Ground - GREEN

120 VAC Power - BLACK
120 VAC Power Neutral - WHITE

120 VAC Control (Internally Powered) - RED
120 VAC Control (Externally Powered) - YELLOW

24 VAC Control - ORANGE

DC Power (+) - BLUE
DC Power (-) - GRAY

Analog Signal – BLACK/WHITE

19. Component Labels: All interior panel components shall be individually labeled on the back plate with a custom engraved plastic tag with adhesive back (see Section 17000 for nameplates). The tags shall be white with black letters and match the nomenclature indicated on the as-built wiring diagrams.

20. Mounting Hardware: All mounting hardware such as screws or bolts used in the manufacturing of control panels shall be Type 316 stainless steel. All holes in the back plate shall be drilled and tapped. No self-tapping screws, adhesive tapes, or Velcro will be accepted for the mounting of any hardware.

21. Isolation and interposing relays shall be provided on all discrete inputs and outputs to and from the PLC and shall be DIN rail mounting type, DPDT, minimum 10 amp, 120 VAC contact rating. Relay coils shall be 120 VAC or 24 VDC as required. Relays shall have a flag indicator to show relay status, a pushbutton to allow manual operation of the relay, and an internal pilot light to indicate power to the coil. Relays shall be as manufactured by Phoenix Contact or Allen Bradley.

22. Corrosion Protection: Panel interior components shall be treated with a corrosion inhibiting spray on all exposed metallic surfaces, particularly terminations, contacts, and wire ends. After installation, furnish corrosion inhibiting capsules that emit molecular level coating on metallic surfaces throughout the panel that provide specific corrosion barrier toward hydrogen sulfide and/or subsequent formation of sulfuric acid when combined with ambient moisture.

23. Panel Seal-Offs: For all panels and enclosures, furnish and install panel seal-offs on all conduits leading to equipment installed in hazardous process areas to prohibit

exposure to corrosive gasses. Panel seal-offs shall be mounted near the equipment and shall be provided with terminations on either side of the epoxy-based seal-off material to allow for replacement of cable without breaking the seal. All conduits entering a panel or enclosure shall be sealed at the conduit entry point with a removable, expandable conduit seal material to further prohibit outside air or process gasses from entering the panel. Panel seal-off components, materials, enclosures, and terminals shall be furnished with the panels and enclosures under this Section, installed under Division 16.

2.02 PROGRAMMING

A. CONTROL OPERATION: The Grit Removal System control panels shall replace the existing hard-wired explosion proof control enclosures located between the two sets of grit removal units as noted on the Drawings. The new panels shall restore the essentially manual functionality of the existing grit removal and grit pumping systems as well as incorporate the replacement grit washer / dewatering equipment supplied under this project. Manual controls shall be through a new PLC that coordinates the operation of what equipment is to run as designated by operators. Operator interface Terminal (OIT) shall be through local, explosion-proof panel mounted industrial PCs in place of the existing control enclosures. Provide control and interface as follows:

1. Grit Collector Influent Gate Operation: Operators shall select which grit collector influent gate (gates 1 through 4) are to operate by pressing a normally open, momentary contact, OPEN pushbutton at the associated Grit Removal System Local Panel. Operators shall be able to close each grit collector influent gate by pressing a normally closed, momentary contact, CLOSE pushbutton adjacent to the associated OPEN pushbutton that breaks the latched open signal. Grit Removal System Local Panel 1 shall have pushbuttons for grit collector influent gates 1 and 2. Grit Removal System Local Panel 2 shall have pushbuttons for grit collector influent gates 3 and 4. The open/close signals shall be sent to the existing grit removal influent gate actuators re-using the three existing control wires used by the existing OPEN/CLOSE controls on the replaced explosion proof enclosures and the latched circuitry at the gate operator. Integrator shall verify that, and if necessary modify, the existing actuator operation travels to and holds the gate position selected by the operators through the new pushbuttons at the Grit Removal System Local Panel.

2. Grit Influent Gate Status: Open and Close status contacts at the existing gate actuators shall be wired to the associated Grit Removal Local Panel as remote I/O inputs to the PLC. Each grit collector influent gate status (OPEN – Red, CLOSE – Green) shall be indicated on a Grit Removal System graphic display on each new OIT.

3. Grit Collector Operation: Operators shall select which grit collector units (units 1 through 4) are to operate by pressing a normally open, momentary contact, START pushbutton at the associated Grit Removal System Local Panel. Operators shall be able to take a grit collector unit out-of-service by pressing a normally closed, momentary contact, STOP pushbutton adjacent to the associated START pushbutton that breaks the latched start signal. Grit Removal System Local Panel 1 shall have pushbuttons for grit collector units 1 and 2. Grit Removal System Local Panel 2 shall have pushbuttons for grit collector units 3 and 4. The start/stop signals shall be sent to the existing MCC grit removal unit starters re-using the three existing control wires used by the existing START/STOP controls on the replaced explosion proof enclosures and the latched circuitry at the MCC starter. Integrator shall verify that, and if necessary modify, the existing MCC starter control circuits holds the run signal once operators start a drive through the new pushbuttons at the Grit Removal System Local Panel (restarts the drive after a power outage).

4. Grit Collector Status: Running status and alarm contacts at the existing MCC starters for each grit collector shall be wired to the Grit Removal Main Control Panel as inputs to the PLC. Each grit collector status (ON – Red, OFF – Green, ALARM – Yellow) shall be indicated on a Grit Removal System graphic display on each new OIT.

5. Grit Pump Operation: Operators shall select which grit pumps (units 1A/B through 4A/B) are to operate by pressing a normally open, momentary contact, START pushbutton at the associated Grit Removal System Local Panel. Operators shall be able to take a grit pump out-of-service by pressing a normally closed, momentary contact, STOP pushbutton adjacent to the associated START pushbutton that breaks the latched start signal. Grit Removal System Local Panel 1 shall have pushbuttons for grit pumps 1A, 1B, 2A, and 2B. Grit Removal System Local Panel 2 shall have pushbuttons for grit pumps 3A, 3B, 4A, and 4B. The start/stop signals shall be sent to the existing MCC grit pump starters re-using the three existing control wires used by the existing START/STOP controls on the replaced explosion proof enclosures and the latched circuitry at the MCC starter. Integrator shall verify that, and if necessary modify, the existing MCC starter control circuits holds the run signal once operators start a pump through the new pushbuttons at the Grit Removal System Local Panel (restarts the pump after a power outage). When a blowdown / SlurryCup disabled signal from one of the Grit Washer Control Panel PLCs is received, the associated Grit Pump feeding that SlurryCup shall be stopped.

6. Grit Pump Status: Running status and alarm contacts at the existing MCC starters for each grit pump shall be wired to the Grit Removal Main Control Panel as inputs to the PLC. Each grit pump status (ON – Red, OFF – Green, ALARM – Yellow) shall be indicated on a Grit Removal System graphic display on each new OIT.

7. Grit Washer/Dewatering Unit Operation: Operators can manually start each grit washer/dewatering unit by placing a Local/Off/Remote (LOR) switch in local. When in REMOTE, the grit washer/dewatering unit shall run as described under 11412 when enabled by the Grit Removal Main Control Panel PLC when placed in ENABLED through an ENABLED/DISABLED software switch on each new OIT.

8. Grit Washer/Dewatering Unit Status: Running status, speed, and alarm status shall be transmitted over the Ethernet link from each grit washer/dewatering unit PLC. Each grit washer/dewatering unit status (ON – Red, OFF – Green, ALARM – Yellow, and speed) shall be indicated on a Grit Removal System graphic display on each new OIT.

9. Grit Washer/Dewatering Unit Feed Valve Operation: Depending on which Grit Pumps are placed in service and which Grit Slurry Cups each pump is assigned to pump to (depends on the selected position of the Grit Washer/Dewatering Unit isolation valves), the PLC shall modulate the position of each Grit Washer / Dewatering Unit Feed Valve. The Grit Slurry Cups each have an optimal flow range of 280 to 400 gpm. The Grit Pumps each typically can deliver over 300 gpm so limits on the feed line are needed to keep both the grit pumps and the Slurry Cups within optimal ranges. The following control conditions shall govern:

    a. Normally, one grit pump will pump to one Slurry Cup. If only one pump is run through a feed line, the PLC shall modulate the position of the pinch valve to maintain a NORMAL flow setpoint set at the OIT (typically set at around 335 gpm).

    b. At times operators may elect to run two grit pumps through the same feed line (typically to drain a grit collector tank more quickly) to one Slurry Cup. Under this condition, the PLC shall modulate the position of the pinch valve to go to full open (2 grit pumps in the same feed line should not exceed 400 gpm) but

shall begin to modulate the pinch valve to keep the flow below 400 gpm if needed.

c. In case a Grit Washer or one of the Slurry Cups is out of service for maintenance, operators may elect to run up to two feed lines to one Slurry Cup. Under these conditions, the PLC shall modulate the position of the pinch valve for each feed line to be equal to one-half the value of a HIGH flow setpoint set at the OIT (typically set close to 400 gpm to maximize withdrawal from each grit collector but still stay under the upper limit of the Slurry Cup.

10. Grit Washer/Dewatering Unit Isolation Valve Operation: Operators will determine which Grit Collectors (GC) pump to which Slurry Cups (SC) based on the position of the 10 isolation valves feeding the Slurry Cups. A matrix display on the OIT shall allow the following selections:

Grit Feed Matrix

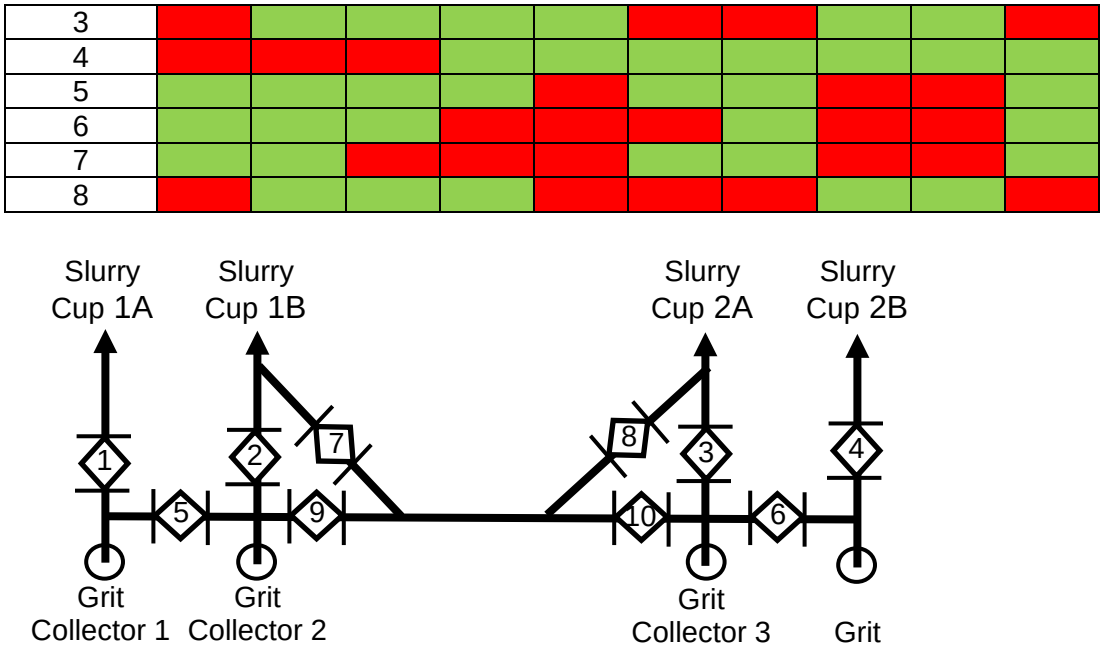
		Slurry Cups			
		1A	1B	2A	2B
Grit Collector 1		☐	☐	☐	☐
Grit Collector 2		☐	☐	☐	☐
Grit Collector 3		☐	☐	☐	☐
Grit Collector 4		☐	☐	☐	☐

Operators shall be allowed to select one Slurry Cup per Collector by clicking on the appropriate square. The selected square shall then turn RED. If a selection is changed, the previous selection shall be removed (no color). No more than 2 Grit Collectors shall be allowed to be assigned to the same Slurry Cup. If an attempt is made to do otherwise, a warning shall pop up on the display "Slurry Cup X already has two grit collectors assigned – please select another available Slurry Cup".

Once a selection has been made, the PLC shall open the appropriate isolation valves to direct grit from each grit collector (grit pump feed line) to the selected Slurry Cup. Although more combinations are possible, the following are typical selections:

Selection	Selection	Example
1	All Units in Service	GC1 to SC1A GC2 to SC1B GC3 to SC2A GC4 to SC2B Enable both escalators
2	One GC, all SC's available	GC2 to SC1B, enable escalator 1
3	Two GC's, all SC's available	GC1 to SC1A GC4 to SC1B Enable escalator 1
4	Three GC's, all SC's available	GC1 to SC1A GC2 to SC1A GC3 to SC1B enable both escalators
5	One GC, opposite SC's available	GC1 to SC2A, enable escalator 2
6	Two GC's, opposite SC's available	GC1 to SC2A GC3 to SC2B Enable escalator 2
7	Three GC's, two SC's available	GC1 to SC2A GC2 to SC2A GC4 to SC2B, enable escalator 2
8	Four GC's, two SC's available	GC1 to SC1A GC2 to SC1A GC3 to SC1B GC4 to SC1B Enable escalator 1

Condition	Resulting Isolation Valve Positions (red is open, green is closed)									
	1	2	3	4	5	6	7	8	9	10
1										
2										



Grit Washer/Dewatering Unit Isolation Valves

B. PHYSICAL CONTROL INTERFACE – Provide devices and interface signals on the front face of the indicated panels as follows:

1. Power On indicating light on Grit Removal System Main Control Panel

2. Start/Stop pushbuttons for Grit Collectors 1 and 2 on Grit Removal System 1 Local Control Panel.

3. Start/Stop pushbuttons for Grit Pump 1A, 1B, 2A, and 2B on Grit Removal System 1 Local Control Panel.

4. Open/Close pushbuttons for Grit Collector Tank 1 and 2 Influent Gate on Grit Removal System 1 Local Control Panel.

5. OIT on Grit Removal System 1 Local Control Panel.

6. Start/Stop pushbuttons for Grit Collectors 3 and 4 on Grit Removal System 2 Local Control Panel.

7. Start/Stop pushbuttons for Grit Pump 3A, 3B, 4A, and 4B on Grit Removal System 2 Local Control Panel.

8. Open/Close pushbuttons for Grit Collector Tank 3 and 4 Influent Gate on Grit Removal System 1 Local Control Panel.

9. OIT on Grit Removal System 2 Local Control Panel.

C. SOFTWARE INPUT/OUTPUTS – Provide the internal and external I/O to/from the indicated control panels as listed on the I/O list below.

Grit Removal System Main Control Panel I/O

Digital Inputs

1 Grit Pump 1A Running
2 Grit Pump 1A Fault
3 Grit Pump 1B Running
4 Grit Pump 1B Fault
5 Grit Pump 2A Running
6 Grit Pump 2A Fault
7 Grit Pump 2B Running
8 Grit Pump 2B Fault
9 Grit Pump 3A Running
10 Grit Pump 3A Fault
11 Grit Pump 3B Running
12 Grit Pump 3B Fault
13 Grit Pump 4A Running
14 Grit Pump 4A Fault
15 Grit Pump 4B Running
16 Grit Pump 4B Fault
17 Grit Collector 1 Running
18 Grit Collector 1 Fault
19 Grit Collector 2 Running
20 Grit Collector 2 Fault
21 Grit Collector 3 Running
22 Grit Collector 3 Fault
23 Grit Collector 4 Running
24 Grit Collector 4 Fault
25 Normal Power Available (from power relay)
26 Panel Internal Temperature High alarm

Digital Outputs
1 Slurry Cup Isolation Valve 1 open command
2 Slurry Cup Isolation Valve 2 open command
3 Slurry Cup Isolation Valve 3 open command
4 Slurry Cup Isolation Valve 4 open command
5 Slurry Cup Isolation Valve 5 open command
6 Slurry Cup Isolation Valve 6 open command
7 Slurry Cup Isolation Valve 7 open command
8 Slurry Cup Isolation Valve 8 open command
9 Slurry Cup Isolation Valve 9 open command
10 Slurry Cup Isolation Valve 10 open command

Analog Inputs
1 Grit Feed Line 1 flow
2 Grit Feed Line 2 flow
3 Grit Feed Line 3 flow
4 Grit Feed Line 4 flow
5 Grit Feed Line 1 Valve Position (% Open)
6 Grit Feed Line 2 Valve Position (% Open)
7 Grit Feed Line 3 Valve Position (% Open)
8 Grit Feed Line 4 Valve Position (% Open)

Analog Outputs
1 Grit Feed Line 1 Valve Position Reference
2 Grit Feed Line 2 Valve Position Reference
3 Grit Feed Line 3 Valve Position Reference
4 Grit Feed Line 4 Valve Position Reference

Internal Digital Registers

1 Grit Washer/Dewatering Unit 1 Enable
2 Grit Washer/Dewatering Unit 2 Enable
3 UPS running on batteries
4 UPS fault
5 Panel internal temperature HIGH

Internal Analog Registers
1 Grit Feed Line Normal Flow Setpoint
2 Grit Feed Line High Flow Setpoint
3 UPS % Battery Life Remaining

Grit Removal System 1 Local Control Panel Remote I/O

Digital Inputs
1 Grit Collector 1 Influent Gate Opened
2 Grit Collector 1 Influent Gate Closed
3 Grit Collector 2 Influent Gate Opened
4 Grit Collector 2 Influent Gate Closed
5 Grit Pump 1A Suction Valve Opened
6 Grit Pump 1B Suction Valve Closed
7 Grit Pump 2A Discharge Valve Opened
8 Grit Pump 2B Discharge Valve Closed
9 Normal Power Available (from power relay)
10 Panel Internal Temperature High alarm
11 UPS fault

Digital Outputs (none)
Analog Inputs (none)
Analog Outputs (none)
Internal Digital Registers (none)
Internal Analog Registers (none)

Grit Removal System 2 Local Control Panel Remote I/O

Digital Inputs
1 Grit Collector 3 Influent Gate Opened
2 Grit Collector 3 Influent Gate Closed
3 Grit Collector 4 Influent Gate Opened g
4 Grit Collector 4 Influent Gate Closed
5 Grit Pump 3A Suction Valve Opened
6 Grit Pump 3B Suction Valve Closed
7 Grit Pump 4A Discharge Valve Opened
8 Grit Pump 4B Discharge Valve Closed
9 Normal Power Available (from power relay)
10 Panel Internal Temperature High alarm
11 UPS fault

Digital Outputs (none)

Analog Inputs (none)
Analog Outputs (none)

Internal Digital Registers (none)

Internal Analog Registers (none)

Remote I/O within the new local control panels shall utilize intrinsically safe remote I/O that avoid the need for a NEMA 7 rating of the enclosure.

Grit Washer Ethernet Link I/O: Register/Address signals to/from the Grit Removal System Main Control Panel PLC from each Grit Washer PLC shall include, as a minimum, the following:

- Individual SlurryCup enable/call to run for both units from the main PLC
- Individual SlurryCup ready for both units (permissive to operate associated grit pump) to the main PLC.
- SlurryCup running for both units
- SlurryCup in blowdown for both units (interlocked to stop associated grit pump during blowdown sequence)
- SlurryCup in backwash for both units
- UPS running on battery, % battery life left value, and fault
- VFD running input, speed output, speed input, run command output, and fault
- PLC and network switch faults

D. PANEL CONTROL and POWER INTERFACE: Provide terminals for incoming power, dry contacts rated 10A at 120V for interface with local control devices on the LCS's, and terminals for both poles and shields for analog signals from instruments on control panels as indicated on the I/O list at the end of this section.

2.03 FLOW METERS: Provide the four new flow meters shown on the drawings. Meters and transmitters shall be as specified under the City's specification W-35 – MAGNETIC FLOW METERS.

2.04 OIT DISPLAYS: Information depicted on the Grit Removal System Local Control Panel OIT's shall be easily readable and understood on the limited visual window of the 10" display screen supplied. Integrator shall develop several displays, with easily understood display navigation buttons to go from one display to another, to break up the amount of information shown on any particular screen. As a minimum, displays for equipment operation status, alarms, individual equipment controls, setpoint listing, and grit feed matrix shall be provided subject to approval during the submittal process on proposed screen displays.

2.05 Plant SCADA Interface: City personnel will program plant work station displays to allow remote status monitoring and control of the upgraded grit removal system. All data registers / addresses developed under this project shall be made assessible for remote display and interface to allow operators to monitor and control the system from plant work stations.

PART 3 – EXECUTION

3.01 CONTROL PANEL FABRICATION

A. Enclosures shall provide mounting for power supplies, control equipment, input/output subsystems, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling.

B. Enclosures shall be constructed so that no screws or bolt heads are visible when viewed from the front. Penetrations for instruments and other devices shall be clean and smoothly finished with rounded edges.

C. The temperature inside each enclosure containing digital hardware shall be continuously monitored and shall generate an alarm to the PLC if the temperature rises to an adjustable, preset high temperature. This thermostat shall be independent and separate from the

thermostat used to control the temperature in the enclosure described above. Enclosure interior temperature alarm shall be displayed on the OIT operator interface displays.

D. All wiring shall be bundled with nylon cable ties when exposed (leaving in conduits, at bends, etc.) but otherwise shall be routed and enclosed in vented plastic wireway as required. Wireways shall be oversized by a minimum of 10%; overfilled wireways shall not be acceptable. DC power, analog signal and discrete signals shall be run in separate wireways from AC signal and power wiring.

E. Spare field wiring shall be bundled, tied, and labeled as specified above, and shall be neatly coiled in the bottom of the cabinet.

F. All installed spare I/O hardware shall be wired along with live I/O wiring to the field wiring terminal blocks within the cabinet. Where space for spare I/O modules has been provided with the PLC backplane or DIN-rail mounting system, corresponding space for wiring, surge protection, and terminations shall be furnished within the cabinet.

G. A copper ground bus shall be installed in each cabinet, and shall be connected to the building power ground.

H. Interior panel wiring shall be tagged at all terminations with machine-printed self-laminating labels. Labeling system shall be Brady TLS 2200 Printer with TLS 2200®/TLS PC Link™ labels, or equivalent system by Seton or Panduit. The wire numbering system and identification tags shall be as specified in Section 16123, Building Wire and Cable. Field wiring terminating in panels shall be labeled in accordance with the requirements Division 16. Where applicable, the wire number shall contain the ID number listed in the input/output schedules.

I. Main breaker and branch breaker sizes shall be coordinated such that an overload in a branch circuit will trip only the branch breaker but not the main breaker.

J. Enclosures with any dimension larger than 36 inches shall be provided with 120-volt duplex receptacles for service equipment and LED service lights. Power to these devices shall be independent from the PLC power supply and its associated uninterruptible power system.

K. Where applicable, enclosures shall be furnished with red laminated plastic warning signs in each section. The sign shall be inscribed to read, "WARNING - This Device Is Connected to Multiple Sources of Power." Letters in the word "WARNING" shall be 0.75 inch high, white.

L. The interconnection between equipment and panel shall be by means of flexible cables provided to permit withdrawal of the equipment from the cabinet without disconnecting the plugs.

3.02 PAINTING/FINISHING

A. All steel enclosures shall be free from dirt, grease, and burrs and shall be treated with a phosphatizing metal conditioner before painting. All surfaces shall be filled, sanded, and finish coated by spraying a 1-2 mil epoxy prime coat and smooth, level, high grade textured finish between flat and semi-gloss shine. The colors shall be selected by the Owner from a minimum of six color samples provided. Refer to Division 9 for additional requirements.

B. Materials and techniques shall be of types specifically designed to produce a finish of superior quality with respect to adherence, as well as impact and corrosion resistance.

C. Panels fabricated from stainless steel shall not be painted.

3.03 SCHEDULE OF PAYMENT

A. Progress payments shall be in accordance with the approved Payment Schedule. The INSTRUMENTATION SUBCONTRACTOR will be allowed to request partial payments for submittals, initial download of programming, and final completion.

B. The payment schedule and project milestones shall be defined in the General Provisions.

3.04 TESTING REQUIREMENTS

A. The Contractor shall provide the services of experienced factory trained technicians, tools and equipment to field calibrate, test, inspect, and adjust all equipment in accordance with manufacturer's specifications and instructions.

B. The proper control of all final control elements shall be verified by tests conducted in accordance with the requirements specified herein.

C. All modulating final control elements shall be tested for appropriate speed or position response by applying power and input demand signals, and observing the equipment for proper direction and level of reaction. Each final control element shall be tested at 0, 25, 50, 75, and 100 percent of signal input level and the results checked against specified accuracy tolerances. Final control elements which require turndown limits such as VFD's shall be initially set during this test.

D. Prior to control system startup and testing, each monitoring and control loop shall be tested on an individual basis from the primary element to the final element, including the operator work station or loop controller level, for continuity and for proper operation and calibration.

E. Signals from transducers, sensors, and transmitters shall be utilized to verify control responses. Simulated input data signals may be used subject to prior written approval by the Engineer. All modes of control shall be exercised and checked for proper operation.

F. Control system startup and testing shall be performed to demonstrate complete compliance with all specified functional and operational requirements. Testing activities shall include the simulation of both normal and abnormal operating conditions.

G. Each loop and control strategy test shall be witnessed and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.

H. Upon completion of the startup tests and prior to final system acceptance, the new controls shall be tested under normal operating conditions, initiated either automatically or manually, over a 30 day test period to demonstrate continuous reliable operation as intended.

I. If the system fails the 30 day availability test, unless the failure is related to programming, the 30 day test period shall be restarted after the failed component is repaired / replaced and full operation is restored.

3.05 FINAL ACCEPTANCE

A. Final acceptance of the instrumentation programming will be determined complete by the Engineer, and shall be based successful completion of startup testing and training of the operations staff to the Owner’s satisfaction.

- END OF SECTION –

SECTION 17000 – INSTRUMENTATION REQUIREMENTS – BUILDING 1

PART 1 -- GENERAL

1.01 SCOPE

A. Provide, install, and place in operation the new Grit Removal System control panels and associated instruments as listed herein and noted on the Drawings. The work under this section shall be provided through a qualified system integrator herein referred to as the INSTRUMENTATION SUBCONTRACOR. In addition to the specifications herein, comply with all requirements of the City's technical specification W-46 – CONTROLS and W-35 – MAGNETIC FLOW METERS. If there is a conflict, assume the more stringent requirement until directed otherwise and bring such conflicts to the City's project manager's attention for clarification

B. The scope of work to be performed under this Section includes:

1. The CONTRACTOR shall retain overall responsibility for the control system as specified herein and as supplied by equipment provided under other Divisions of the specifications.

2. The CONTRACTOR shall be responsible to install all new instruments and control panels as specified herein and as indicated on the Drawings.

3. The CONTRACTOR shall furnish and install new instrument supports and mounting hardware as shown on the Drawings.

4. The ELECTRICAL SUBCONTRACTOR shall provide final termination and testing of all instrumentation and control system signal wiring and power supply wiring at all equipment furnished or modified under this project.

5. The INSTRUMENTATION SUBCONTRACTOR shall furnish and install transient voltage surge suppression systems for all new analog instruments and control panels furnished under this section.

6. The INSTRUMENTATION SUBCONTRACTOR shall provide testing, calibration, training and startup services as specified herein.

7. The INSTRUMENTATION SUBCONTRACTOR shall provide the programming as described herein to fully incorporate the instruments and equipment supplied under this project, as well as for the interface with and control of existing equipment as noted herein. Programming shall include operator interface software within, and communications software between, panels furnished under this section as well as panels furnished with equipment supplied under Division 11.

8. The INSTRUMENTATION SUBCONTRACTOR shall fabricate new PLC panels and furnish new instruments and control stations as specified herein.

1.02 ANALOG SIGNAL TRANSMISSION

A. Signal transmission between electric or electronic instruments, controllers, and all equipment and control devices shall be linear 4-20 milliamperes and shall operate at 24 volts D.C. Signal isolation and/or conversion shall be provided where necessary to interface with instrumentation, equipment controls, panels and appurtenances.

B. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating.

C. All cable shields shall be grounded at one end only, at the control panel, with terminals bonded to the panel ground bus.

1.03 DISCRETE INPUTS

A. All discrete inputs from field devices shall be dry contacts in the field device or equipment, powered from the signal source with isolation to the PLC inputs.

B. Sensing power (wetting voltage) shall match existing conventions, in general 120V AC.

1.04 DISCRETE OUTPUTS

A. All discrete outputs to field devices shall be through isolation relays within the new control panels with contacts on the relays rated for the service intended.

1.05 INSTRUMENT AND HARDWARE SUBMITTALS

A. Submit information for all new hardware including, but not limited to, the following:

1. Product (item) name and tag number.
2. Catalog cuts.
3. Manufacturer's complete model number.
4. Location of the device.
5. Input - output characteristics.
6. Range, size, and graduations.
7. Physical size with dimensions, NEMA enclosure classification and mounting details.
8. Materials of construction of all enclosures, wetted parts and major components.
9. Instrument or control device sizing calculations where applicable.
10. Certified calibration data on all flow metering devices.
11. Environmental requirements during storage and operation.
12. Associated surge protection devices.
13. Mounting requirements.
14. Environmental requirements during storage and operation.
15. Complete panel fabrication shop drawings including panel layouts and wiring diagrams.
16. Complete network diagram showing all network communications to PLCs, VFDs, UPSs, OIUs, OITs, remote I/O, network switches, and CAT6 and RS485 cables, protocols used, components used, and conduit sizes between panels. Coordinate with the grit washer manufacturer to include components supplied within the vendor panels in the submitted network diagram for a complete network description.

1.06 SOFTWARE SUBMITTALS

A. Software submittals shall include the following as a minimum:

1. PLC input/output schedules for interface with values being sent to and received from the existing and new field I/O and internal data registers. List complete addresses and tagnames for each data register.

2. Panel operator interface software (OIS) – use by the Operator Interface Unit (OIT) – and database including OIS tagname, corresponding PLC register cross reference, scales, functions, etc.

3. Written control strategy documentation to describe the proposed control logic interface with the I/O.

4. Upon approval of PLC input/output schedules, new OIS database point list, and written control strategy documentation, submit a complete hard copy of fully commented PLC ladder logic programming and a complete hard copy of proposed OIS display screen modifications.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Provide equipment operation and maintenance manuals for new instruments. The manuals shall contain all illustrations, detailed drawings, wiring diagrams, and instructions necessary for installing, operating, and maintaining the equipment. The illustrated parts shall be numbered for identification. All modifications to manufacturer standard equipment and/or components shall be clearly identified and shown on the drawings and schematics. All information contained therein shall apply specifically to the equipment furnished and shall only include instructions that are applicable. All such illustrations shall be incorporated within the printing of the page to form a durable and permanent reference book.

B. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The maintenance instructions shall include trouble shooting data and full preventive maintenance schedules. The instructions shall be bound in locking 3-D-ring binders with bindings no larger than 3.5 inches and CD's with PDF files shall be provided. The manuals shall include 15% spare space for the addition of future material. The instructions shall include Drawings reduced or folded and shall provide at least the following as a minimum.

1.08 FINAL SYSTEM DOCUMENTATION

A. Provide two copies on CD-ROM for all software for the PLC and OIS systems (actual program files and pdf copies). PLC files shall include all comments. Provide complete control panel as-installed panel fabrication and wiring diagrams for new panels in dwg and pdf format on CD-ROM.

1.09 SHIPPING HANDLING AND STORAGE

A. In addition to shipping, handling and storage requirements specified elsewhere in the Contract Documents, air conditioning/heating shall be provided for storage of all new field instrumentation and ancillary devices to maintain temperatures between 20 and 25 degrees C and relative humidity 40 to 60 percent without condensation. The air shall be filtered and free of corrosive contaminants and moisture.

1.10 INSTALLATION

A. All instrumentation and control system installation work shall conform to all applicable codes and standards and be in accordance with manufacturer's recommendations.

B. All labor shall be performed by qualified craftsmen in accordance with the standards of workmanship in their profession and shall have had a minimum of five years of documented experience on similar projects.

C. All equipment and materials shall fit properly in their installations. Any required work to correct improperly fit installations shall be performed at no additional expense to the Owner.

D. The Contractor shall provide all required cutting, drilling, inserts, supports, bolts, and anchors, and shall securely attach all equipment and materials to their supports. All supports and hardware shall be Type 316 stainless steel.

1.11 OPERATOR TRAINING

A. Provide a minimum of two sessions, each approximately 4 hours in duration, to train operations staff on the new controls and instruments.

1.12 CONTROL SYSTEM SUPPLIER

A. The INSTRUMENTATION SUBCONTRACTOR's scope of work for field work shall be performed by a qualified instrumentation subcontractor experienced with municipal domestic wastewater treatment plant control system work, particularly for work within classified areas for Class 1, Division 1, hazardous rated.

B. The CONTRACTOR shall employ a qualified system integrator to implement the scope of work specified herein. Qualified system integrators are Curry Controls (Lakeland, FL), Automated Integration (Brandon, FL), CC Control Corp (West Palm Beach, FL), C2I (Smyrna, GA), and CEC Controls (Bradenton, FL). Programming shall follow standard City practices for OIS and PLC development and shall provide full interface with the new and existing equipment as specified herein.

PART 2 -- PRODUCTS

2.01 CONTROL PANELS

A. Furnish, test, install and place in satisfactory operation the control panels and other enclosures, with all spare parts, accessories, and appurtenances as specified herein and as shown on the Drawings.

Control Panel and Control Station Schedule

Description	Location	PLC	OIT	Qty
Grit Removal System Main Control Panel	Non-Haz	Yes	No	1
Grit Removal System Local Panel (OIT)	Haz	No	Yes	2
Grit Removal System Local Panel (controls)	Haz	No	No	2
Grit Removal System Local Panel (remote I/O)	Hax	I/O	No	2
Grit Feed Valve Control Station	Haz	No	No	1
Grit Escalator Motor Control Station	Haz	No	No	2
Grit Slurry Cup 1 Valve Control Station	Haz	No	No	2
Grit Slurry Cup 2 Valve Control Station	Haz	No	No	2
Slurry Cup Feed Isolation Valve Control Station	Haz	No	No	2

Hazardous (Haz) area control panels and stations shall be rated for Class 1, Division 1, Group D, NEMA 7 for non-intrinsically safe internal components, NEMA 4X for intrinsically safe internal components.

B. Control panels and enclosures shall be assembled, wired, and tested in the INSTRUMENTATION SUBCONTRACTOR's own facilities. All components and all necessary accessories such as power supplies, conditioning equipment, mounting hardware, signal input and output terminal blocks, and plug strips that may be required to complete the system shall be provided.

C. Control panels themselves, and all interior and exterior equipment, shall be identified with nameplates. The equipment shall be mounted such that service can occur without removal of other equipment. Face mounted equipment shall maintain the panel's NEMA rating. All equipment shall be accessible such that adjustments can be made while the equipment is in service and operating. All enclosures shall fit within the allocated space as shown on the Drawings.

D. Hazardous Area Panel Construction, Non-Intrinsically Safe Use: Panels shall be floor, wall, or rack-mounted panels, as scheduled, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosures shall be Explosion Proof, rated for Class 1, Division 1, Group D all cast aluminum enclosures, with stainless steel hinges, pins, latches, and fasteners. The enclosures shall have a hinged outer door with suitable bolted connections and continuous gaskets to be rated explosion proof. The enclosures shall have an aluminum removable subpanel for mounting of internal components.

E. Hazardous Area Panel Construction, Intrinsically Safe Use: Panels shall be floor, wall, or rack-mounted panels, as scheduled, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosures shall be rated NEMA 4X all Type 316 stainless steel enclosures, minimum 14 gauge, including stainless steel hinges, pins, latches, and fasteners. The enclosures shall have a hinged outer door with suitable bolted connections and continuous gaskets to be water and gas tight and keep ambient corrosive gasses from entering the panel when closed. The enclosures shall have a 12-ga steel, formed, removable subpanel. The subpanel shall be degreased, cleaned, treated with a phosphatizing process, then primed and painted with white industrial grade baked enamel.

F. Non-hazardous Area Panel Construction: The panels shall be floor, wall, or rack-mounted panels, as scheduled, constructed in accordance with UL 508 requirements for enclosed industrial control panels and shall bear the serialized UL label. Enclosures shall be NEMA 12 painted steel enclosures, minimum 14 gauge, suitable for indoor, non-air-conditioned, non-corrosive spaces. Enclosures shall have a hinged outer door with suitable latching mechanisms and include continuous gaskets to hinder ambient humidity from entering the panel when closed. The enclosures shall have a 12-ga steel, formed, removable subpanel. The panel enclosure and subpanel shall be degreased, cleaned, treated with a phosphatizing process, then primed and painted with industrial grade baked enamel, grey for panel enclosure inside and out and white for the subpanel.

G. Panel Manufacturer: Panel enclosures shall be pre-fabricated enclosures as provided by Quality Metals, Hoffman Engineering, or approved equal.

H. Panel Support Rack: The Contractor shall fabricate and install a suitable aluminum mounting rack for rack-mounted control panels, supports constructed of aluminum alloy 6061-T6 with clear anodized finish using standard structural shapes. Support shall be adequate to provide a rigid support for the supplied panel.

I. Panel Wall and Floor Mounting Supports: The Contractor shall install wall mounted panels using Type 316 stainless steel hardware and suitable spacers to maintain a 1/4" minimum air gap between the back of the panel and the wall. Fasteners shall be suitable for the type of wall used. Floor mounted panels shall be mounted on 4” high concrete house-keeping pads mounted on neoprene rubber gaskets around the panel perimeter, anchored using Type 316 stainless steel concrete anchors.

J. Control Panel Components: Panels shall consist of the following components:

1. Manual main breaker to disconnect all power to the panel other than foreign voltages used to pick up relay contacts. The circuit breakers shall be as manufactured by Phoenix Contact or Allen Bradley for 120V input power.

2. Control Branch Circuit Breakers: Provide branch circuit breakers for a panel receptacle and light, panel fans, UPS power, 120V control power, and for each individual PLC input/output card. The circuit breakers shall be quick-make, quick-brake and trip free. The circuit breakers shall as manufactured by Square D, General Electric, Allen Bradley, or Phoenix Contact for 120V input power.

3. Programmable Controller (PLC): Each panel shall include a PLC for all control logic. The PLC shall be GE Intelligent Platforms RX3i (City’s standard product). CPU, Power Supply, Network Interface, and all I/O modules within the new Main Grit System Control Panel are to match City’s standard modules for input voltage, number of channels, and spare capacity. PLC hardware and software shall be provided to allow operators to make changes to setpoints and control settings within the PLC over an Ethernet link to the plant SCADA system. Software ladder programming shall be set up to allow modifications to the programming either through direct laptop connection at the PLC, through the OIT, or over the Ethernet link from remote work station(s). City’s standard PLC components include:

   - Rx3i Analog Output – GE IC694ALG392 AO, 4-20mA, 8 channel
   - Rx3i Analog Input – GE IC694ALG221 AI, 4-20mA, 4 channel – or –
   - Rx3i Analog Input – GE IC695ALG616 AI, 4-20mA option, 16 SE - AWTP Warehouse item
   - Rx3i Digital Output – GE IC694MDL940 DO 0-125VDC/0-256VAC, 16 point
   - Rx3i Digital Input – GE IC694MDL240, DI 120V
   - Rx3i Network – GE IC695ETM001 Ethernet Module, 10 Base T
   - Rx3i Power Supply – GE IC695PSA140 PS, 40W, 120V
   - Rx3i Base – GE695CH012 Rack, 12-slot, high speed base – or –
   - Rx3i Base – GE695CH016 Rack, 16-slot (12 slot is preferred)
   - Rx3i CPU – GE695CPE305 CPU, 5 MB User Memory, Ethernet port

4. Intrinsically Safe Remote I/O: Remote input/output modules within the two new Grit System Intrinsically Safe Local Control Panels shall utilize remote I/O components suitable for use in a Class I, Division I environment without requiring an explosion proof enclosure. Components shall be intrinsically safe, be hot swappable, suitable for use in ambient conditions of the grit process area, and fully capable of complete interface and communications with the main PLC supplied. Remote I/O shall be Stahl IS1+ Remote I/O or approved equal.

5. Operator Interface Unit (OIT): Provide an OIT for each Grit Removal System local control panel. The OIT units shall be an explosion proof Class 1, Division 1 certified panel mounted industrial grade computer with the following features:

a. Intel ATOM processor, 1.66 GHz

b. 10-inch projective capacitance touch screen high resolution full color display

c. Fanless, Class 1, Division 1, aluminum enclosure with highly efficient heat dissipation capabilities

d. 667 HHz FSB

e. 1 MB L2 cache

f. 2 GB DDR2 RAM

g. 80 GB SSD Hard Drive

h. -20^{o}C to 50^{o}C operating temperature in 5 to 95% humidity

i. Windows 10 operating system

j. 120V power supply

k. Fully licensed copy of windows-based software utilized

OIT's shall be General Atomics HMI3000Ex Panel Mount PCs, 858-964-6830, contact Ron Mucim, latest edition at time of bid, or approved equal.

6. Uninterrupted Power Supply (UPS): The PLC and OITs within panels, as well as all other circuits within a panel other than receptacles, lights, and ventilation equipment, shall operate on 120V power from a UPS securely mounted inside the panel (loose installation at bottom of panel not acceptable). The UPS shall be APC Schneider Electric, or approved equal, with Ethernet/IP communications directly with the panel PLC for full status monitoring of UPS (battery life, running on battery, faults, etc.). UPS shall be sized, and panel shall be wired, to power all components within the panel other than the panel light, receptacle, and ventilation fans. Panel ventilation shall be sized to dissipate the heat generated by the UPS when running on battery, full load. Provide a manual bypass switch around the UPS to allow control power to be directly connected to the UPS load side to facilitate UPS maintenance.

7. Ethernet Interface to Grit Washer Panels: The Grit Removal System Main Control Panel PLC shall communicate with the two Grit Washer Control Panel PLCs (located in the same building) over a copper local Ethernet PoE link connected through a PLC communications module and the local area network switch. The conduit between panels shall be furnished and supplied under Division 16. The Ethernet cable between the panels shall be furnished under this Section and shall be Allen Bradley 1585-C8CB-S600 with LAPP Group PN 2170060 Connectors to protect against interference from 480V power within the Grit Washer panels.

8. Interface to Grit Removal System Local Panel OIT and I/O: Communication between the Grit Removal System Local intrinsically safe Remote I/O and Operator Interface Terminal (OIT) shall be by Ethernet via high quality, shielded CAT6 cable. Communication between the OIT and Grit Removal System Main Control Panel shall be by RS485 physical layer and Modbus RTU application layer via shielded 1-1/2 pair RS485 cable, Belden 3106A or equal. The conduit between panels shall be furnished and installed under Division 16. A separate RS485 cable and conduit shall be provided and installed between each Local OIT and the Main Control Panel. All cables shall be supplied by the INSTRUMENTATION SUBCONTRACTOR, installed under Division 16.

9. Local Area Network Switch and SCADA Interface Network Switch: Ethernet interface components within the Grit Removal Main Control Panel shall be through a local area

network switch, Stratix 5700 or equal. The minimum 10-port local area network switch shall provide communications with City-assigned IP addresses for the Grit Washer Control Panel PLC interfaces and the Grit Removal System Main Control Panel PLC and UPS. Cable between the network switch and the PLC and UPS within the panel shall be through industrial grade CAT6 cable and ST connectors. Communications between the Grit Removal System Main Control Panel PLC and the existing SCADA RTU shall be by RS485 physical layer and Modbus RTU application layer via shielded 1-1/2 pair RS485 cable, Belden 3106A or equal. Provide a new 4-port serial communication module #GEIC695CMM004 to replace the existing 2-port #GEIC695CMM002 module in the existing SCADA RTU PLC. The proposed RS485 cable from the Main Grit Control Panel shall be connected to this module. Modifications to the existing RTU PLC will be made by City Personnel. City Personnel will assist the Integrator with the required Modbus Register Mapping for the existing SCADA RTU. The conduit between panels shall be furnished and installed under Division 16. All cables shall be supplied by the INSTRUMENTATION SUBCONTRACTOR, installed under Division 16.

10. Panel Heat Dissipation: Explosion proof panels housing PLC components (CPU or remote I/O) shall be fitted with heat dissipation fins or other suitable means of dissipating heat buildup within the panels that maintain the explosion proof protection.

11. Louvers and Fans: Non-hazardous area panels housing PLC components shall be equipped with internal fans and louvers to dissipate heat generated by equipment mounted inside the panel. Provide louvered openings near the bottom and top of the panel on opposite sides to promote complete ventilation of the panel. All air-flow openings shall be fitted with dust filters. Provide thermostatically controlled, low-noise cooling fans to circulate outside air into the enclosure through the top louvered opening, exhausting through the bottom louvered opening. Air velocities through the enclosure shall be minimized to assure quiet operation.

12. Power/Signal Surge Devices: Provide a surge arrestor installed on the line side of the main breaker in accordance with manufacturer's instructions. Provide surge suppression devices on all signal and power leads on all circuits that have any part of the control or power circuit that extends past the limits of the building housing the control panel. Surge devices shall be as manufactured by Phoenix Contact:
    a. for 110VAC Signal use Phoenix Contact 2794987
    b. for 120VAC Power use Phoenix Contact 2856812
    c. for 4-20mA signals use Phoenix Contact 2838186

13. Field selector switches, including Local/Off/Remote (LOR), Local/Remote (LR), Potentiometers (Pot), or Open/Close/Remote (OCR) as noted on the Drawings, for manual control at the associated equipment, shall be mounted in the aluminum enclosures provided as local control stations (LCS). Switches shall be SPDT, two- or three-position selector switches, Allen Bradley Type 800H rated for XP hazardous areas, or equivalent by Square D or General Electric. Potentiometers shall be Allen Bradley Type 800T, or equivalent by Square D or General Electric, rated for XP hazardous areas. Local control stations shall be:

Local Control Station Devices

Description	LOR	OCR	LR	Pot	E-stop
Grit Escalator Motor Control Stations	1				1

Slurry Cup A Valve Control Stations		2			
Slurry Cup B Valve Control Stations		3			
Slurry Cup Feed Iso Valve Ctrl Station		5			
Grit Feed Valve Control Station			4	4	

14. Field emergency stop, start/stop, or open/close pushbuttons mounted on LCS's or control panels shall be mushroom head, red pushbuttons for emergency stop and black pushbuttons for start/stop and open/close service. Emergency stop pushbuttons shall be normally closed contacts that disconnect control power and stop the associated motor, push-to-stop, pull-to-reset. Start/Stop and Open/Close pushbuttons shall be momentary contact normally open for start and open, normally closed for stop and close. Contacts shall be normally closed enable contacts. Pushbuttons shall be Allen Bradley Type 800H, or equivalent by Square D or General Electric, rated for XP hazardous areas or NEMA 12 for non-hazardous areas.

15. Panel indicator lights as noted herein shall be mounted on the panel front door. Indicator lights shall be NEMA 12, SPDT, red for running indication, amber for fault lights, white for power and shall be Allen Bradley Type 800H, or equivalent by Square D or General Electric. Indicating lights shall be LED type and wired for individual lamp push-to-test operation.

16. As-built Drawings: A laminated "As Built" copy of the panel wiring diagrams shall be provided and placed in the panel print pocket for all panels. All panel drawings shall be developed using AutoCad®. The drawings shall have a complete Bill of Materials, panel exterior and interior layouts, and show all electrical wiring. As-built drawings shall be submitted with the O&M materials on a CD in both AutoCad® (.dwg) and Adobe Acrobat® (.pdf).

17. Terminals: Terminal blocks shall be as follows:

    a. Terminal blocks shall be assembled on non-current carrying aluminum DIN mounting rails securely bolted to the cabinet subpanel. Terminals shall be of the screw down pressure plate type as manufactured by Allen Bradley or Phoenix Contact.

    b. Power terminal blocks for both 120 VAC and 24 VDC power shall be single tier with a minimum rating of 600 volts, 30 amps.

    c. Discrete signal terminal blocks shall be 2-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal.

    d. Analog signal terminal blocks shall be 3-tier with a minimum rating of 600 volts, 20 amps. One terminal block shall be used for each signal. The positive wire shall be installed on the top or left-most terminal and the shield/drain wire shall be installed on the bottom or right-most terminal.

    e. Only one wire shall be terminated under a single wire clamp or screw.

    f. Terminal blocks for field wire connections shall be added as needed in 10-pole increments. Terminal blocks shall be mounted with a minimum of 2" from both enclosure sides and from the bottom of the enclosure for easy access to terminal screws.

    g. Terminals shall be marked with a permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field incoming

conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

h. Separate terminal strips shall be provided for each type of power and signal used within each cabinet. Where applicable, terminal strips for different voltages of discrete signal wiring shall also be separated. Terminal strips shall be labeled as to voltage and function.

18. Wiring: All wiring shall be color-coded using tinned copper MTW #14 AWG minimum for power and control wiring and #16 twisted pair for analog signal wiring. Wiring and cables shall be numbered at each end. Wire numbers shall be printed on non-removable heat-shrink tags. Wires shall be color coded as follows:

Equipment Ground - GREEN

120 VAC Power - BLACK
120 VAC Power Neutral - WHITE

120 VAC Control (Internally Powered) - RED
120 VAC Control (Externally Powered) - YELLOW

24 VAC Control - ORANGE

DC Power (+) - BLUE
DC Power (-) - GRAY

Analog Signal – BLACK/WHITE

19. Component Labels: All interior panel components shall be individually labeled on the back plate with a custom engraved plastic tag with adhesive back (see Section 17000 for nameplates). The tags shall be white with black letters and match the nomenclature indicated on the as-built wiring diagrams.

20. Mounting Hardware: All mounting hardware such as screws or bolts used in the manufacturing of control panels shall be Type 316 stainless steel. All holes in the back plate shall be drilled and tapped. No self-tapping screws, adhesive tapes, or Velcro will be accepted for the mounting of any hardware.

21. Isolation and interposing relays shall be provided on all discrete inputs and outputs to and from the PLC and shall be DIN rail mounting type, DPDT, minimum 10 amp, 120 VAC contact rating. Relay coils shall be 120 VAC or 24 VDC as required. Relays shall have a flag indicator to show relay status, a pushbutton to allow manual operation of the relay, and an internal pilot light to indicate power to the coil. Relays shall be as manufactured by Phoenix Contact or Allen Bradley.

22. Corrosion Protection: Panel interior components shall be treated with a corrosion inhibiting spray on all exposed metallic surfaces, particularly terminations, contacts, and wire ends. After installation, furnish corrosion inhibiting capsules that emit molecular level coating on metallic surfaces throughout the panel that provide specific corrosion barrier toward hydrogen sulfide and/or subsequent formation of sulfuric acid when combined with ambient moisture.

23. Panel Seal-Offs: For all panels and enclosures, furnish and install panel seal-offs on all conduits leading to equipment installed in hazardous process areas to prohibit exposure to corrosive gasses. Panel seal-offs shall be mounted near the equipment and shall be provided with terminations on either side of the epoxy-based seal-off

material to allow for replacement of cable without breaking the seal. All conduits entering a panel or enclosure shall be sealed at the conduit entry point with a removable, expandable conduit seal material to further prohibit outside air or process gasses from entering the panel. Panel seal-off components, materials, enclosures, and terminals shall be furnished with the panels and enclosures under this Section, installed under Division 16.

2.02 PROGRAMMING

A. CONTROL OPERATION: The Grit Removal System control panels shall replace the existing hard-wired explosion proof control enclosures located between the two sets of grit removal units as noted on the Drawings. The new panels shall restore the essentially manual functionality of the existing grit removal and grit pumping systems as well as incorporate the replacement grit washer / dewatering equipment supplied under this project. Manual controls shall be through a new PLC that coordinates the operation of what equipment is to run as designated by operators. Operator interface Terminal (OIT) shall be through local, explosion-proof panel mounted industrial PCs in place of the existing control enclosures. Provide control and interface as follows:

1. Grit Collector Influent Gate Operation: Operators shall select which grit collector influent gate (gates 5 through 8) are to operate by pressing a normally open, momentary contact, OPEN pushbutton at the associated Grit Removal System Local Panel. Operators shall be able to close each grit collector influent gate by pressing a normally closed, momentary contact, CLOSE pushbutton adjacent to the associated OPEN pushbutton that breaks the latched open signal. Grit Removal System Local Panel 1 shall have pushbuttons for grit collector influent gates 5 and 6. Grit Removal System Local Panel 2 shall have pushbuttons for grit collector influent gates 7 and 8. The open/close signals shall be sent to the existing grit removal influent gate actuators re-using the three existing control wires used by the existing OPEN/CLOSE controls on the replaced explosion proof enclosures and the latched circuitry at the gate operator. Integrator shall verify that, and if necessary modify, the existing actuator operation travels to and holds the gate position selected by the operators through the new pushbuttons at the Grit Removal System Local Panel.

2. Grit Influent Gate Status: Open and Close status contacts at the existing gate actuators shall be wired to the associated Grit Removal Local Panel as remote I/O inputs to the PLC. Each grit collector influent gate status (OPEN – Red, CLOSE – Green) shall be indicated on a Grit Removal System graphic display on each new OIT.

3. Grit Collector Operation: Operators shall select which grit collector units (units 5 through 8) are to operate by pressing a normally open, momentary contact, START pushbutton at the associated Grit Removal System Local Panel. Operators shall be able to take a grit collector unit out-of-service by pressing a normally closed, momentary contact, STOP pushbutton adjacent to the associated START pushbutton that breaks the latched start signal. Grit Removal System Local Panel 1 shall have pushbuttons for grit collector units 5 and 6. Grit Removal System Local Panel 2 shall have pushbuttons for grit collector units 7 and 8. The start/stop signals shall be sent to the existing MCC grit removal unit starters re-using the three existing control wires used by the existing START/STOP controls on the replaced explosion proof enclosures and the latched circuitry at the MCC starter. Integrator shall verify that, and if necessary modify, the existing MCC starter control circuits holds the run signal once operators start a drive through the new pushbuttons at the Grit Removal System Local Panel (restarts the drive after a power outage).

4. Grit Collector Status: Running status and alarm contacts at the existing MCC starters for each grit collector shall be wired to the Grit Removal Main Control Panel as inputs to the PLC. Each grit collector status (ON – Red, OFF – Green, ALARM –

Yellow) shall be indicated on a Grit Removal System graphic display on each new OIT.

5. Grit Pump Operation: Operators shall select which grit pumps (units 5A/B through 8A/B) are to operate by pressing a normally open, momentary contact, START pushbutton at the associated Grit Removal System Local Panel. Operators shall be able to take a grit pump out-of-service by pressing a normally closed, momentary contact, STOP pushbutton adjacent to the associated START pushbutton that breaks the latched start signal. Grit Removal System Local Panel 1 shall have pushbuttons for grit pumps 5A, 5B, 6A, and 6B. Grit Removal System Local Panel 2 shall have pushbuttons for grit pumps 7A, 7B, 8A, and 8B. The start/stop signals shall be sent to the existing MCC grit pump starters re-using the three existing control wires used by the existing START/STOP controls on the replaced explosion proof enclosures and the latched circuitry at the MCC starter. Integrator shall verify that, and if necessary modify, the existing MCC starter control circuits holds the run signal once operators start a pump through the new pushbuttons at the Grit Removal System Local Panel (restarts the pump after a power outage). When a blowdown / SlurryCup disabled signal from one of the Grit Washer Control Panel PLCs is received, the associated Grit Pump feeding that SlurryCup shall be stopped.

6. Grit Pump Status: Running status and alarm contacts at the existing MCC starters for each grit pump shall be wired to the Grit Removal Main Control Panel as inputs to the PLC. Each grit pump status (ON – Red, OFF – Green, ALARM – Yellow) shall be indicated on a Grit Removal System graphic display on each new OIT.

7. Grit Washer/Dewatering Unit Operation: Operators can manually start each grit washer/dewatering unit by placing a Local/Off/Remote (LOR) switch in local. When in REMOTE, the grit washer/dewatering unit shall run as described under 11412 when enabled by the Grit Removal Main Control Panel PLC when placed in ENABLED through an ENABLED/DISABLED software switch on each new OIT.

8. Grit Washer/Dewatering Unit Status: Running status, speed, and alarm status shall be transmitted over the Ethernet link from each grit washer/dewatering unit PLC. Each grit washer/dewatering unit status (ON – Red, OFF – Green, ALARM – Yellow, and speed) shall be indicated on a Grit Removal System graphic display on each new OIT.

9. Grit Washer/Dewatering Unit Feed Valve Operation: Depending on which Grit Pumps are placed in service and which Grit Slurry Cups each pump is assigned to pump to (depends on the selected position of the Grit Washer/Dewatering Unit isolation valves), the PLC shall modulate the position of each Grit Washer / Dewatering Unit Feed Valve. The Grit Slurry Cups each have an optimal flow range of 280 to 400 gpm. The Grit Pumps each typically can deliver over 300 gpm so limits on the feed line are needed to keep both the grit pumps and the Slurry Cups within optimal ranges. The following control conditions shall govern:

    a. Normally, one grit pump will pump to one Slurry Cup. If only one pump is run through a feed line, the PLC shall modulate the position of the pinch valve to maintain a NORMAL flow setpoint set at the OIT (typically set at around 335 gpm).

    b. At times operators may elect to run two grit pumps through the same feed line (typically to drain a grit collector tank more quickly) to one Slurry Cup. Under this condition, the PLC shall modulate the position of the pinch valve to go to full open (2 grit pumps in the same feed line should not exceed 400 gpm) but shall begin to modulate the pinch valve to keep the flow below 400 gpm if needed.

c. In case a Grit Washer or one of the Slurry Cups is out of service for maintenance, operators may elect to run up to two feed lines to one Slurry Cup. Under these conditions, the PLC shall modulate the position of the pinch valve for each feed line to be equal to one-half the value of a HIGH flow setpoint set at the OIT (typically set close to 400 gpm to maximize withdrawal from each grit collector but still stay under the upper limit of the Slurry Cup.

10. Grit Washer/Dewatering Unit Isolation Valve Operation: Operators will determine which Grit Collectors (GC) pump to which Slurry Cups (SC) based on the position of the 10 isolation valves feeding the Slurry Cups. A matrix display on the OIT shall allow the following selections:

Grit Feed Matrix

	Slurry Cups			
	3A	**3B**	**4A**	**4B**
Grit Collector 5	☐	☐	☐	☐
Grit Collector 6	☐	☐	☐	☐
Grit Collector 7	☐	☐	☐	☐
Grit Collector 8	☐	☐	☐	☐

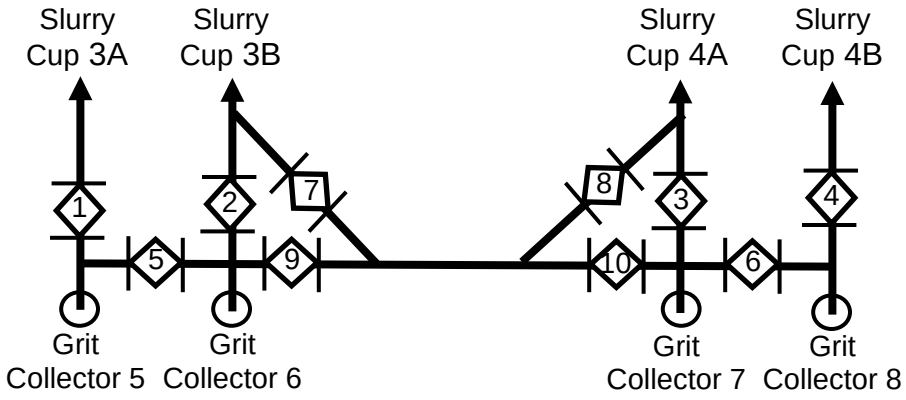
Operators shall be allowed to select one Slurry Cup per Collector by clicking on the appropriate square. The selected square shall then turn RED. If a selection is changed, the previous selection shall be removed (no color). No more than 2 Grit Collectors shall be allowed to be assigned to the same Slurry Cup. If an attempt is made to do otherwise, a warning shall pop up on the display “Slurry Cup X already has two grit collectors assigned – please select another available Slurry Cup”.

Once a selection has been made, the PLC shall open the appropriate isolation valves to direct grit from each grit collector (grit pump feed line) to the selected Slurry Cup. Although more combinations are possible, the following are typical selections:

Selection	Selection	Example
1	All Units in Service	GC5 to SC3A GC6 to SC3B GC7 to SC4A GC8 to SC4B Enable both escalators
2	One GC, all SC’s available	GC6 to SC3B, enable escalator 3
3	Two GC’s, all SC’s available	GC5 to SC3A GC8 to SC3B Enable escalator 3
4	Three GC’s, all SC’s available	GC5 to SC3A GC6 to SC3A GC7 to SC3B enable both escalators
5	One GC, opposite SC’s available	GC5 to SC4A, enable escalator 4
6	Two GC’s, opposite SC’s available	GC5 to SC4A GC7 to SC3B Enable escalator 4
7	Three GC’s, two SC’s available	GC5 to SC4A GC6 to SC4A GC8 to SC4B, enable escalator 4
8	Four GC’s, two SC’s available	GC5 to SC3A GC6 to SC3A GC7 to SC3B GC8 to SC3B Enable escalator 3

Condition	Resulting Isolation Valve Positions (red is open, green is closed)									
	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										

5										
6										
7										
8										



Grit Washer/Dewatering Unit Isolation Valves

B. PHYSICAL CONTROL INTERFACE – Provide devices and interface signals on the front face of the indicated panels as follows:

1. Power On indicating light on Grit Removal System Main Control Panel

2. Start/Stop pushbuttons for Grit Collectors 5 and 6 on Grit Removal System 3 Local Control Panel.

3. Start/Stop pushbuttons for Grit Pump 5A, 5B, 6A, and 6B on Grit Removal System 1 Local Control Panel.

4. Open/Close pushbuttons for Grit Collector Tank 5 and 6 Influent Gate on Grit Removal System 3 Local Control Panel.

5. OIT on Grit Removal System 3 Local Control Panel.

6. Start/Stop pushbuttons for Grit Collectors 7 and 8 on Grit Removal System 4 Local Control Panel.

7. Start/Stop pushbuttons for Grit Pump 7A, 7B, 8A, and 8B on Grit Removal System 4 Local Control Panel.

8. Open/Close pushbuttons for Grit Collector Tank 7 and 8 Influent Gate on Grit Removal System 4 Local Control Panel.

9. OIT on Grit Removal System 4 Local Control Panel.

C. SOFTWARE INPUT/OUTPUTS – Provide the internal and external I/O to/from the indicated control panels as listed on the I/O list below.

Grit Removal System Main Control Panel I/O

Digital Inputs

1 Grit Pump 5A Running
2 Grit Pump 5A Fault
3 Grit Pump 5B Running
4 Grit Pump 5B Fault
5 Grit Pump 6A Running
6 Grit Pump 6A Fault

7 Grit Pump 6B Running
8 Grit Pump 6B Fault
9 Grit Pump 7A Running
10 Grit Pump 7A Fault
11 Grit Pump 7B Running
12 Grit Pump 7B Fault
13 Grit Pump 8A Running
14 Grit Pump 8A Fault
15 Grit Pump 8B Running
16 Grit Pump 8B Fault
17 Grit Collector 5 Running
18 Grit Collector 5 Fault
19 Grit Collector 6 Running
20 Grit Collector 6 Fault
21 Grit Collector 7 Running
22 Grit Collector 7 Fault
23 Grit Collector 8 Running
24 Grit Collector 8 Fault
25 Normal Power Available (from power relay)
26 Panel Internal Temperature High alarm

Digital Outputs
1 Slurry Cup Isolation Valve 11 open command
2 Slurry Cup Isolation Valve 12 open command
3 Slurry Cup Isolation Valve 13 open command
4 Slurry Cup Isolation Valve 14 open command
5 Slurry Cup Isolation Valve 15 open command
6 Slurry Cup Isolation Valve 16 open command
7 Slurry Cup Isolation Valve 17 open command
8 Slurry Cup Isolation Valve 18 open command
9 Slurry Cup Isolation Valve 19 open command
10 Slurry Cup Isolation Valve 20 open command

Analog Inputs
1 Grit Feed Line 5 flow
2 Grit Feed Line 6 flow
3 Grit Feed Line 7 flow
4 Grit Feed Line 8 flow
5 Grit Feed Line 5 Valve Position (% Open)
6 Grit Feed Line 6 Valve Position (% Open)
7 Grit Feed Line 7 Valve Position (% Open)
8 Grit Feed Line 8 Valve Position (% Open)

Analog Outputs
1 Grit Feed Line 5 Valve Position Reference
2 Grit Feed Line 6 Valve Position Reference
3 Grit Feed Line 7 Valve Position Reference
4 Grit Feed Line 8 Valve Position Reference

Internal Digital Registers
1 Grit Washer/Dewatering Unit 5 Enable
2 Grit Washer/Dewatering Unit 6 Enable
3 UPS running on batteries
4 UPS fault
5 Panel internal temperature HIGH

Internal Analog Registers

1 Grit Feed Line Normal Flow Setpoint
2 Grit Feed Line High Flow Setpoint
3 UPS % Battery Life Remaining

Grit Removal System 1 Local Control Panel Remote I/O

Digital Inputs
1 Grit Collector 5 Influent Gate Opened
2 Grit Collector 5 Influent Gate Closed
3 Grit Collector 6 Influent Gate Opened
4 Grit Collector 6 Influent Gate Closed
5 Grit Pump 5A Suction Valve Opened
6 Grit Pump 5B Suction Valve Closed
7 Grit Pump 6A Discharge Valve Opened
8 Grit Pump 6B Discharge Valve Closed
9 Normal Power Available (from power relay)
10 Panel Internal Temperature High alarm
11 UPS fault

Digital Outputs (none)

Analog Inputs (none)

Analog Outputs (none)

Internal Digital Registers (none)

Internal Analog Registers (none)

Grit Removal System 2 Local Control Panel Remote I/O

Digital Inputs
1 Grit Collector 7 Influent Gate Opened
2 Grit Collector 7 Influent Gate Closed
3 Grit Collector 8 Influent Gate Opened
4 Grit Collector 8 Influent Gate Closed
5 Grit Pump 7A Suction Valve Opened
6 Grit Pump 7B Suction Valve Closed
7 Grit Pump 8A Discharge Valve Opened
8 Grit Pump 8B Discharge Valve Closed
9 Normal Power Available (from power relay)
10 Panel Internal Temperature High alarm
11 UPS fault

Digital Outputs (none)

Analog Inputs (none)

Analog Outputs (none)

Internal Digital Registers (none)
Internal Analog Registers (none)

Remote I/O within the new local control panels shall utilize intrinsically safe remote I/O that avoid the need for a NEMA 7 rating of the enclosure.

Grit Washer Ethernet Link I/O: Register/Address signals to/from the Grit Removal System Main Control Panel PLC from each Grit Washer PLC shall include, as a minimum, the following:

- Individual SlurryCup enable/call to run for both units from the main PLC
- Individual SlurryCup ready for both units (permissive to operate associated grit pump) to the main PLC.
- SlurryCup running for both units
- SlurryCup in blowdown for both units (interlocked to stop associated grit pump during blowdown sequence)
- SlurryCup in backwash for both units
- UPS running on battery, % battery life left value, and fault
- VFD running input, speed output, speed input, run command output, and fault
- PLC and network switch faults

D. PANEL CONTROL and POWER INTERFACE: Provide terminals for incoming power, dry contacts rated 10A at 120V for interface with local control devices on the LCS's, and terminals for both poles and shields for analog signals from instruments on control panels as indicated on the I/O list at the end of this section.

2.03 FLOW METERS: Provide the four new flow meters shown on the drawings. Meters and transmitters shall be as specified under the City's specification W-35 – MAGNETIC FLOW METERS.

2.04 OIT DISPLAYS: Information depicted on the Grit Removal System Local Control Panel OIT's shall be easily readable and understood on the limited visual window of the 10" display screen supplied. Integrator shall develop several displays, with easily understood display navigation buttons to go from one display to another, to break up the amount of information shown on any particular screen. As a minimum, displays for equipment operation status, alarms, individual equipment controls, setpoint listing, and grit feed matrix shall be provided subject to approval during the submittal process on proposed screen displays.

2.05 Plant SCADA Interface: City personnel will program plant work station displays to allow remote status monitoring and control of the upgraded grit removal system. All data registers / addresses developed under this project shall be made assessible for remote display and interface to allow operators to monitor and control the system from plant work stations.

PART 3 – EXECUTION

3.01 CONTROL PANEL FABRICATION

A. Enclosures shall provide mounting for power supplies, control equipment, input/output subsystems, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling.

B. Enclosures shall be constructed so that no screws or bolt heads are visible when viewed from the front. Penetrations for instruments and other devices shall be clean and smoothly finished with rounded edges.

C. The temperature inside each enclosure containing digital hardware shall be continuously monitored and shall generate an alarm to the PLC if the temperature rises to an adjustable, preset high temperature. This thermostat shall be independent and separate from the thermostat used to control the temperature in the enclosure described above. Enclosure interior temperature alarm shall be displayed on the OIT operator interface displays.

D. All wiring shall be bundled with nylon cable ties when exposed (leaving in conduits, at bends, etc.) but otherwise shall be routed and enclosed in vented plastic wireway as required. Wireways shall be oversized by a minimum of 10%; overfilled wireways shall not be acceptable. DC power, analog signal and discrete signals shall be run in separate wireways from AC signal and power wiring.

E. Spare field wiring shall be bundled, tied, and labeled as specified above, and shall be neatly coiled in the bottom of the cabinet.

F. All installed spare I/O hardware shall be wired along with live I/O wiring to the field wiring terminal blocks within the cabinet. Where space for spare I/O modules has been provided with the PLC backplane or DIN-rail mounting system, corresponding space for wiring, surge protection, and terminations shall be furnished within the cabinet.

G. A copper ground bus shall be installed in each cabinet, and shall be connected to the building power ground. All hinged surfaces shall be grounded with a bonding jumper secured to the enclosure or backpanel.

H. Interior panel wiring shall be tagged at all terminations with machine-printed self-laminating labels. Labeling system shall be Brady TLS 2200 Printer with TLS 2200®/TLS PC Link™ labels, or equivalent system by Seton or Panduit. The wire numbering system and identification tags shall be as specified in Section 16123, Building Wire and Cable. Field wiring terminating in panels shall be labeled in accordance with the requirements Division 16. Where applicable, the wire number shall contain the ID number listed in the input/output schedules.

I. Main breaker and branch breaker sizes shall be coordinated such that an overload in a branch circuit will trip only the branch breaker but not the main breaker.

J. Enclosures with any dimension larger than 36 inches shall be provided with 120-volt duplex receptacles for service equipment and LED service lights. Power to these devices shall be independent from the PLC power supply and its associated uninterruptible power system.

K. Where applicable, enclosures shall be furnished with red laminated plastic warning signs in each section. The sign shall be inscribed to read, "WARNING - This Device Is Connected to Multiple Sources of Power." Letters in the word "WARNING" shall be 0.75 inch high, white.

L. The interconnection between equipment and panel shall be by means of flexible cables provided to permit withdrawal of the equipment from the cabinet without disconnecting the plugs.

3.02 PAINTING/FINISHING

A. All steel enclosures shall be free from dirt, grease, and burrs and shall be treated with a phosphatizing metal conditioner before painting. All surfaces shall be filled, sanded, and finish coated by spraying a 1-2 mil epoxy prime coat and smooth, level, high grade textured finish between flat and semi-gloss shine. The colors shall be selected by the Owner from a minimum of six color samples provided. Refer to Division 9 for additional requirements.

B. Materials and techniques shall be of types specifically designed to produce a finish of superior quality with respect to adherence, as well as impact and corrosion resistance.

C. Panels fabricated from stainless steel shall not be painted.

3.03 SCHEDULE OF PAYMENT

A. Progress payments shall be in accordance with the approved Payment Schedule. The INSTRUMENTATION SUBCONTRACTOR will be allowed to request partial payments for submittals, initial download of programming, and final completion.

B. The payment schedule and project milestones shall be defined in the General Provisions.

3.04 TESTING REQUIREMENTS

A. The Contractor shall provide the services of experienced factory trained technicians, tools and equipment to field calibrate, test, inspect, and adjust all equipment in accordance with manufacturer's specifications and instructions.

B. The proper control of all final control elements shall be verified by tests conducted in accordance with the requirements specified herein.

C. All modulating final control elements shall be tested for appropriate speed or position response by applying power and input demand signals, and observing the equipment for proper direction and level of reaction. Each final control element shall be tested at 0, 25, 50, 75, and 100 percent of signal input level and the results checked against specified accuracy tolerances. Final control elements which require turndown limits such as VFD's shall be initially set during this test.

D. Prior to control system startup and testing, each monitoring and control loop shall be tested on an individual basis from the primary element to the final element, including the operator work station or loop controller level, for continuity and for proper operation and calibration.

E. Signals from transducers, sensors, and transmitters shall be utilized to verify control responses. Simulated input data signals may be used subject to prior written approval by the Engineer. All modes of control shall be exercised and checked for proper operation.

F. Control system startup and testing shall be performed to demonstrate complete compliance with all specified functional and operational requirements. Testing activities shall include the simulation of both normal and abnormal operating conditions.

G. Each loop and control strategy test shall be witnessed and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.

H. Upon completion of the startup tests and prior to final system acceptance, the new controls shall be tested under normal operating conditions, initiated either automatically or manually, over a 30 day test period to demonstrate continuous reliable operation as intended.

I. If the system fails the 30 day availability test, unless the failure is related to programming, the 30 day test period shall be restarted after the failed component is repaired / replaced and full operation is restored.

3.05 FINAL ACCEPTANCE

A. Final acceptance of the instrumentation programming will be determined complete by the Engineer, and shall be based successful completion of startup testing and training of the operations staff to the Owner’s satisfaction.

- END OF SECTION –