

**The Enclosed Document Is Provided For Your Convenience.**

**Please Email ALL Questions:**

**[MailTo:ContractAdministration@TampaGov.net](mailto:ContractAdministration@TampaGov.net)**

**Please Let Us Know If You Plan To Bid**

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

CITY OF  
TAMPA, FLORIDA

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

FOR

**Contract 17-C-00042**

# **Hillsborough River Dam MFL Low Flow Control Gate**

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

JUNE 2017

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

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**BID NOTICE MEMO**

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

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**CONTRACT NO.:** 17-C-00042; Hillsborough River Dam MFL Low Flow Control Gate

**BID DATE:** July 25, 2017 **ESTIMATE:** \$1,000,000 **SCOPE:** The project comprises furnishing all labor, materials and equipment to install erosion and sedimentation control barriers, cofferdam, work platform, remove original sluice gate, core concrete, install slide gate, pedestal and actuator, install platform and ladder, test and commission slide gate, remove temporary facilities, with all associated work required for a complete project in accordance with the Contract Documents. **PRE-BID CONFERENCE:** Tuesday, July 11, 2017, 2:30p.m. 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, Specifications and Addenda for this work may be examined at, and downloaded from, [www.demandstar.com](http://www.demandstar.com). Backup files are available at <http://www.tampagov.net/contract-administration/programs/construction-project-bidding>. Subcontracting opportunities may exist for City certified Small Local Business Enterprises (SLBEs). A copy of the current SLBE directory may be obtained at [www.Tampagov.net](http://www.Tampagov.net). Phone (813) 274-8456 for assistance. **Email Technical Questions to:** [contractadministration@tampagov.net](mailto:contractadministration@tampagov.net) .

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NOTICE TO BIDDERS  
CITY OF TAMPA, FLORIDA  
Contract 17-C-00042; Hillsborough River Dam MFL Low Flow Control Gate

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., July 25, 2017, in the 4<sup>th</sup> 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 install erosion and sedimentation control barriers, cofferdam, work platform, remove original sluice gate, core concrete, install slide gate, pedestal and actuator, install platform and ladder, test and commission slide gate, remove temporary facilities, 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.

Any Requests For Information must be submitted by email to [ContractAdministration@tampagov.net](mailto: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 Statutes.

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

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 Hillsborough River Dam MFL Low Flow Control Gate 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](mailto:ContractAdministration@tampagov.net). To be given consideration, such request must be received at least seven (7) days prior to the date fixed for the opening of the Proposals. Any and all such interpretations and any supplemental instructions will be in the form of written addenda which, if issued, will be posted on DemandStar.Com and on the Department's web page, with notice given to all prospective bidders at the respective fax numbers or e-mail addresses furnished, for such purposes. Failure of any Bidder to receive any such addenda shall not relieve said Bidder from any obligation under his Proposal as submitted. All addenda so issued shall become part of the Contract Documents.

I-1.04 INSTRUCTIONS TO BIDDERS

**SECTION 2 – GENERAL INSTRUCTIONS.** Section I-2.07 SIGNATURE AND QUALIFICATIONS OF BIDDERS is replaced with the following:

Proposals must be signed in ink by the Bidder with signature in full. When firm is a Bidder, the Proposal shall be signed in the name of the firm by one or more partners. When a corporation is a bidder the officer signing shall set out the corporate name in full beneath which he shall sign his name and give the title of his office. The Proposal shall also bear the seal of the corporation attested by its secretary.

If the bidder referred to in Section I-2.07 is a corporation, it must submit; upon request, a copy of its filed Articles of Incorporation. In addition, if the bidder was incorporated in another state, it must establish that it is authorized to do business in the State of Florida. If the bidder is using a fictitious name, it must submit upon request, proof of registration of such name with the Clerk of the Circuit Court of the County where its principal place of business is. Failure to submit what is required is grounds to reject the bid of that bidder.

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

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

INSTRUCTIONS TO BIDDERS  
SECTION 1 - SPECIAL INSTRUCTIONS

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

I-1.05 TIME FOR COMPLETION:

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

The time for completion of this project, referred in Article 4.01 of the Agreement, shall be 210 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 / SLBE / REQUIREMENTS

**BIDDERS MUST SUBMIT COMPLETED FORMS MBD-10 AND MBD-20 WITH BIDS. BIDS SUBMITTED WITHOUT THE COMPLETED FORMS (INCLUDING SIGNATURES) WILL BE DEEMED NON-RESPONSIVE.**

In accordance with the City of Tampa's Equal Business Opportunity Program, a Goal of \_\_\_\_\_% has been established for subcontracting with Small Local Business Enterprises, (SLBEs), certified by the City. The goal is based upon the availability of the firms listed on the Subcontract Goal Contract List included herein.

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

INSTRUCTIONS TO BIDDERS  
SECTION 1 - SPECIAL INSTRUCTIONS

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

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

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

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

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

**I-1.11 BID SECURITY:**

Surety companies shall have a rating of not less than B+ Class VI as evaluated in the most recently circulated Best 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;

INSTRUCTIONS TO BIDDERS  
SECTION 1 - SPECIAL INSTRUCTIONS

- (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.

**SECTION 10 – PAYMENTS**, Article 10.05, Page A-10, 1<sup>st</sup> Paragraph, 1<sup>st</sup> 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, 1<sup>st</sup> Paragraph, 2<sup>nd</sup> Sentence:  
Delete the 2<sup>nd</sup> Sentence in its entirety and replace it with the following new 2<sup>nd</sup> 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 Contract 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.

INSTRUCTIONS TO BIDDERS  
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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 Contractor 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

INSTRUCTIONS TO BIDDERS  
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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.

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 [www.tampagov.net/contract-administration](http://www.tampagov.net/contract-administration)

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.

Section 287.135, Florida Statutes, prohibits agencies or local governmental entities from contracting with companies for goods or services of \$1 million or more 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, created pursuant to Section 215.473, Florida Statutes, or is on the Scrutinized Companies that Boycott Israel List, created pursuant to Section 215.4725, Florida Statutes, (effective October 1, 2016), or is engaged in a boycott of Israel (effective October 1, 2016), or is engaged in business operations in Cuba or Syria. A company that is on either the Scrutinized Companies with Activities in Sudan List or the

INSTRUCTIONS TO BIDDERS  
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Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to Section 215.473, Florida Statutes, or is on the Scrutinized Companies that Boycott Israel List, created pursuant to Section 215.4725, Florida Statutes, (effective October 1, 2016) or is engaged in a boycott of Israel (effective October 1, 2016) or is engaged in business operations in Cuba or Syria 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 \$1 million or more. Contractor certifies that it is not in violation of Section 287.135, Florida Statutes. For contracts \$1,000,000 and greater, if the City determines the Contractor submitted a false certification under Section 287.135(5) of the Florida Statutes, or has been placed on the Scrutinized Companies with Activities in the Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or is on the Scrutinized Companies that Boycott Israel List, created pursuant to Section 215.4725, Florida Statutes, (effective October 1, 2016), or is engaged in a boycott of Israel (effective October 1, 2016), or been engaged in business operations in Cuba or Syria, the City shall either terminate the Agreement after it has given the Contractor notice and an opportunity to demonstrate the City's determination of false certification was in error pursuant to Section 287.135(5)(a) of the Florida Statutes, or maintain the Agreement if the conditions of Section 287.135(4) of the Florida Statutes are met.

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.

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# INSTRUCTIONS TO BIDDERS

## 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 item 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 the 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 <sup>1</sup>

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 25 03 or 25 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 Firm (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 (CPL)/ 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 (RPL) 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

<sup>1</sup> "M" indicates million(s), for example \$1M is \$1,000,000

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&I Insurance 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.; coverage 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 (IOB) 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. IOB by which minimum monthly rent will be paid to City for up to 1 year if premises are destroyed, rendered inaccessible or untenable, including disruption of utilities, water, or telecommunications. **(IF APPLICABLE)**

O. 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

ACCEPTABILITY 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.

ADDITIONAL 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.

UNAVAILABILITY - 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.

## Procurement Guidelines To Implement Minority & Small Business Participation

### Underutilized WMBE Primes by Industry Category

<b>FORMAL PROCUREMENT</b>	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

<b>SUB WORK</b>	Construction	Construction-Related	Professional	Non-Professional	Goods
	Black	Black	Black	Black	Black
		Asian	Hispanic	Asian	Asian
		Native Am.	Asian	Native Am.	Native Am.
		Woman	Native Am.		Woman
			Woman		

#### Policy

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

#### Index

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

#### Industry Categories

**Construction** is defined as: new construction, renovation, restoration, maintenance of public improvements and underground utilities.

**Construction-Related Services** are defined as: architecture, professional engineering, landscape architecture, design build, construction management services, or registered surveying and mapping.

**Professional Services** are defined as: attorney, accountant, medical doctor, veterinarian, miscellaneous consultant, etc.

**Non-Professional Services** are defined as: lawn maintenance, painting, janitorial, printing, hauling, security guard, etc.

**Goods** are defined as: all supplies, materials, pipes, equipment, machinery, appliances, and other commodities.

#### MBD Form-70

Instructions Regarding Use of the SLBE Goal Contact List

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

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

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

SOLICITATION FOR SUBCONTRACTOR QUOTES

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

To Subcontractor:

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

Plans and Specs for this project are posted at:  
<http://www.tampagov.net/contract-administration/programs/construction-project-bidding>

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

Please complete and submit with your subcontract bid or response:

YOUR FIRM'S NAME:  
MAILING ADDRESS:  
CITY:  
STATE:  
ZIP:  
FAX NUMBER:  
E-MAIL ADDRESS:

Yes, my company is interested in quoting this project for the following items of work:

No, my company will not quote this project for the following reason(s):

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

PROPOSAL

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

Legal Name of Bidder: \_\_\_\_\_

Bidder's Fictitious Name, *if applicable*: \_\_\_\_\_

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

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

Bidder Mailing Address: \_\_\_\_\_

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

Bidder's License No.: \_\_\_\_\_ Bidder's FDOS (SUNBIZ) Doc. No.: \_\_\_\_\_

*(See Ch. 489, FS; use entity's, individual's only if applicable)*

Bidder Contact Name\*\*: \_\_\_\_\_ Email: \_\_\_\_\_ Phone: (\_\_\_\_) \_\_\_\_\_

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

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

- (1) He/She is of lawful age and is authorized to act on behalf of Bidder (the individual, partnership, corporation, entity, etc. submitting this Proposal) and that all statements made in this document are true and correct to the best of my knowledge.
- (2) If Bidder is operating under a fictitious name, Bidder has currently complied with any and all laws and procedures governing the operation of businesses under fictitious names in the State of Florida
- (3) No person or entity other than Bidder has any interest in this Proposal or in the Contract proposed to be entered into.
- (4) This Proposal is made without any understanding, agreement, or connection with any person or entity making Proposal for the same purposes, and is in all respects fair and without collusion or fraud.
- (5) Bidder is not in arrears to the City of Tampa, upon debt or contract, and is not a defaulter, as surety or otherwise, upon any obligation to the City of Tampa.
- (6) That no officer or employee or person whose salary is payable in whole or in part from the City Treasury is, shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this Proposal, or in the performance of the Contract, or in the supplies, materials, or equipment and work or labor to which it relates, or in any portion of the profits thereof.
- (7) Bidder has carefully examined and fully understands the Solicitation and has full knowledge of the scope, nature, and quality of the work to be performed; furthermore, Bidder has carefully examined the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials and the kinds and extent of equipment and other facilities needed for the performance of the work, the general and local conditions and all difficulties to be encountered, and all other items which may, in any way, affect the work or its performance.
- (8) Bidder (including its principals)  has |  has NOT been debarred or suspended from contracting with a public entity.
- (9) Bidder  has |  has NOT implemented a drug-free workplace program that meets the requirements of Section 287.087, Florida Statutes.
- (10) Bidder has carefully examined and fully understands all the component parts of the Contract Documents and agrees Bidder will execute the Contract, provide the required Public Construction Bond, and will fully perform the work in strict accordance with the terms of the Contract and Contract Documents therein referred to for the following prices, to wit:

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

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

Contract Item No.	Estimated Quantity	Description and Price in Words	Computed Total Price for Item in Figures
BASE BID	LS	The work includes the furnishing of all labor, equipment, and material to install erosion and sedimentation control barriers, cofferdam, work platform, remove original sluice gate, core concrete, install slide gate, pedestal and actuator, install platform and ladder, test and omission slide gate, remove temporary facilities, any allowances that may be listed in Section 01020, with all associated work required for a complete project in accordance with the Contract Documents.	
		<hr/> _____ 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.	_____	_____	_____	_____	_____
<b>Total Cost: \$</b>					_____

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 RFO/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**  
**(page 2 of 2)**

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	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

Failure to Complete, Sign and Submit  
this form with your Bid or Proposal  
Shall render the Bid Non-Responsive  
(Do Not Modify This Form)

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.





## Page 4 of 4 DMI – Solicited/**Utilized**

### 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 (GFCEP) requirements applies (MBD Form-50) and supporting documentation must accompany the bid.
- **See attached documents.** Check box, if after completing the DMI Form in its entirety, you need more space to list additional firms and/or if you have supplemental information/documentation relating to the scope/value/percent utilization of subcontractors. Reproduce copies of MBD-20 and attach. All data not submitted on duplicate forms must be in the same format and content as specified in these instructions.

The following instructions are for information of Any and All subcontractors To Be Utilized.

- **Federal ID. FIN.** A number assigned to a business for tax reporting purposes. This information is critical in proper identification of the subcontractor.
- **“S” = SLBE, “W” = WMBE.** Enter “S” for firms Certified by the City as Small Local Business Enterprises and/or “W” for firms Certified by the City as Women/Minority Business Enterprise; **“O” = Non-certified others.**
- **Company Name, Address, Phone & Fax.** Provide company information for verification of payments.
- **Type of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business.
- **Trade, Services, or Materials (NIGP code if Known)** Indicate the trade, service, or material provided by the subcontractor. Abbreviated list of NIGP is available at <http://www.tampagov.net/mbd> “Information Resources”.
- **Amount of Quote, Letters of Intent** (required for both SLBEs and WMBEs).
- **Percent of Work/Contract.** Indicate the percent of the total contract price the subcontract(s) represent. For CCNA only (i.e. Consultant A/E Services) you must indicate subcontracts as percent of total scope/contract.
- **Total Subcontract/Supplier Utilization.** – Provide total dollar amount of all subcontractors/suppliers projected to be used for the contract. (Dollar amounts may be optional in CCNA depending on solicitation format).
- **Total SLBE Utilization.** Provide total dollar amount for all projected SLBE subcontractors/Suppliers used for this contract. (Dollar amounts may be optional in CCNA proposals depending on the solicitation format).
- **Total WMBE Utilization.** Provide total dollar amount for all projected WMBE subcontractors/Suppliers used for this contract. (Dollar amounts may be optional in CCNA proposals depending on the solicitation format).
- **Percent SLBE Utilization.** Total amount allocated to SLBEs divided by the total bid/proposal amount.
- **Percent WMBE Utilization.** Total amount allocated to WMBEs divided by the total bid/proposal amount.

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

TAMPA BID BOND  
Contract 17-C-00042; Hillsborough River Dam MFL Low Flow Control Gate

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 17-C-00042, Hillsborough River Dam MFL Low Flow Control Gate.

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 17-C-00042 in accordance with your Proposal dated \_\_\_\_\_, amounting to a total of \$\_\_\_\_\_ as completed in accordance with subsections I-2.09 and I-2.10 of the Instruction to Bidders.

This AGREEMENT, made and entered into in triplicate, between the City of Tampa, Florida, hereinafter called the City, and \_\_\_\_\_ hereinafter called the Contractor, as of the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_ when the City Council of the City of Tampa, Florida adopted a Resolution authorizing, among other things, the Mayor's execution of this Agreement.

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

Contract 17-C-00042; Hillsborough River Dam MFL Low Flow Control Gate, shall include, but not be limited to, furnishing all labor, materials, and equipment to install erosion and sedimentation control barriers, cofferdam, work platform, remove original sluice gate, core concrete, install slide gate, pedestal and actuator, install platform and ladder, test and commission slide gate, remove temporary facilities 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 Contract.

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

and Extra Work.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## **SECTION 2 POWERS OF THE CITY'S REPRESENTATIVES**

### **ARTICLE 2.01 THE ENGINEER**

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

(a)To monitor the performance of the work.

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

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

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

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

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

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

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

### **ARTICLE 2.02 DIRECTOR**

The Director of the Department in addition to those matters

expressly made subject to his determination, direction or approval in his capacity as "Engineer", shall also have the power:

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

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

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

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

### **ARTICLE 2.03 NO ESTOPPEL**

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

### **ARTICLE 2.04 NO WAIVER OF RIGHTS**

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

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

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

### **SECTION 3 PERFORMANCE OF WORK**

#### **ARTICLE 3.01 CONTRACTOR'S RESPONSIBILITY**

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

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

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

#### **ARTICLE 3.02 COMPLIANCE WITH LAWS**

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

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

#### **ARTICLE 3.03 INSPECTION**

During the progress of the work and up to the date of final acceptance, the Contractor shall, at all times, afford the representatives of the City, the Florida Department of Environmental Regulation, and if applicable, the Federal Environmental Protection Agency and the Federal Department of Labor every reasonable, safe and proper facility for inspecting the work done or being done at the

site. The inspection of any work shall not relieve the Contractor of any of his obligations to perform proper and satisfactory work as herein specified. Finished or unfinished work found not to be in strict accordance with the Contract shall be replaced as directed by the Engineer, even though such work may have been previously approved and payment made therefor.

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

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

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

#### **ARTICLE 3.04 PROTECTION**

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

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

#### **ARTICLE 3.05 PRESERVATION OF PROPERTY**

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

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

**ARTICLE 3.06 BOUNDARIES**

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

**ARTICLE 3.07 SAFETY AND HEALTH REGULATIONS**

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

**ARTICLE 3.08 TAXES**

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

**ARTICLE 3.09 ENVIRONMENTAL CONSIDERATIONS**

The Contractor, in the performance of the work under this Contract, shall comply with all Local, State and Federal laws, statutes, ordinances, rules and regulations applicable to protection of the environment; and, in the event he violates any of the provisions of same, he shall be answerable to the Local, State and Federal agencies designated by law to protect the environment. In the event the City receives, from any of the environmental agencies, a citation which is occasioned by an act or omission of the Contractor or his

subcontractor or any officers, employees or agents of either, it is understood and agreed that the Contractor shall automatically become a party-respondent under said citation; and the City immediately shall notify the Contractor and provide him with a copy of said citation.

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

**SECTION 4  
TIME PROVISIONS**

**ARTICLE 4.01 TIME OF START AND COMPLETION**

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

The Contractor must complete the work covered by this Contract in the number of consecutive calendar days set forth in the Instructions to Bidders, unless the date of completion is extended pursuant to the provisions of Article 4.05 hereof.

The period for performance shall start from the date of signing of this Agreement by the City.

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

**ARTICLE 4.02 PROGRESS SCHEDULE**

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

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

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

**ARTICLE 4.03 APPROVAL REQUESTS**

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

**ARTICLE 4.04 COORDINATION WITH OTHER CONTRACTORS**

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

**ARTICLE 4.05 EXTENSION OF TIME**

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

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

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

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

The Contractor agrees to make no claim for damages for delay in the performance of this Contract occasioned by any

act or omission to act of the City or any of its representatives or because of any injunction which may be brought against the City or its representatives and agrees that any such claim shall be fully compensated for by an extension of time to complete performance of the work as provided herein.

**ARTICLE 4.06 LIQUIDATED DAMAGES**

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

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

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

**ARTICLE 4.07 FINAL INSPECTION**

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

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

**SECTION 5  
SUBCONTRACTS AND ASSIGNMENTS**

**ARTICLE 5.01 LIMITATIONS AND CONSENT**

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

Before making any subcontract, the Contractor must submit a

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

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

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

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

**ARTICLE 5.02 RESPONSIBILITY**

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

**SECTION 6  
SECURITY AND GUARANTY**

**ARTICLE 6.01 CONTRACT SECURITY**

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

maintenance and guaranty provisions, and for the payment of all persons performing labor and furnishing materials in connection with the Contract. The premiums on the Performance Bond shall be paid by the Contractor.

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

**ARTICLE 6.02 CONTRACTORS INSURANCE**

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

**ARTICLE 6.03 AGAINST CLAIMS AND LIENS**

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

**ARTICLE 6.04 MAINTENANCE AND GUARANTY**

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

It is also agreed that all warranties, expressed or implied, inure to the benefit of the City and are enforceable by the City.

**SECTION 7  
CHANGES**

**ARTICLE 7.01 MINOR CHANGES**

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

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

Construction conditions may require that minor changes be made in the location and installation of the work and equipment to be furnished and other work to be performed hereunder, and the Contractor when ordered by the Engineer, shall make such adjustments and changes in said locations and work as may be necessary, without additional cost to the City, provided such adjustments and changes do not alter the character, quantity or 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 Contract 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 or 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 or 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 indemnify 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 Contract Documents made a part hereof, an indemnification provision within the purview of Chapter 725.06, Laws of Florida, the monetary limitation on the extent of the indemnification under each such provision shall be One Million Dollars or a sum equal to the total Contract price, whichever shall be the greater.

**ARTICLE 11.08 UNLAWFUL PROVISIONS DEEMED STRICKEN**

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

**ARTICLE 11.09 LEGAL PROVISIONS DEEMED INCLUDED**

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

**ARTICLE 11.10 DEATH OR INCOMPETENCY OF CONTRACTOR**

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

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

**ARTICLE 11.11 NUMBER AND GENDER OF WORDS**

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

**ARTICLE 11.12 ACCESS TO RECORDS**

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

**SECTION 12  
LABOR STANDARDS**

**ARTICLE 12.01 LABOR STANDARDS**

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

**ARTICLE 12.02 NOTICE TO LABOR UNIONS**

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

**ARTICLE 12.03 SAFETY AND HEALTH REGULATIONS**

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

**ARTICLE 12.04 EEO AFFIRMATIVE ACTION REQUIREMENTS**

The Contractor understands and agrees to be bound by the equal opportunity requirements of Federal regulations which shall be applicable throughout the performance of work under this Contract. The Contractor also agrees to similarly

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

**ARTICLE 12.05 PREVAILING RATES OF WAGES**

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

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

\* \* \* \* \*

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

CITY OF TAMPA, FLORIDA

\_\_\_\_\_  
Bob Buckhorn, Mayor  
(SEAL)

ATTEST:

\_\_\_\_\_  
City Clerk

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

\_\_\_\_\_  
Rachel S. Peterkin, Assistant City Attorney

Contractor

By: \_\_\_\_\_  
(SEAL)

Title:

ATTEST:

\_\_\_\_\_  
Witness

TAMPA AGREEMENT (ACKNOWLEDGMENT OF PRINCIPAL)

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)

\_\_\_\_\_  
(Name of Surety)

\_\_\_\_\_  
(Principal Business Address)

\_\_\_\_\_  
(Surety Address)

By \_\_\_\_\_

By \_\_\_\_\_  
(As Attorney in Fact)\*

Title \_\_\_\_\_

\_\_\_\_\_  
Telephone Number of Surety

\_\_\_\_\_  
Telephone Number of Principal

Approved as to legal sufficiency:

**Countersignature:**

By \_\_\_\_\_  
Assistant City Attorney

\_\_\_\_\_  
(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 the 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.

## TEMPORARY STRUCTURES

### 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 constructed in accordance with the requirements of the Contract Documents.

## SECTION 6

### 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.

**SECTION 13  
CLEANING**

**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.

**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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SUPPLEMENTARY GENERAL PROVISIONS

1.0 GENERAL:

- 1.1 This Section sets forth modifications to the "General Provisions" of the Contract Documents which are referred to as Specifications, General Provisions.
- 1.2 Paragraph numbers and titles used herein refer to similarly numbered and titled articles in the General Provisions.
- 1.3 Only those paragraphs contained herein shall be assumed to be modified. Paragraphs not appearing herein shall apply as written in the General Provisions.
- 1.4 Any portion of the General Provisions, whether or not modified herein, may be further modified in Special Conditions and in the Instructions to Bidders of these Specifications.
- 1.5 Where the Supplementary General Provisions, Special Conditions and Instructions to Bidders conflict with the General Provisions, the Supplementary General Provisions, Special Conditions and the Instructions to Bidders shall take precedence.

2.0 MODIFICATIONS TO THE GENERAL PROVISIONS AS FOLLOWS:

2.1 SECTION 1 SCOPE AND INTENT

G-1.02 WORK INCLUDED

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

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

2.2 SECTION 3 WORKING DRAWINGS

- a. Change to read as follows:

SECTION 3 SHOP DRAWINGS

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

G-3.01 SCOPE

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

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

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

- (2) All working and erection dimensions.
- (3) Arrangement and sectional views.
- (4) Necessary details, including complete information for making connections between work under this contract and work under other contracts.
- (5) Kinds of materials and finishes.
- (6) Parts list and description thereof.

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

Fax submittals will not be reviewed.

G-3.02 APPROVAL:

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

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

- (1) Each request shall include a complete description of the proposed substitute and the name of the material or equipment for which it is to be substituted.
- (2) Furnish drawings, cut, manufacturer's printed specifications, performance and test data and any other data or information necessary for a complete evaluation of both the item specified and the proposed substitute item.

Approval of the drawings shall constitute approval of the subject matter thereof only and not of any structure, material, equipment or apparatus shown or indicated.

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

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

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

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

<u>Items</u>	<u>Submittals</u>	<u>*Approval</u>
All trade	Fourteen (14) Days	Fourteen (14) Days

\*From date of receipt of submittal.

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

### G-3.03 JOB SITE:

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

## 2.3 SECTION 4 MATERIALS AND EQUIPMENT

### G-4.01 GENERAL REQUIREMENTS

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

### G4.03 REFERENCE TO STANDARDS

The following paragraph shall be added in its entirety:

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

### G-4.05 EQUIVALENT QUALITY

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

## 2.4 SECTION 5 INSPECTION AND TESTING

### G-5.06 PRELIMINARY FIELD TESTS

### G-5.07 FINAL FIELD TEST

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

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

## 2.5 SECTION 6 TEMPORARY STRUCTURES

### G-6.03 CONTRACTOR'S FIELD OFFICE

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

G-6.03 CONTRACTOR'S FIELD OFFICE

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

2.6 SECTION 7 TEMPORARY SERVICES

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

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

G-7.07 TELEPHONE

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

2.7 SECTION 14 MISCELLANEOUS

G-14.04 USE OF EXPLOSIVES:

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

G-14.05 OWNERSHIP OF MATERIALS:

The removal of any underground and surface structures as required shall be performed in a careful manner to permit salvaging of as much material, such as pipe and brick, also broken section of sidewalk, as practical for use in repair and maintenance of City-owned facilities.

Such acceptable salvaged material remains the property of the City and shall be placed in stock piles so as not to interfere with new construction work but accessible for loading and hauling by the City or by the Contractor within the free haul limit of six (6) miles. The Engineer and/or Architect shall direct the Contractor as to the location of stockpile.

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

G-14.06 NOTICE OR SERVICE THEREOF:

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

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

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

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

G-14.07 REQUIREMENTS FOR CONTROL OF THE WORK:

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

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

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

G-14.08 WORK DIRECTIVE CHANGE:

"A Work Directive Change is a written directive to the Contractor, issued on or after the date of the execution of the Agreement, and signed by the Engineer on behalf of the City, ordering an addition, deletion or revision in the work, or responding to an emergency. A Work Directive Change will not change the contract price or the time for completion, but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the contract price or the time for completion. "Without invalidating the Agreement, additions, deletions or revisions in the Work may, at any time or from time to time, be authorized by a Change Order or a Work Directive Change. Upon receipt of any such document, the Contractor shall promptly proceed with the work involved."

G-14.09 RESERVED PARKING SIGNS IN PARKING METER AREAS

Not Applicable.

G-14.10 EROSION AND SEDIMENT CONTROL:

During construction, the Contractor shall provide adequate erosion and sediment controls to prevent adverse effects to the environment and public and private property. He shall construct and maintain control structures necessary to prevent erosion and sediment. He shall conduct and schedule construction operations to avoid, prevent, and minimize erosion and sediment. He shall comply with City, County, State, and Federal codes, laws, and regulations and the plans and specifications for this project pertaining to erosion and sediment prevention and control.

At the Preconstruction Conference, the Contractor shall present a plan for erosion and sediment prevention and control. This plan shall include the operations methods, also temporary and permanent control measures and structures to be used on this project.

G-14.11 ENGINEER'S FIELD OFFICE:

Not Applicable.

G-14.12 PROJECT SIGNS:

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

G-15.0 NOTIFICATION TO CONTRACTORS:

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

## Appendix C

### Contractor Notification Requirements

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

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

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

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

Comply with all regulatory requirements for removal and disposal.

## SPECIFIC PROVISIONS

### SP-1 Scope and Contractor Qualifications

The Work included under these Contract Documents includes, but is not limited to the following:

Furnishing all labor, materials, equipment, services and incidentals for the installation of a new slide gate, including temporary cofferdams, temporary environmental controls, removal of concrete and existing abandoned sluice gate, coring/mining of penetrations, conduit, concrete work and grouting, gate pedestal and actuator, platform and ladder, commissioning of gate, riprap erosion protection, and conducting flow measurement and calibration, along with associated piping, electrical work, and ancillary equipment.

The CONTRACTOR must conform to the experience and documentation requirements spelled out in the Instructions to Bidders, I-2.02, as may be required. Additionally, the CONTRACTOR must be able to demonstrate the ability and experience to construct, install, and operate the work specifically described in these Specifications and as shown on the Plans, all as required for a complete functional installation, and as described and directed by the ENGINEER, in accordance with the obvious or expressed intent of the Contract.

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

### SP-2 Permits and Authorizations

The CONTRACTOR shall have in his possession the proper license to perform the work before submittal of his bid. The CONTRACTOR shall obtain any required City building permits and shall obtain and pay for all other permits, 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. The CONTRACTOR is responsible for complying with all licenses, regulations, ordinances, conditions, and permits of the various authorities having jurisdiction over the work.

City building permit fees will be paid by the CITY.

The CONTRACTOR shall require all subcontractors to be currently licensed by the City to perform the proposed work in their respective fields 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 all required inspections and tests for all phases of work to obtain final approval thereof.

The CITY shall be responsible for obtaining any required permits or exemptions from federal, state, regional, and local regulatory agencies.

SP-3 Environmental Protection

The CONTRACTOR will be held liable for the violation of any and all environmental regulations. Violation citations carry civil penalties and in the event of willful violation, criminal penalties. The fact that the permits are issued to the CITY does not relieve the CONTRACTOR in any way of his environmental obligations and responsibilities. Refer also to Tampa Agreement Article 3.09.

SP-4 Construction Start

Construction shall not begin prior to receipt by the CITY of the required permits. If issuance of the Notice to Proceed is delayed due to permit acquisition, the contract time will be extended to suit, but no extra payment will be made to the CONTRACTOR. Refer also to Tampa Agreement Article 4.01.

SP-5 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-6 Discrepancy Between Drawing and Specifications

In case of any discrepancy between the drawings and specifications, the more stringent requirement shall apply. The Contractor will not be held responsible for the discovery of such discrepancy, but any work done on the item involved after such discovery, and prior to authorization by the Engineer, will be done at the Contractor's risk and expense.

SP-7 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 material and equipment. After the CONTRACTOR has received approval of the ENGINEER, procurement shall commence.

SP-8 Working Hours

Normal working hours for this project will be from 7:00am to 3:30pm, Monday through Friday. If certain phases of the project require work outside of the normal hours, a minimum of 7-days notice must be provided to allow scheduling of CITY inspectors.

SP-9 Contractor's Field Office

Article G-6.03 CONTRACTOR's Field Office on Page G-14 of the GENERAL PROVISIONS is deleted. 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-10 Salvage

All existing pipe, appurtenances and equipment removed by the CONTRACTOR 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.

#### SP-11 Sequence of Operations

The CONTRACTOR shall be responsible for scheduling his work in an orderly fashion to meet the project goals described herein. The CONTRACTOR shall perform the work in a manner that will not disturb dam operations. Follow the general sequence of operation as described below:

1. Improve access, prepare staging, and construct crane pad
2. Install erosion and sediment control Best Management Practices
3. Install downstream work platform
4. Install upstream fabricated steel bulkhead/cofferdam, seals, and dewater
5. Remove original sluice gate
6. Remove existing form from upstream face of existing plug
7. Core/mine dam penetrations
8. Trench, install and backfill power and control conduits (and supporting facilities) to existing control building
9. Install conduit, transition, and gate thimble
10. Grout annulus between existing plug penetration and conduit
11. Form and place new upstream plug
12. Pull power and control wire/cable
13. Remove formwork and install slide gate, pedestal, and actuator
14. Remove downstream work platform
15. Install access platform and ladder
16. Install temporary downstream cofferdam, install riprap basin
17. Flood upstream cofferdam
18. Connect power and controls and coordinate integration with City of Tampa
19. Test and commission slide gate, conduct flow measurement and calibration
20. Remove downstream cofferdam
21. Remove upstream cofferdam; place/store cofferdam at or near staging area as directed by CITY.
22. Remove erosion and sediment control features

A detailed construction sequence and schedule shall be submitted to the ENGINEER for approval.

#### SP-12 Cleaning and 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. Refer also to General Provisions Section 13.

SP-13 Surface Restoration

Where construction activities are conducted in existing grassed areas, the grassed areas shall be restored as specified or directed by sodding to match existing conditions. Surface restoration in paved areas, where applicable, shall be as shown on the Plans and in accordance with SP-30.

SP-14 Work Adjacent to Utilities

Existing utilities including house services adjacent to or crossing the line of the work shall be protected as shown on the Plans, specified herein, and in accordance with the requirements of the Agreement. All excavations for pipelines or conduits shall be hand dug with care to avoid damaging underground structures or utilities that may not be shown on the Plans. Refer also to General Provisions Section 1.03.

SP-15 Water and Electric Services

The CITY will provide potable water service from existing connection or fixtures at the Dam's Walkway. The quantity of water available is limited to that which might flow from a hose connection. Any other water required by the CONTRACTOR for the Work shall be the responsibility of the CONTRACTOR and shall be supplied from his own source of supply (tanker trucks or the like). Construction and removal of piping from existing connections and/or use of a separate construction water service shall be the responsibility of the CONTRACTOR, and such cost shall be included in the Lump Sum Price and no separate payment will be made therefore. This provision supersedes General Provisions Section G-7.01 and Supplementary General Provisions Section 2.6 pertaining to General Provisions Section G-7.01.

The CONTRACTOR may utilize power that is available at existing 120V electrical outlets located in the vicinity of the Work. Additional power, if necessary, will be the responsibility of the CONTRACTOR.

SP-16 Protection of Trees and Shrubs

Not applicable this project. There are no trees or landscaping in the project area.

SP-17 Facility Operations During Construction

CONTRACTOR shall perform all work in recognition of and coordination with on-going Dam Operation activities. The following shall apply:

CONTRACTOR shall perform work in a manner to minimize noise, vibration, dust and debris. CONTRACTOR shall coordinate with the CITY'S Dam Tender in advance of operations producing excessive noise and/or vibration and the use of non-designated areas in order to avoid disruption or interference with dam operations.

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

Deliveries or other use of non-designated areas at the dam complex shall be coordinated in advance with the CITY. The CONTRACTOR shall notify the designated CITY representative whenever deliveries are expected (Name of supplier, item(s) being delivered) in keeping with security measures in place at the dam facility (refer to SP-22).

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

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

CONTRACTOR shall not be allowed to use any facility in the Dam Tender's residence or the Dam Control Building located on the South Abutment of the dam.

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

The CONTRACTOR shall have a supervisor on-site with Contract related personnel at all times. Failure to adhere to approved sequencing/layout plan and/or failure to have supervisory personnel present and/or failure to maintain appropriate site conditions will be cause for work stoppage without additional Contract time.

#### SP-18 Testing

The cost of all testing required shall be borne by the CONTRACTOR.

#### SP-19 Monthly Schedules

In addition to the Progress Schedule required in Article 4.02 of the Agreement, the CONTRACTOR shall submit a monthly schedule with each pay estimate. Pay estimates will not be processed unless accompanied by an updated monthly schedule. The schedule shall be broken down into the following components:

1. Procurement status
2. Demolition
3. Installation of Video Monitoring Equipment
4. Installation of Cofferdams
5. Installation of Slide Gate and Outlet Conduit
6. Installation of Ladder System
7. Installation of Scour and Erosion Mitigation Feature
8. Installation of Instrumentation and Electrical Items
9. Equipment Testing and Acceptance
10. Final Restoration

#### SP-20 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. Refer also to Supplementary General Provisions Section G-14.08.

#### SP-21 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 the equipment and for providing training to CITY personnel in the operation and maintenance of such equipment.

Such manufacturers' services shall be of sufficient time and shall meet the requirements of the Specifications. Additional time shall be provided if necessary.

The cost of all services of manufacturers' representatives shall be included in the total Lump Sum Price, and no separate payment will be made therefore. Refer also to General Provisions Section G-4.11.

#### SP-22 Access to Work Area

The CITY'S dam facility is a secure facility. As such, the CONTRACTOR will be obligated to comply with access rules and procedures described herein.

1. Prior to the start of on-site activities, CONTRACTOR must submit a list of employees to the CITY that the CONTRACTOR expects to assign to the project. Each individual on the list will undergo a background check in order to obtain a security clearance from the Tampa Police Department.
2. The above requirement extends to all employees of the Prime CONTRACTOR and all of the CONTRACTOR'S Sub-contractors.
3. The CONTRACTOR shall have a period of five business days following the Notice to Proceed to provide the employee list(s) to the CITY. The list(s) shall include: Employee Name, photo identification, driver license number, race, sex, and date of birth.
4. The CITY will notify the CONTRACTOR when the background checks are complete. The CITY reserves the right to reject any employee on the submitted list(s) (Prime and Subs) and may request that the CONTRACTOR submit additional names, if necessary.
5. During the course of the Work, the CITY will require the CONTRACTOR to submit additional names of employees, as needed, who were not on the original background checklist and who are later proposed to work on the project.

6. Prior to on-site activity, all CONTRACTOR and sub-contractor employees who have been cleared to work on the project will be issued identification badges by the Water Department's Security Supervisor. These badges must be worn and visible at the job site and must be returned to the CITY upon request.
7. The CITY will not approve any request to increase the contract period resulting from the CONTRACTOR'S failure to take into account the review time required to conduct subsequent background checks.

SP-23 Storage of Materials

The CONTRACTOR may use an area near the Dam Operations Control Building for storage of material and equipment at the specific location identified by the CITY. Payment for use and restoration of storage areas will be included in the lump sum price and no separate payment will be made therefore.

SP-24 Temporary Work Stoppages

The CONTRACTOR shall temporarily discontinue all construction activities from, and including, Thanksgiving Day through the following Sunday, and December 24 through January 2.

If applicable, prior to temporary work stoppages, all streets shall be restored to permit access and to allow ingress and egress by local plant traffic only. The CONTRACTOR shall maintain all streets at this condition level for the duration of the shutdown period.

All equipment, except that used for excavation and well pointing, and all materials including, but not limited to, structures, pipe, and stockpiled material shall be removed to either the CONTRACTOR's storage lot or to a location outside the project area as approved by the ENGINEER.

SP-25 Project Photographs

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

The CONTRACTOR shall submit pre-construction photographs in digital form (JPEG) to the CITY prior to the start of construction.

SP-26 Record Drawings

During the course of the Work, the CONTRACTOR shall maintain, at the site, a clean undamaged set of Contract Documents. The CONTRACTOR shall mark the Construction Documents on a daily basis showing the location, progress of the Work, and deviations, if any.

Drawings and specifications book shall be on-site at all times and available for review by the CITY. Failure of CONTRACTOR to have the Contract Documents and/or up to date may result in suspension of the Work until the situation is corrected. Extension of the Contract Time will not be granted for such condition.

At the conclusion of the Work, the CONTRACTOR shall provide the CITY with one complete set of Electronic Record Drawings (AutoCAD DWG) incorporating any changes (an un-marked set of construction drawings will be provided to the CONTRACTOR by the CITY for this purpose).

SP-27 Not Used

SP – 28 Safety

The CONTRACTOR is solely responsible for the safety of its workers, and shall comply with all OSHA requirements pertaining to safety at the site of the Work. All costs associated with safety measures shall be included in the total lump sum contract price, and no separate payment shall be made therefore. Refer also to the Tampa Agreement Article 3.07.

After the Contract is awarded, the CITY will conduct a dam safety training session with the CONTRACTOR'S designated Supervisor. The training session will cover actions to be taken by the CONTRACTOR in the event of an emergency at the dam. The CONTRACTOR shall provide the names and contact information of the designated Supervisor and other key employees that will be involved in the Work. The Supervisor will be responsible for informing employees about the procedures that will be covered in the dam safety training session.

The CONTRACTOR will be responsible for immediately notifying the CITY if a potential or actual event occurs that may be or is threatening the integrity of the dam and/or affecting its operations, and/or threatening the public in any way.

SP-29 Disposal of Debris

The CONTRACTOR shall be solely responsible for removal and proper disposal of debris to locations off of the project site.

SP-30 Pavement Restoration

If applicable, restoration shall conform to standard requirements of CITY and as shown on the Plans.

END OF SECTION



**Page 1 of 2 –DMI Payment**  
**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	Company Name Address Phone & Fax	Total Sub Contract Or PO Amount	Amount Paid To Date	Amount To Be Paid For This Period
Trade/Work Activity			Amount Pending Previously Reported	Sub Pay Period Ending Date
[ ]Sub [ ]Supplier				
Federal ID				
			\$	\$
			\$	\$
			\$	\$
			\$	\$
			\$	\$
			\$	\$

**(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: \_\_\_\_\_



## 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 if 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.

0 1 2 3 4 5 6 7 8

**Sign Information**

**Building a Better Tampa**

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

**\$1.5 Million investment**  
 Scheduled for completion in October, 2012

**Orion Marine Construction, Inc.**

**Improvement Project**

**City of Tampa**  
 Florida

Mayor Bob Buckhorn

Project Contact:  
 Don Cermeno  
 Contract Administration  
 City of Tampa  
 Don.Cermeno@tampagov.net

For information call:  
 (813) 635-3400



**Building a Better Tampa**

**David L. Tippin Water Treatment Facility Caustic Soda Piping Improvements**

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

\$TBD investment  
 Scheduled for completion in TBD 2014

TBD

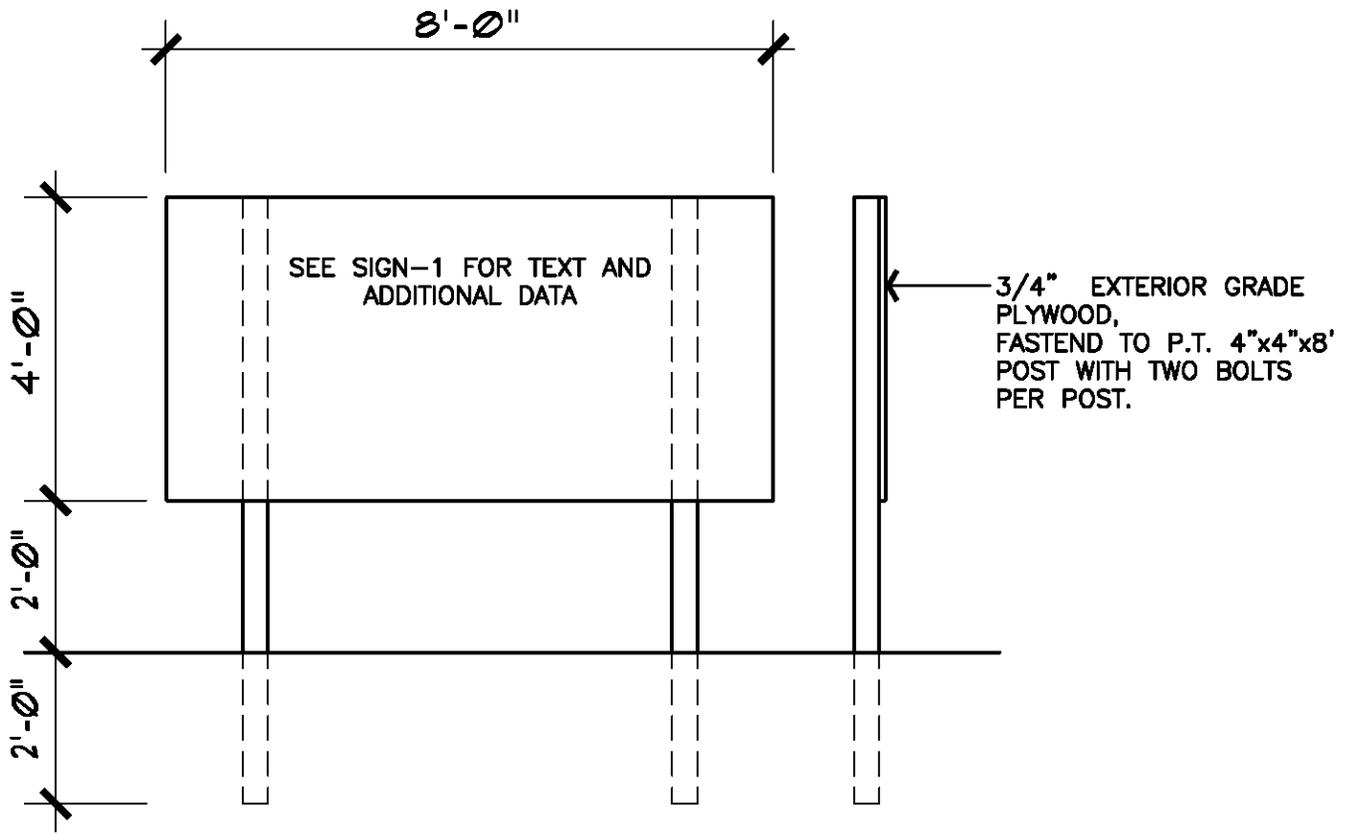
**Colors**

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

**SIGN EXAMPLE ONLY GRAPHIC TO BE DEVELOPED BY CONTRACTOR**

scale: 3"  3"

**Font**  
 Franklin Gothic



SECTION 01020 - ALLOWANCE

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

SUMMARY

This Section includes administrative and procedural requirements governing allowances.

Types of allowances include the following:

Contingency allowances.

SELECTION AND PURCHASE

SUBMITTALS

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

CONTINGENCY ALLOWANCES

Use the contingency allowance only as directed by the City.

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

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

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

EXAMINATION

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

PREPARATION

Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

SCHEDULE OF ALLOWANCES

Allowance No. 1: Include a contingency allowance of \$88,000 for use according to the City's instructions. The allowance shall be included in the Base Bid.

END OF SECTION 01020

SECTION 01 32 36

VIDEO MONITORING AND DOCUMENTATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
  - 1. Requirements for video recording surveillance system of the construction from mobilization to final completion.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 26 05 00 – Common Work Results for Electrical

1.02 SUBMITTALS

- A. Submit documentation as required to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions, and Section 26 05 00, Common Work Results for Electrical:
  - 1. Product Data:
    - a. Specification sheets (cut sheets) of proposed equipment.
  - 2. Sample:
    - a. Sample image of camera view.
  - 3. Shop Drawings:
    - a. Plan of proposed system including camera location(s).
  - 4. Special Procedure Submittals:
    - a. Video/image discs.

PART 2 PRODUCTS

2.01 PERFORMANCE

- A. Requirements:
  - 1. Provide, install and maintain a high definition megapixel web camera which will provide a view of the dam construction site from mobilization through final completion. The view and extent of the image shall not change throughout the project without approval from the Engineer.
  - 2. Provide secured web access for the City, Engineer, and Consultant to view current and past images.
  - 3. High resolution color day/night dome camera(s).
  - 4. Minimum of 480 lines of resolution.
  - 5. Vandal resistant camera housing.
- B. Criteria:
  - 1. Capture and save an image at least every 30 minutes, 24 hours a day.

2. Installed in accordance with the 2008 National Electric Code and the local authority having jurisdiction.
3. Equipment hardware shall be installed in accordance with UL requirements.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install all equipment and materials in accordance with the manufacturer's recommendations and specifications. The work shall also be in accordance with approved submittals and applicable codes.

#### 3.02 FIELD QUALITY CONTROL

- A. Operational Testing: The Contractor shall perform thorough operational testing and verify that all system components are fully operational.

#### 3.03 MAINTENANCE

- A. During the project period, the Contractor shall be responsible for maintenance and repair of the system including the repair of workmanship defects, free of charge (parts and labor).
- B. The installer shall correct any system defect within six (6) hours of receipt of call from the Engineer.

### **END OF SECTION**

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
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SECTION 02 41 00  
DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for demolition work at existing facilities, salvage of identified items and materials and removal of resulting rubbish and debris. In general, the extent of demolition work is as indicated and annotated on the Drawings and as necessary to accomplish new work, and includes:
1. Existing slide gate and related components.
  2. Existing formwork abandoned in-place.
  3. Concrete.
- B. Related Sections:
1. General Provisions and all Supplementary General Provisions
  2. Section 03 30 00 – Cast-in-Place Concrete.
  3. Section 35 22 26 – Slide Gates.

1.02 REFERENCES

- A. Definitions:
1. Authority Having Jurisdiction (AHJ): Building Code officials, zoning officials, inspectors, and government and regulatory agencies given the authority to protect the public's health, safety, and welfare.
  2. Construction and Demolition Debris: Discarded materials generally considered to be not water soluble and non-hazardous in nature, including but not limited to steel, glass, brick, concrete, asphalt material, pipe, gypsum wallboard, and lumber, from the construction or destruction of a structure as part of a construction or demolition project or from the renovation of a structure, including such debris from construction of structures at a site remote from the construction or demolition project site. The term includes rocks, soils, tree remains, trees, and other vegetative matter which normally results from land clearing or land development operations for a construction project; clean cardboard, paper, plastic, wood, and metal scraps from a construction project; effective January 1, 1997, except as provided in Section 403.707(13)(j), F.S., unpainted, non-treated wood scraps from facilities manufacturing materials used for construction of structures or their components and unpainted, non-treated wood pallets provided the wood scraps and pallets are separated from other solid waste where generated and the generator of such wood scraps or pallets implements reasonable practices of the generating industry to minimize the commingling of wood scraps or pallets with other solid waste; and de minimis amounts of other nonhazardous wastes that are generated at construction or demolition projects, provided such amounts are consistent with best management practices of the construction and demolition industries. Mixing of construction and demolition debris with other types of solid

waste will cause it to be classified as other than construction and demolition debris.

**B. Reference Standards:**

1. State of Florida
  - a. Florida Administrative Code (FAC)
    - 1) FAC 62-701.730 Construction and Demolition Debris Disposal and Recycling.
2. U. S. Government:
  - a. Code of Federal Regulations (CFR):
    - 1) Occupational Safety and Health Administration, Department of Labor (OSHA):
      - a) 29 CFR 1910 Occupational Health and Safety Standards.
      - b) 29 CFR 1926 Safety and Health Regulations for Construction.
    - 2) Environmental Protection Agency (EPA):
      - a) 40 CFR 60 Standards of Performance for New Stationary Sources.
      - b) 40 CFR 61 National Emission Standards for Hazardous Air Pollutants.
      - c) 40 CFR 62 Approval and Promulgation of State Plans for Designated Facilities and Pollutants.
      - d) 40 CFR 63 National Emission Standards for Hazardous Air Pollutants for Source Categories.
      - e) 40 CFR 122 EPA Administered Permit Programs: The National Pollutant Discharge Elimination System.
      - f) 40 CFR 131 Water Quality Standards.
  - b. United States Code:
    - 1) 15 U.S.C. Section 2601 et seq.
      - a) Federal Toxic Substances Control Act, Public Law 99-519, as amended.
    - 2) 33 U.S.C. Section 1251 et seq.
      - a) Water Quality Act of 1987, Public Law 100-4.
      - b) Clean Water Act of 1977, Public Law 95-217.
      - c) Federal Water Pollution Control Act Amendments of 1972, Public Law 95-500.
    - 3) 42 U.S.C. Section 6901 et seq.
      - a) Resource Conservation and Recovery Act (RCRA), Public Law 94-580.
    - 4) 42 U.S.C. Section 7401 et seq.
      - a) Clean Air Act, as amended by Public Law 101-549, 104 Stat. 2399.95-95.

**1.03 SYSTEM DESCRIPTION**

- A. Performance Requirements: The demolition work specified in this Section is not intended to be performed as a total wrecking operation but selective demolition as preparatory work relative to the performance of various construction operations in the Project.

## 1.04 PROJECT/SITE CONDITIONS

- A. Existing Conditions: The information presented on the Drawings is based on visual field examination of the site and review of existing record documents. While the information provided is believed to be correct, no assurance is implied relative to its total completeness or accuracy. Report discrepancies to Engineer before disturbing existing installations.
  - 1. The Drawings are intended to indicate the general nature of the demolition work required. Every facility appurtenant to those items designated for removal may not be indicated. Field verify dimensions, quantity, type, material, location, means of anchorages and support, interconnection with other facilities, and other pertinent characteristics of facilities which are to be removed or demolished to accommodate new facilities.
  - 2. The Contractor hereby distinctly agrees that neither the City nor the Consultant is responsible for the correctness or sufficiency of the information given and after the Contractor's own Site Investigation will have no claim for delay or extra compensation or damage against the City, Engineer or Consultant on account of the information given; and will have no claim for relief from any obligation or responsibility under the Contract with respect to the above stated stipulations.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Temporary Barriers: Materials needed or required for temporary protection in the form of barricades, fences, enclosures, cofferdams, etc., may be pre-used construction materials of sound condition and reasonably clean. However, the condition of these materials shall meet or exceed the requirements of governing agencies or approving bodies as may be involved with the work.
- B. Equipment: Equipment, machinery and apparatus, motorized or otherwise, used to perform the demolition work may be as chosen at the Contractor's discretion, but which will perform the work within the limits of the Contract requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Field Inspection: Prior to performance of the actual work, carefully inspect the sites of the indicated and annotated demolition work and locate those objects and structures designated to be demolished and removed.
  - 1. Verify with the Engineer the objects and structures to be demolished and removed.
- B. Utilities: Locate existing exposed and buried active utilities and determine the requirement for their protection, or their disposition with respect to the demolition work.

### 3.02 PREPARATION

- A. Protection: Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the City. This includes limiting vibrations that may cause damage to existing items. Repair or replace any damaged items at the Contractor's expense.
- B. Exterior Dust Control: To prevent unnecessary spread of dust during performance of exterior demolition work, thoroughly moisten the work surfaces and debris as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the site. Provide water for use in dust control.
- C. Interior Dust Control: To prevent spread of dust during performance of the interior demolition work, erect and maintain a dust tight temporary enclosure surrounding the areas of demolition. Fabricate such temporary enclosure from impervious materials such as plywood or sheet polyethylene supported on rough carpentry framing.
- D. Protection During Demolition: Exercise care during demolition work to confine demolition operations to the areas as indicated on the Drawings. The physical means and methods used for protection are at the Contractor's option. However, the Contractor shall be completely responsible for replacement and restitution work of whatever nature at no increase in Contract Price.
  - 1. Public Safety: If public safety is endangered during the progress of the demolition work, provide adequate protective measures to protect public pedestrian and vehicular traffic on streets and walkways.
  - 2. Facility Safety: If facility personnel are endangered during the progress of the demolition work, provide adequate protective measures to protect persons and vehicular traffic on the plant roadways and walkways.
  - 3. Barriers: Signs, signals and barricades used shall conform to requirements of Federal, State and local laws, rules, regulations, precautions, orders and decrees.

### 3.03 PERFORMANCE

- A. Existing Slide Gate Removal: Removal of the existing slide gate is a means and methods operation. The Contractor is responsible for verifying and accounting for the condition of the gate and verifying existing conditions and dimensions of all items related to the gate removal. The gate has been submerged for an extended period of time and as a result has experienced corrosion. Removal of the gate is anticipated to consist of cutting it into pieces and removing it through the temporary coffer dam, removing it vertically through the old sluice gate slot, or some other means. If the gate is removed through the old sluice gate slot, demolition preparation work is expected to include removal of the existing reinforced concrete cap (plugging the sluice gate slot) on the deck of the dam. If the concrete cap is removed, the contractor is responsible for replacing it in-kind, including repairing any damage, and replacing the deck surface coating.

- B. General Requirements: The means and methods of performing demolition and removal operations are the sole responsibility of the Contractor. However, equipment used, and methods of demolition and removal will be subject to approval of the Engineer.
  - 1. When removing concrete, saw cut, core or use robotic chipping to the limits of removal to accomplish new work to assure a smooth, uniform joint with new concrete installation.
  - 2. Surface preparation shall meet the requirements of Section 03 30 00 – Cast-in-Place Concrete.
- C. Salvage: The City has the right to claim as salvage, any items and materials permanently removed under the work of this Section. Should such right of salvage be exercised by the City, move and neatly store removed items on the site in a location agreeable to the City, in a manner approved by the Engineer. Contractor is responsible for maintaining the equipment in its existing condition and adequately protecting it during removal until the time it is provided to the City.
- D. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.
- E. Waste Management:
  - 1. Do not allow demolished materials to accumulate onsite. Containerize or otherwise store debris as work is in progress and/or dispose of demolished items and materials promptly.
  - 2. Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain City property, remove demolished materials from Site, and legally dispose of them in an EPA-approved landfill.
    - a. Comply with hauling and disposal regulations of the Authorities Having Jurisdiction (AHJ).
    - b. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Dispose of demolition debris off Site in a lawful manner.
  - 4. Hazardous Waste Landfill Records:
    - a. Maintain documentation indicating the receipt and acceptance of the hazardous wastes by a landfill facility licensed to accept hazardous wastes for the record.
  - 5. Burning debris on the Site is not permitted.

### 3.04 REPAIR / RESTORATION

- A. Restore adjacent areas to the conditions existing prior to the start of the demolition work.
- B. Use the same trade which originally constructed items that have been damaged to patch or repair these items at no increase in the Contract Price.

- C. Repair all damage to existing underground and overhead utilities, services, and improvements caused by demolition or other operations; whether or not such utilities, services, and improvements are indicated on the Contract Drawings.
  - 1. Commence and complete the work to repair damaged utilities as soon as practicable.

**END OF SECTION**

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SECTION 03 10 00  
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section covers the concrete formwork for construction of all concrete structures set forth on the Drawings and in these Specifications.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 03 30 00 – Cast-in-Place Concrete.

1.02 REFERENCES:

- A. American Concrete Institute:
  - 1. ACI 347 - Guide to Formwork for Concrete.
  - 2. ACI 350R - Environmental Engineering Concrete Structures.
- B. U.S. Department of Commerce Product Standards:
  - 1. PS-1-74 - Construction and Industrial Plywood.
  - 2. PS-20-70 - American Softwood Lumber.
- C. Western Wood Products Association: WWPA Catalog "A" Product Use Manual.
- D. American Plywood Association: APA Grade - Trademarks.
- E. Southern Pine Inspection Bureau: Standard Grading Rules for Southern Pine.

1.03 SUBMITTALS

- A. Submit documentation as required to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
  - 1. Form Coating: Submit manufacturer's descriptive product data and current specification covering named product, include certification that material is acceptable for use in structures processing or storing potable water.
  - 2. Form Ties: Submit manufacturer's descriptive product data, current specification covering named product, and two samples.

1.04 QUALITY ASSURANCE

- A. Formwork Design: Provide formwork designed to ensure the tolerances indicated and to include factors pertinent to safety of personnel during construction.
  - 1. Design formwork in accordance with American Concrete Institute's Guide to Formwork for Concrete, ACI 347, and in accordance with the following:

- a. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, temporary construction material, foundation pressures, stresses, lateral stability, and such other factors pertinent to safety of structure during construction.
  - b. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent construction.
- B. Allowable Tolerances: Set and maintain concrete forms within tolerance limits stated in American Concrete Institute's Guide to Formwork for Concrete, ACI 347.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection:
1. Protect formwork materials before, during, and after erection to ensure acceptable finished concrete work. Also protect in-place materials and work of other trades in connection with concrete work.
  2. In event of damage to erected forms, make necessary repairs or replacements prior to concrete pours. Perform such corrective work at no increase in Contract Price.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Lumber:
1. Form framing, sheathing, struts, braces and shoring in conformance with WWPA Catalog A or SPIB Grading Rules.
  2. Rough Structural and Dimension Lumber: Provide lumber of allowable species, surfaced four sides as applicable, and grade stamped with the appropriate WWPA or SPIB stamp indicating product compliance with PS-20-70.
  3. Use lumber free of material defects that would deform the finished concrete product.
- B. Plywood:
1. Form Sheathing and Panels: Not less than 5/8 inch thick Exterior Type B-B Plywood Class I and II EXT-APA conforming to U.S. Product Standard PS-1-74.
  2. Use Class II only on surfaces not exposed to view.
- C. Steel:
1. Metal Forms of a pre-engineered standard design, conforming to the concrete sections indicated on the Drawings, may be used in lieu of wood forms.
- D. Form Ties:
1. Provide factory-fabricated, adjustable-length, removable or snap-off metal form ties conforming to ACI 347 and ACI 350R.
  2. Use snap-off metal ties with ends that break at least 1½ inches from the face of the wall.
  3. Do not use removable ties that leave holes larger than one (1) inch.

4. In construction of liquid-retaining structures and structures designed to exclude groundwater, use ties that are designed to prevent seepage or flow of water along the embedded item.
  5. Do not use removable type form ties in construction of liquid-retaining concrete structures.
  6. Do not use wire ties, flat bands or form ties fabricated on the project site.
  7. Do not use wood spacers.
- E. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds. On surfaces which will be in contact with potable water, use no material which will add taste, odor, or toxic effects to the water.

### PART 3 EXECUTION

#### 3.01 INSPECTION

- A. Prior to placement of concrete, inspect forms for cleanliness and accuracy of alignment.

#### 3.02 PREPARATION

- A. Apply form coatings in accordance with manufacturer's specifications.
- B. Do not allow excess form coating material to accumulate in the forms.
- C. Do not allow form coatings to come in contact with construction joints and reinforcing steel.

#### 3.03 ERECTION

- A. General: Construct forms in accordance with ACI 347 to required dimensions, plumb, straight, mortar tight, and paste tight where appearance is important.
  1. Securely brace and shore forms to prevent displacement, bowing and pillowing, and to safely support imposed concrete load.
  2. Provide offsets, keyways, recesses, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and such other features as required. Use selected materials to obtain above requirements.
  3. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
  4. Form intersecting planes to provide true, clean-cut corners with edge grain of plywood not exposed to concrete.
  5. Build into forms, or otherwise secure in forms, items such as inserts, anchors, miscellaneous metal items, and such other embedded items as indicated on Drawings.

6. Wet forms sufficiently to prevent joints in wood forms from opening prior to concrete pour.
  7. Do not use stay-in-place metal forms.
- B. Openings: Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete.
1. Securely brace temporary openings and set tightly to forms to prevent the loss of concrete mortar. Locate temporary openings on forms in as inconspicuous a location as possible consistent with the requirements of the work.
  2. Provide openings in concrete formwork of the correct size and in the proper location to accommodate other items and operations of construction work passing through forms. Accurately place and securely support items to be built into forms.
- C. Earth Forms: Earth forms are not permitted.

### 3.04 CONSTRUCTION

- A. Form Removal
1. Remove forms in accordance with ACI 347 without damage to concrete and in a manner to ensure complete safety and serviceability of the structure.
    - a. Do not cut form ties back from the face of the concrete.
    - b. Concrete surface shall not contain residual form coating that will interfere with other materials or coatings to be applied.
  2. Do not remove supporting forms or shoring until the members have acquired sufficient strength to safely support their weight and the anticipated construction loads without distortion or excessive deflection. The Engineer's consent to remove forms does not relieve the Contractor of the responsibility for the safety of the work.
  3. When the atmospheric temperature at the site has been continuously above 50 degrees F. from the time of the pour, the forms shall be removed at the earliest practical time within the limits set forth in this paragraph, and wet curing shall continue without delay.
    - a. Forms for walls and other vertical faces may be carefully removed 24 hours after the last portion of concrete in the section involved has been placed, provided the concrete has sufficiently hardened to preclude damage resulting from form removal, and provided these members are not subjected to loads for a period of 14 days.
    - b. Maintain horizontal forms in place for a minimum of 14 days or until the concrete, as determined by job-cured cylinders, has attained a compressive strength of 3,000 psi.
    - c. Carefully remove forms for columns before the falsework is removed from beneath the beams or girders.
    - d. When a water-reducing retarder is used in the concrete mix, the normal time periods for removing forms may need to be increased.

4. When the atmospheric temperature at the site drops below 50 degrees F., leave all forms in place for at least 5 days regardless of the temperature within the protective covering or enclosure.
5. Upon removal of forms, notify the Engineer in order that a review of the newly stripped surfaces may be made before patching.

**3.05 RE-USE OF FORMS**

- A. Forms for re-use shall meet new form requirements with respect to effect on poured concrete appearance and structural stability.
- B. Do not delay or change the concrete pour schedule as a result of reusing forms compared to the schedule obtainable if all forms were new (in the case of wood forms) or if the total required forms were available (in the case of metal forms).

**END OF SECTION**

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SECTION 03 20 00  
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

- A. The work specified in this Section consists of furnishing and installing reinforcement for concrete structures.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 03 30 00 – Cast-in-Place Concrete.

1.02 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 315 - Details and Detailing of Concrete Reinforcement.
  - 2. ACI 318-02 - Building Code Requirements for Reinforced Concrete.
- B. American Society for Testing and Materials:
  - 1. ASTM A 82 - Specification for Cold-Drawn Steel Wire for Concrete Reinforcement.
  - 2. ASTM A 185 - Specification for smooth Welded Steel Wire Fabric for Concrete Reinforcement.
  - 3. ASTM A 615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, including Supplementary Requirements.
  - 4. ASTM A 663 - Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.
- C. Concrete Reinforcing Steel Institute: Manual of Standard Practice for Reinforcing Concrete Construction.

1.03 SUBMITTALS

- A. Submit documentation as required to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
  - 1. Shop Drawings and Product Data:
    - a. Prepare shop drawings of concrete reinforcement in accordance with American Concrete Institute's ACI 315.
    - b. Provide drawings showing all fabrication dimensions and locations for placing reinforcement and bar supports; indicate bending diagrams, splicing, and lap of rods, shapes, dimensions, and details of bar reinforcing and accessories.
  - 2. Test Reports:

- a. Submit copies of reports showing the results of tests, conducted in accordance with the American Society for Testing and Materials Specifications.
- b. Test Requirements may be waived based upon certified copies of mill test reports.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

##### A. Storage of Materials:

1. Store reinforcing materials in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
2. Identify bundles of reinforcing steel with tags wired to steel.

#### 1.05 PROJECT CONDITIONS

- ##### A. Protection: Protect in-place reinforcement from excessive construction traffic and other work.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

##### A. Reinforcing Steel:

1. Reinforcement Bars: ASTM A615, Grade 60, deformed steel, which shall satisfy the exceptions in ACI Building Code, AASHTO, and Federal Specifications.
2. Wire: ASTM A82.
3. Welded Wire Fabric: ASTM A185.
4. Metal Accessories: CRSI Manual of Standard Practice for Reinforcing Concrete Construction.

##### B. Rebar Splicing Coupler: A two-piece splicing system manufactured from ASTM A615 Grade 60 deformed rebar. A dowel bar splicer with integral nailing flange shall be threaded for a threaded down-in rebar such that the completed splice exceeds the tensile requirements of ACI 318.

1. Internal Coupler Protector: Provide coupler manufacturer's plastic internal coupler protector where couplers are provided for anticipated future additions.
2. Bar End Protectors: Plastic solid sleeve for placement over bar ends to protect threading from damage, contamination, and rust.
3. Use Rebar Splicing Coupler only where shown on Drawings or where approved by the Engineer.
4. Acceptable Manufacturers:
  - a. Richmond Screw Anchor Co.
  - b. Dayton Superior.
  - c. Or approved equal.

##### C. Dowel Bars (for shear transfer)

1. Plain round bar conforming to requirements of ASTM A663, Grade 70, 75 or 80 which is not burred, roughened or deformed out-of-round so slippage is not hindered.
2. Coat with curing compound to render surface bondless. See curing compound - Section 03 30 00.

## 2.02 FABRICATION

- A. General: Fabricate reinforcement to the dimensions indicated on the Drawings and within the tolerances given in ACI 315. Perform bending of steel reinforcement by the cold bending method.
1. Do not use bars with kinks or bends not indicated on Drawings.
  2. Perform bar shape fabrication in a manner that will not injure the material or lessen the member strength.
  3. Use a designed bending machine, either hand- or power-operated.
  4. Do not field bend bars partially embedded in concrete unless approved by the Engineer.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Notify the City 48 hours before placing concrete so the placement of metal reinforcement can be inspected.

### 3.02 INSTALLATION

- A. Placing:
1. Place metal reinforcement accurately and securely brace against displacement within permitted tolerances and in accordance with ACI 318 through the use of reinforcing accessories.
  2. Terminate reinforcement two inches from face of expansion joints.
  3. Continue reinforcement across or through construction joints.
  4. When obstructions interfere with the placement of reinforcement, pass such obstructions by placing reinforcing around it. Do not bend the reinforcing to clear the obstructions.
  5. Install welded wire fabric as indicated, lapping joints eight inches and wiring securely. Extend welded wire fabric to within two inches of sides and ends of slabs.
  6. Do not lay metal reinforcement on formwork.
  7. Place slab reinforcement supported from the ground on concrete blocks of the correct height and having a compressive strength equal to or greater than the specified compressive strength of the concrete that is being placed. Use concrete blocks not larger than 3 inches by 3 inches with a height equal to required bottom steel cover.

8. Reinforcement supported from formwork for slabs and beams not exposed to weather or to a continuous wet environment may use bar chairs made of plastic or metal. Use stainless steel boosters in areas exposed to a wet environment.
9. Place additional reinforcement around openings in slabs and walls as detailed on the Drawings.

**B. Splicing:**

1. Splice metal reinforcement as indicated on the Drawings and in accordance with ACI 318.
2. Welding of crossing bars (tack welding) is not permitted.
3. Secure metal reinforcement at intersections with not less than No. 16-gauge annealed wire or appropriate size clips. When bar spacing is less than 12 inches, tie alternate intersections.
4. Make mechanical butt splices in accordance with rebar splicing coupler manufacturer's installation instructions.

**C. Dowel Bar Installation:** Install one-half the length of coated bar dowel into slab to be poured.

**D. Cleaning:** Clean or otherwise protect metal reinforcement so that at the time concrete is placed, reinforcement is free from rust, scale or other coatings that will destroy or reduce bond.

**E. Concrete Reinforcement Protection:** Provide protection for reinforcement during concrete pours in accordance with ACI 318, unless indicated otherwise on the Drawings.

**END OF SECTION**

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. The work specified in this Section consists of designing mix, furnishing, placing, and curing Portland Cement concrete, reinforced and unreinforced, as indicated.
- B. Related Work
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 03 10 00 - Concrete Forming and Accessories.
  - 3. Section 03 20 00 - Concrete Reinforcing.
  - 4. Work Specified Under Other Sections: Items to be embedded in concrete are as specified in the various Sections of this Contract Specification. The responsibility for coordinating concrete pours with embedded items rests solely with the Contractor.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials: AASHTO M 182 - Burlap cloth made from Jute or Kenaf.
- B. American Concrete Institute:
  - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
  - 2. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
  - 3. ACI 211.2 - Standard Practices for Selecting Proportions for Structural Lightweight Concrete.
  - 4. ACI 213R - Guide for Lightweight Aggregate Concrete.
  - 5. ACI 301 - Specifications for Structural Concrete for Buildings.
  - 6. ACI 304R - Guide for Measuring; Mixing, Transporting and Placing Concrete.
  - 7. ACI 305R - Hot Weather Concreting.
  - 8. ACI 306R - Cold Weather Concreting.
  - 9. ACI 308 - Standard Practice for Curing Concrete.
  - 10. ACI 318 - Building Code Requirements for Reinforced Concrete.
  - 11. ACI 350R - Environmental Engineering Concrete Structures.
- C. American Society for Testing and Materials:
  - 1. ASTM C 31 - Methods of Making and Curing Concrete Test Specimens in the Field.
  - 2. ASTM C 33 - Specification for Concrete Aggregates.
  - 3. ASTM C 39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  - 4. ASTM C 42 - Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
  - 5. ASTM C 78 - Test Method Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
  - 6. ASTM C 94 - Specification for Ready-Mixed Concrete.

7. ASTM C 143 - Test Method for Slump of Portland Cement Concrete.
8. ASTM C 150 - Specification for Portland Cement.
9. ASTM C 156 - Test Method for Water Retention By Concrete Curing Materials.
10. ASTM C 171 - Specification for Sheet Materials for Curing Concrete.
11. ASTM C 172 - Methods of Sampling Freshly Mixed Concrete.
12. ASTM C 173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C 192 - Method of Making and Curing Concrete Test Specimens in the Laboratory.
14. ASTM C 231 - Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
15. ASTM C 260 - Specification for Air-Entraining Admixtures for Concrete.
16. ASTM C 309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
17. ASTM C 330 - Specification for Lightweight Aggregate for Structural Concrete.
18. ASTM C 494 - Specification for Chemical Admixtures for Concrete.
19. ASTM D 695 - Test Method for Compressive Properties of Rigid Plastics.
20. ASTM D 1751 - Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
21. ASTM D 1752 - Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
22. ASTM C989 - Standard Specification for ground granulated blast-furnace slag for use in concrete and mortars.

D. U.S. Army Corps of Engineers Specifications: CRD-C 572 - Specification for Waterstop.

E. Federal Specifications: Fed. Spec. TT-C-800A - Curing Compound, Concrete, for New and Existing Structures.

### 1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive product data and current specifications for the concrete accessories specified herein (admixtures, joint fillers, curing materials, floor hardeners, waterstops, etc.). Include installation instructions.
- B. Samples: Submit samples of materials being used when requested by the Engineer including names, sources, and descriptions.
- C. Design Mix: Prior to production of concrete, submit to the Engineer, on form attached at the end of this Section, all mix designs proposed for project. Include with the mix design a standard deviation analysis in accordance with ACI 301 Section 4.2 or trial mixture test data proposed in ACI 301 Section 4.2. Use materials in such proposed design mix as specified herein. Make such adjustments in the proposed design mix as directed by the Engineer. Make such adjustments at no increase in contract price.
- D. Test Reports: Submit concrete test reports specified in Part 3, Field Quality Control in this Specification.

- E. Certificates: Furnish the Engineer and local authorities requiring same, certificates originated by the batch mixing plant certifying ready mixed concrete, as manufactured and delivered, to be in conformance with ASTM C 94.
- F. Delivery Tickets: A delivery ticket shall accompany each load of concrete from the batch plant.
  - 1. Tickets must be signed by the Contractor's representative, noted as to time and place of pour, and kept in a record at the site. Make such records available for inspection upon request by the Engineer.
  - 2. Information presented on the ticket to include the tabulation covered by ASTM C 94, Section 16, as well as any additional information the local codes may require.
- G. Schedule: Submit schedule showing methods, construction joint locations, and sequence of pouring a minimum of 10 days prior to placing concrete.
- H. Testing Agency: Submit name and qualifications of Testing Agency to Engineer prior to proceeding with testing.

#### 1.04 QUALITY ASSURANCE

- A. Testing Agency: An agency regularly performing work conforming to The American Society for Testing and Materials ASTM E 329, Recommended Practice for Inspection and Testing Agencies for Concrete and Steel in Construction.
- B. Source Quality Control:
  - 1. Laboratory Tests: Materials stated herein require advance examination or testing according to methods referenced, or as required by the Engineer.
  - 2. Compression Test Cylinders: For laboratory trial batches, make in accordance with American Concrete Institute ACI 301. Test to consist of three compression test cylinders for each class of concrete with one broken at seven days and two broken at 28 days; ASTM C 192 and ASTM C 39.

#### 1.05 PROJECT CONDITIONS

- A. ACI Compliance: Cast-in-place concrete work shall conform to ACI 301 except as modified by these Specifications or the Drawings.
- B. Concrete Encasement of Pipes: Encase pipes under structures and buildings indicated by the Drawings to be encased in concrete for the full length of the pipe run under the structure.
- C. Equipment Bases: Construct reinforced concrete bases for equipment and piping under this contract at no increase in contract price.

#### 1.06 SEQUENCING

- A. Where other construction work is relative to concrete pours, or must be supported by or embedded in concrete, those performing such related work must be given five days notice to introduce or furnish embedded items before concrete is placed.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Cement:
1. Portland Cement: ASTM C 150 of the following Type:
    - a. Type II, Moderate Sulfate Resistance.
  2. Only one brand and manufacturer of approved cement shall be used for exposed concrete.
  3. Cementitious material is a mixture of cement and ground granulated blast –furnace slag (GGBFS).
- B. Crystalline Waterproofing Additive: Add crystalline waterproofing to all concrete.
1. Concrete waterproofing system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction, and shall protect the concrete from deterioration due to harsh environmental conditions.
  2. Dosage rate to be 2% of the total cementitious material content. Add Xypex at the batch plant.
  3. Acceptable Manufacturer: Xypex.
- C. Normal weight Concrete Aggregates: Process aggregate meeting requirements of ASTM C 33 and subject to the following limitations.
1. Coarse Aggregate Size: Maximum size of coarse aggregate shall not exceed the following requirements but in no case larger than 1½ inches.
    - a. One-fifth narrowest dimension between sides of forms within which concrete is to be cast.
    - b. Three-fourths of the minimum clear spacing between reinforcing bars.
    - c. One-third the slab thickness for unreinforced slabs.
    - d. Reduced aggregate concrete containing aggregate with particle size not less than 1/8 inch nor more than 1/2 inch in any dimension and a maximum of 5 percent of particles passing a No. 8 sieve (for use in metal pan stairs only).
- D. Water: Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or reinforcement.
- E. Concrete Admixtures:
1. Prohibited Admixtures: Use only non-corrosive, non-chloride admixtures.
  2. Provide admixtures produced and serviced by established, reputable manufacturers and use in compliance with manufacturer's recommendations.
  3. Air-Entraining Admixture: Use a product conforming to requirements of ASTM C260.
  4. Water-Reducing Admixture: Use a product conforming to requirements of ASTM C494 Type A. (Use this for all concrete except where an admixture listed below is used).
    - a. Acceptable Manufacturers:
      - 1) Eucon WR-75; The Euclid Chemical Company.
      - 2) Pozzoloth 220N; Master Builders.
      - 3) Plastocrete 161; Sika Corporation.
      - 4) Or approved equal.

5. Water-Reducing and Retarding Admixture: Use a product conforming to requirements of ASTM C494, Type D.
    - a. Acceptable Manufacturers:
      - 1) Eucon Retarder-75; The Euclid Chemical Company.
      - 2) Pozzolith 100XR; Master Builders.
      - 3) Plastiment; Sika Corporation.
      - 4) Or approved equal.
  6. Water-Reducing, and Acceleration Admixture: Use a product conforming to requirements of ASTM C494, Types C or E. Not permitted for use in concrete for water retaining structures.
    - a. Acceptable Manufacturers:
      - 1) Accelguard 80; The Euclid Chemical Company.
      - 2) MasterSet FP 20; Master Builders.
      - 3) Plastocrete 161 FL; Sika Corporation.
      - 4) Or approved equal.
  7. Store admixtures in a manner to prevent contamination, evaporation, moisture penetration, or damage. Do not use products which have been stored longer than 6 months.
  8. Prior to the mix design review by the Engineer, provide written conformance to the specified requirements of the admixture.
- F. Preformed Expansion Joint Fillers:
1. Non-extruding and Resilient Bituminous Types (for exterior use in pavements and sidewalks only): ASTM D1751.
  2. Sponge Rubber and Cork Type: ASTM D1752.
  3. Self Expanding Cork Type: ASTM D1752.
  4. Acceptable Manufacturers:
    - a. A. C. Horn.
    - b. Greenstreak.
    - c. Or approved equal.
- G. Vinyl Waterstops: Ribbed type manufactured from virgin polyvinyl chloride plastic compound conforming to U.S. Corps of Engineers CRD-C 572.
1. Retrofit Waterstop: 6 x 3/8-inch with 3-3/16 inch T leg; such as Greenstreak Product No. 609, or approved equal.
- H. Surface Applied Waterstop: A specially formulated joint sealant which swells upon contact with water. Provide waterstop packaged in continuous length coils. Material composition as follows:
1. Chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties.
  2. Waterstop shall have a coating formulated to inhibit initial expansion due to moisture presence in the fresh concrete.
  3. Size: Dual extrusion design; 10 mm by 20 mm.
  4. Waterstop shall be secured to hardened concrete with the waterstop manufacturer's standard adhesive binder.
  5. Acceptable Manufacturers:
    - a. Greenstreak; Hydrotite CJ.
    - b. ADEKA; Ultraseal.

- c. Or approved equal.
- I. Curing Materials. Use curing materials that will not stain or affect concrete finish or lessen the concrete strength and comply with the following requirements:
  - 1. Burlap: Materials conforming to AASHTO M 182.
  - 2. Sheet Materials: Material conforming to ASTM C 171.
  - 3. Liquid Curing Compound.
    - a. Use curing compounds which are nontoxic and free of taste, odor and complies with low V.O.C. requirements.
    - b. Where a finish material is to be applied over concrete with architectural finish, provide certification by the product manufacturer stating the curing compound as non-detrimental to the bond of the finish material.
    - c. Acceptable Manufacturers:
      - 1) L&M Cure; L&M Construction Chemicals, Inc.
      - 2) Masterkure; Master Builders.
      - 3) Or approved equal.
- J. Epoxy Bonding Compound: A high-modulus, low-viscosity, moisture-insensitive epoxy adhesive having the following properties:
  - 1. Compressive Properties, ASTM D 695 at 28 days;
    - a. Compressive Strength: 8,000 psi. min.
  - 2. Tensile Properties, ASTM D 638 at 14 days.
    - a. Tensile Strength: 4,000 psi. min.
    - b. Elongation at Break: One to three percent.
    - c. Modulus of Elasticity:  $3 \times 10^5$  psi.
  - 3. Bond Strength, ASTM C 882:
  - 4. Plastic concrete to hardened concrete at 14 days (moist cure): 1,700 psi. min.
  - 5. Mixed epoxy resin adhesive shall conform to ASTM C 881, Type II, Grade 2, Class B and C.
  - 6. Acceptable Manufacturers:
    - a. Sika Corporation; Sikadur 32 Hi-Mod.
    - b. Euclid Chemical Company; Euco Epoxy #452 MV or #620.
    - c. Or approved equal.
- K. Epoxy Adhesive (for grouting dowels): Two-component, high strength, moisture tolerant epoxy adhesive:
  - 1. Mixed epoxy resin adhesive shall conform to ASTM C 881.
  - 2. Acceptable Manufacturers:
    - a. Hilti HIT RE 500 V3, [www.hilti.com](http://www.hilti.com).
    - b. Simpson XP, [www.simpsonanchors.com](http://www.simpsonanchors.com).
    - c. Or approved equal.
- L. Crack Injection: (Crack/Joint Repair): Low viscosity, expanding, polyurethane chemical grout to stop water infiltration
  - 1. ANSI/NSF61 approved for potable water content
  - 2. Tensile Properties, ASTM D 190 63
    - a. Tensile Strength: 150 psi
  - 3. Elongation Properties,

- a. Elongation 250%
- 4. Shrinkage Properties, ASTM D 1042
  - a. Less than 4%
- 5. Acceptable Manufacturer:
  - a. Sika Corporation: SikaFix HH LV
  - b. Or approved equal.

2.02 MIXES

- A. Selection of Proportions of Normal weight Concrete: ACI 211.1.
- B. Proportions of Ingredients: Establish proportions, including water ratio on the basis of either laboratory trial mixture tests or standard deviation analysis, with the materials specified herein.
  - 1. Laboratory Trial Mixture Test: ACI 301, Section 4 and ACI 318, Section 5.3.
  - 2. Standard Deviation Analysis: ACI 301, Section 4 and ACI 318, Section 5.3.
- C. Water-Cementitious Material Ratio:
  - 1. Class A Concrete shall have a maximum water- cementitious material ratio of 0.42.
  - 2. Class B Concrete shall have a maximum water- cementitious material ratio of 0.55.
  - 3. Proportion Class C Concrete to meet the strength requirement.
- D. Slump: Proportion and produce concrete to a slump as indicated below. The slump ranges apply when vibration is used to consolidate the concrete.

Types of Construction	Slump, in.	
	Maximum*	Minimum
Reinforced foundation walls and footings	3	1
Plain footings, caissons, and substructure walls	3	1
Slabs, beams and reinforced walls	4	1
Building columns	4	1
Pavements and slabs-on-grade	3	1
Mass concrete	2	1

\* May be increased 1 in. for methods of consolidation other than vibration.

- 1. Pumped concrete shall have a 5-inch maximum slump, measured prior to pumping.

2.03 ADMIXTURES

- A. Water-Reducing Admixture: Unless high temperatures occur or placing conditions dictate a change, use concrete containing a water-reducing admixture.

- B. Water-Reducing and Retarding Admixture: When high temperatures occur or placing conditions dictate, the water-reducing admixture (Type A) may be replaced with a water-reducing and retarding admixture (Type D). Notify the Engineer of such change and submit product data prior to placement of concrete.
- C. Water-Reducing and Accelerating Admixture: When low temperatures occur or placing conditions dictate, the water-reducing admixture (Type A) can be replaced with a water-reducing and accelerating admixture. Notify the Engineer of such change and submit product data prior to placement of concrete. Water-reducing and accelerating admixture (Type C and E) will not be permitted in concrete for water retaining structures.

## 2.04 SOURCE QUALITY CONTROL

- A. General Requirement: Provide only Class A concrete in the project except for those cases where indicated otherwise on the Drawings or specified otherwise.
  - 1. Where in-ground encasement of piping is required, provide Class B concrete.
  - 2. Where in-ground encasement of conduit runs is required, provide Class B concrete.
- B. Classes of Concrete:
  - 1. Class A: 4,500 psi minimum compressive strength at 28 days; 564 pounds per cubic yard minimum cementitious material content.
  - 2. Class B: 3,000 psi minimum compressive strength at 28 days; 517 pounds per cubic yard minimum cementitious material content.
  - 3. Class C: 2,000 psi minimum compressive strength at 28 days; minimum cement content per cubic yard in accordance with current ready-mix plant standard practice.
- C. Specified Flexural Strength at 28 Days: Class A: 603 psi.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Inspect work to receive cast-in-place concrete for deficiencies which would prevent proper execution of the finished work. Do not proceed with placing until such deficiencies are corrected to the satisfaction of the Engineer.

### 3.02 PREPARATION

- A. Joints:
  - 1. Bonding to New Concrete: Bond fresh concrete with hardened previously poured new concrete in accordance with the following:
    - a. Roughen and clean hardened concrete of foreign matter and laitance and dampen with water.
    - b. Cover the hardened concrete with a heavy coating of grout to approximately ½-inch thickness. Use grout of same material composition and proportions of concrete being poured except coarse aggregate omitted. Use grout with a slump of 6 inches minimum.
    - c. Place new concrete on grout before it has attained its initial set.
    - d. Other bonding methods must be approved by Engineer prior to use.

2. Bonding to Existing Concrete: Roughen existing concrete in the area of bonding to produce exposed aggregate and an absolutely uncontaminated concrete surface.
  - a. Apply Epoxy Bonding Compound over existing prepared concrete in accordance with manufacturer's instructions.
3. When concreting is to be discontinued for more than forty-five (45) minutes and if the construction plane is to be horizontal, install keyways, waterstops and embed dowels in the concrete before initial hardening. Use keyways and dowels in vertical concrete construction only when indicated or directed by the Engineer. Use waterstops for water retaining structures or structures below grade. Horizontal joints are not permitted in slabs or footings.
  - a. Extend dowels placed in joint one splice length into wall and one splice length into next concrete pour.

B. Embedded Items:

1. PVC Waterstops:

- a. Install in all joints where watertightness is required.
    - 1) Vinyl Waterstops:
      - a) Use ribbed-type waterstops of the following dimensions except as otherwise indicated on the Contract Drawings.
        - (1) Expansion joints in new construction: 9 inches wide by 3/8 inch thick, with center bulb.
        - (2) Contraction and construction joints: 6 inches wide by 3/8 inch thick; no center bulb.
  - b. Use continuous lengths without splices where possible.
  - c. Provide factory-formed and tested waterstop corners and intersections leaving only straight butt joint splice in the field.
  - d. Connect all adjoining waterstops including vertical and horizontal runs to provide a continuous water barrier.
  - e. Splices:
    - 1) Strength: Not less than 50% of the mechanical strength of the parent section.
    - 2) Watertightness: Make equal to that of continuous material.
    - 3) Heat seal adjacent surfaces in accordance with manufacturer's recommendations using a thermostatically controlled electric source of heat that provides sufficient heat to melt but not to char the material.
  - f. Adequately support waterstops to prevent displacement and deformity of the waterstops during concrete pours. Maintain two inch minimum clearance between waterstop and reinforcing steel.
  - g. Center waterstop on joint with one-half of waterstop width to be embedded in concrete on each side of joint. At expansion joints, keep center bulb unembedded.
  - h. In substructures and other structures required to be watertight, install waterstops if concreting is discontinued for a sufficient length of time which, in the opinion of the Engineer, may result in seepage cracks in concrete.
2. Surface Applied Waterstop Installation: Install surface applied waterstop at such location where indicated on the Drawings.
    - a. Install the waterstop in strict accordance with the manufacturer's installation instructions and with respect to the environmental requirements specified therein and substrate preparation.

3. Embedded Pipes and Conduits: Material not harmful to concrete may be permitted to be embedded in concrete upon approval by the Engineer. Items embedded shall satisfy the following:
    - a. Maximum outside dimension not greater than one-third the overall thickness of the member in which it is embedded.
    - b. Minimum spacing between items not less than 3 widths on center nor 3 inches clear between items.
    - c. Item shall not impair strength of member.
    - d. Provide 2 inch minimum clearance to face of slab.
- C. Anchoring Reinforcement Dowels into Existing Concrete:
1. Drill holes for each dowel to the size and depth indicated on the Drawings with carbide tip bit or star bit. Core drilling will not be permitted. Do not drill into or cut or otherwise damage existing reinforcement bars. If existing reinforcement bars are encountered during the drilling operation, relocate the hole to clear the existing reinforcement as directed by the Engineer.
  2. Blow clean each finished hole with an oil free air jet and then flush with a jet of clean water.
  3. Immediately prior to the grouting operation, remove all water from the hole and from the walls of the hole.
  4. Pump dispensing gun for proper mixture. Insert nozzle and pump epoxy adhesive into the hole and insert reinforcement dowels. Do not retemper grout that has begun to stiffen; discard such grout.

### 3.03 CONSTRUCTION

#### A. Production of Concrete

1. Ready-Mixed Concrete:
  - a. Batched, mixed and transported in accordance with ASTM C94.
  - b. Add admixtures to the mix in accordance with ACI 301.
  - c. Plant equipment and facilities conforming to the "Check List for Certification of Ready Mixed Concrete Production Facilities" of the National Ready Mixed Concrete Association.

#### B. Placing

1. General: Conduct placement work in accordance with ACI 304R and such additional requirements as specified herein.
  - a. Complete discharge of the concrete within 1 ½ hours or before the mixing drum has revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates.
2. Preparation:
  - a. Prepare formwork in advance and remove snow, ice, water, and debris from within forms.
  - b. Pre-position reinforcement in advance of concrete pours.
  - c. Pre-position waterstops, expansion joint materials, anchors, and embedded items in advance of concrete pours.

- d. Sprinkle subgrades sufficiently to eliminate water loss from concrete in accordance with ACI 301 Chapter 11.
- e. Do not place concrete on frozen surfaces.
- 3. Conveying:
  - a. Handle concrete from mixer to final deposit rapidly by methods which will prevent segregation or loss of ingredients to maintain required quality of concrete.
  - b. Do not convey concrete through aluminum or aluminum alloy.
  - c. Do not place concrete with pumps or other similar devices without prior written approval of the Engineer.
  - d. Placing concrete by pumping methods shall conform to the applicable requirements of ACI 304R, Chapter 9, and ACI 304.2R.
- 4. Depositing:
  - a. Do not drop concrete freely where reinforcing will cause segregation, nor more than four (4) feet.
  - b. Deposit concrete in approximately horizontal layers of 12 to 18 inches.
  - c. Do not allow concrete to flow laterally more than three feet.
  - d. Place concrete at such a rate that concrete which is being integrated with fresh concrete is still plastic.
  - e. Do not deposit concrete on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within sections.
  - f. Do not use concrete which has partially hardened or has been contaminated by foreign materials.
  - g. Do not subject concrete to procedures which will cause segregation.
  - h. Do not place concrete in forms containing standing water.
  - i. Make placement within sections continuously to produce monolithic unit.
  - j. Do not begin placement of concrete in beams or slabs until concrete previously placed in walls or columns have attained initial set.
  - k. Do not bend reinforcement out of position when placing concrete.
- 5. Consolidation:
  - a. Consolidate concrete by vibration, spading, rodding, or other manual methods. Work concrete around reinforcement, embedded items and into corners; eliminate all air or stone pockets and other causes of honeycombing, pitting or planes of weakness.
  - b. Use vibration equipment of internal type and not the type attached to forms and reinforcement.
  - c. Use vibrators capable of transmitting vibration to concrete in frequencies sufficient to provide satisfactory consolidation.
  - d. Do not leave vibrators in one spot long enough to cause segregation. Remove concrete segregated by vibrator operation.
  - e. Do not use vibrators to spread concrete.
  - f. Have sufficient reserve vibration equipment to guard against shutdown of work occasioned by failure of equipment in operation.
- 6. Cold Weather Concreting: Perform cold weather concrete work in accordance with ACI 306R and the following additional requirements.
  - a. Provide concrete delivered at the job-site in accordance with the following temperature limitations:

Air Temperature	Minimum Concrete
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Deg. F	Temperature, deg F	
	For sections with least dimension less than 12 in.	For sections with least dimension 12 in or greater
30 to 45	60	55
0 to 30	65	60

- b. Provide equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather.
  - c. Maintain concrete at temperatures listed in Table 1.4.1 of ACI 306R as follows, after the concrete has developed a compressive strength of 500 psi:
    - 1) slab-on-grade: 2 days.
    - 2) walls and supported slabs: 3 days.
  - d. If the strength is not achieved, maintain the minimum temperature an additional 24 hours or until the 500 psi strength is reached.
  - e. Make additional concrete cylinders to verify strength achievement of 500 psi; however, additional cylinders are not required for every pour, provided concrete temperatures are maintained fairly uniform. Once two sets of cylinders have been broken and a strength of 500 psi is achieved, additional cylinders will not be required, except for random testing as determined by the Engineer.
  - f. Remove temperature protection after 500 psi is achieved, but in a manner so thermal shock does not occur to the exposed concrete. The removal criteria shall be as stated in ACI 306R.
  - g. Leave housing, covering, or other protection used in curing intact at least 24 hours after artificial heating is discontinued.
  - h. Surfaces with which the concrete is to come in contact must be free of frost, snow and ice. Subgrade shall be free of frost. Do not place concrete around any embedment which has a temperature below freezing.
  - i. If water or aggregate is heated above 100 degrees F, combine water with aggregate in the mixer before cement is added. Do not mix cement with water or with mixtures of water and aggregate having a temperature greater than 100 degrees F.
  - j. Provide equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. Do not use foreign materials or materials containing snow or ice.
  - k. Surfaces with which the concrete is to come in contact with must be free of frost, snow to and ice.
7. Hot Weather Concreting: Perform hot weather concrete work in accordance with ACI 305R and the following additional requirements.
- a. Temperature of concrete delivered at the job-site shall not exceed 90 degrees F.
  - b. Cool ingredients before mixing to prevent temperature in excess of 90 degrees F.
  - c. Make provisions for windbreaks, shading, fog spraying, sprinkling or wet cover when necessary.
8. Underwater Concreting: In general, perform underwater concreting work in accordance with ACI 304R Chapter 8 and the following requirements:
- a. When permitted by Engineer, foundation concrete may be placed in still water.

- b. Concrete placed in water shall contain an additional twenty percent of cement above the amount specified for the particular class of concrete used. No additional compensation will be allowed for this added cement.
- c. Do not deposit concrete in water which has a temperature below 40 degrees F.
- d. Place the concrete underwater continuously through a tremie pipe. Diameter of the tremie pipe shall be approximately eight times the maximum size of the largest coarse aggregate. Use seal in pipe to start concrete placement, and keep filled with concrete continuously with the end of the pipe embedded in the placed concrete at all times. If seal is lost, withdraw pipe and reseal and start charging operations again.
- e. Protect placed concrete from water motion for at least four days and longer if required.

C. Finishing:

1. General: Finish concrete in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material.
2. Formed Surfaces: Provide one or more of the following finishes to the surfaces of the concrete after removal of forms. The locations where these finishes are required are listed herein or specified on the Drawings. Allowable surface irregularities are designed as either "abrupt" or "gradual." Check gradual irregularities using 10 foot straightedges.
  - a. "Rough Form" finish: Surface may include roughness and irregularities not to exceed ½ inch, but tie holes and defects shall be patched.
  - b. "Ordinary Wall" finish: Surface that is true and uniform without any conspicuous offsets or bulges. Gradual irregularities not to exceed ½ inch and abrupt irregularities not to exceed 1/4 inch.
  - c. "Plywood" finish: Similar to the ordinary wall finish. Construct the surface of the forms using 5/8-inch plywood or boards lined with tempered hardboard not less than 3/16 inch thick. Place the plywood or liner sheets in an orderly and symmetrical arrangement using sheets as large as practicable. Do not use sheets showing torn grain, worn edges, patches of holes from previous use, or other defects which will impair the texture of the concrete surfaces. Remove gradual irregularities exceeding ½ inch and abrupt irregularities exceeding 1/8 inch. Completely remove all fins on the surface. Rub all surfaces which cannot meet these requirements.
  - d. "Rubbed" finish: Apply to a freshly hardened "plywood" finish. Complete rubbing within one day of removal of forms. Wet surfaces and rub with a carborundum brick or other abrasive until all form marks, projections, and irregularities have been removed and a smooth uniform surface, texture, and color are produced. Wash the surface clean after rubbing.
3. Unformed Surfaces: In concrete having unformed surfaces, use just sufficient mortar to avoid the necessity for excessive floating. Slope exposed unformed surfaces to provide quick, positive drainage and to avoid puddles in low spots. Unless otherwise noted, set floor drains 1/2 inch below the normal floor elevation and slope floor toward the drain. Slope all surfaces exposed to weather 1/4 inch per foot for drainage unless noted otherwise on Drawings.
  - a. "Floated" Finish: After concrete has been placed, consolidated, struck off and leveled, do not work further until ready for floating. Begin floating when water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after first floating, check planeness of surface with a ten foot straightedge applied at not less than two different angles. Cut down high spots and

fill low spots during this procedure to produce a surface with true planes within 1/4 inch in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction. Following straightedge checking, refloat slab immediately to a uniform sandy texture.

- b. "Steel Trowel" Finish: Obtained by working a floated finish with a steel trowel. First troweling shall produce a smooth surface which is relatively free of defects but which may still show some trowel marks. Perform additional trowelings by hand after the surface has hardened sufficiently. Perform final troweling when a ringing sound is produced as the trowel is moved over the surface. Thoroughly consolidate surface by hand trowel operations. Produce finished surface essentially free of trowel marks, uniform in texture and appearance, with true planes within 1/4 inch in ten feet, as determined by a ten foot straightedge placed anywhere on the slab in any direction.
  - c. "Broom or Belt" Finish: Immediately after concrete has received a floated finish, give surface a coarse transverse scored texture by drawing a broom or burlap across the surface.
4. Application for Finishes: Except where the type of finish is indicated on the drawings or under "Special Finish", all concrete surfaces shall be finished as indicated below.
- a. "Rough Form" Finish:
    - 1) All surfaces to be covered by earth and not exposed to view.
  - b. "Ordinary Wall" Finish:
    - 1) Interior and exterior wall and slab surfaces not exposed to view.
    - 2) Inside vertical surfaces of tank type structures below an elevation which is 18 inches below normal water surface.
  - c. "Plywood" Finish:
    - 1) All surfaces to be painted.
  - d. "Rubbed" Finish:
    - 1) All interior and exterior surfaces exposed to view which are not to be painted.
    - 2) All exterior surfaces to a point 6 inches below finished ground.
    - 3) Inside vertical surfaces of tank type structures above an elevation which is 18 inches below normal water surface.
    - 4) Equipment pads, pipe supports, etc.
  - e. "Floated" Finish:
    - 1) All unformed surfaces unless otherwise specified.
  - f. "Steel Trowel" Finish:
    - 1) Interior floors of structures except where Architectural Finish is to be applied.
    - 2) Tops of exposed walls.
  - g. "Broom or Belt" Finish:
    - 1) Sidewalks.
    - 2) Walkways.
    - 3) Top surface of top slab of control tower.

### 3.04 CURING AND PROTECTION

- A. General: Immediately after placement and finishing, protect concrete from premature drying, excessive hot or cold temperatures and mechanical injury. Perform curing by water curing, sheet form curing, or liquid membrane forming methods in accordance with ACI 308. Cure

concrete continuously for a minimum of seven days at ambient temperatures above 40 degrees F.

- B. Hot Weather Curing: See Hot Weather Concreting this Section.
- C. Cold Weather Curing: See Cold Weather Concreting this Section.
- D. Application of Liquid Curing Compound:
  - 1. Finishing operations must be completed prior to application. Apply compound as soon as the free water on the surface disappears and no water sheen is visible. Surface shall be capable of taking walking workmen without being marred. Apply compound in two (2) applications.
  - 2. Do not apply curing compound to construction joint surfaces. Protect exposed reinforcement during application of curing compound. Water cure those areas not coated with compound.
  - 3. Do not use liquid curing compound when the ambient air temperature during placement and for 24 hours after placement is or will fall below 35 degrees F.
  - 4. Do not use liquid curing compounds on concrete surfaces which will receive later treatments, such as hardeners, special finishes, protective coating, damp proofing, waterproofing, future grout, grout fill, or coatings.
- E. Curing of surfaces to receive Membrane Waterproofing shall be controlled by water fog spraying, water damped coverings, and/or impermeable sheet film cover for the full 7-day period specified above. All concrete surfaces shall have a minimum cure of 28 days before application of the membrane. The use of liquid membrane-forming curing compounds on these surfaces is prohibited.
- F. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

### 3.05 INJECTION REPAIR CONCRETE CRACKS/JOINTS

- A. Repair Procedure:
  - 1. Crack must be clean and sound. All efflorescence shall be removed prior to injecting.
  - 2. Drill 5/8" diameter holes along the side of the crack/joint at a 45° angle.
  - 3. Follow manufacturer's recommendations for installation.
  - 4. Once ports are used and crack/joint is completely injected, knock off outside of port and cover the hole with polymer repair mortar.

### 3.06 FIELD QUALITY CONTROL

- A. Testing and Inspection:
  - 1. During the entire period when concrete is being placed, provide testing services by an independent testing laboratory at no cost to the City.
  - 2. The Engineer reserves the right to make any and all tests as he deems necessary during the progress of the work.
  - 3. Failure of the independent testing laboratory or the Engineer to detect defective work will not prevent rejection when defect is later discovered, nor will it obligate the Engineer for final acceptance.

4. The Independent Testing Laboratory shall:
  - a. Obtain composite samples in accordance with ASTM C172.
  - b. Mold and cure three test specimens for each strength test in accordance with ASTM C 31 and as follows:
    - 1) Concrete compression test: Use standard 6 inch x 12 inch cylinders.
    - 2) Concrete flexural strength: Use 6 inch x 6 inch x 12 inch beams.
    - 3) Identify each test by number, mix, amount of admixture, origin of sample in the structure, the date the test specimen was made, the date the test specimen was tested, the amount of slump determined, and the compressive and flexural strength test results.
    - 4) Test Methods:
      - a) Compressive strength test: ASTM C39.
      - b) Flexural strength test: ASTM C78 ((Required only for slabs-on-grade subject to wheel loads)).
      - c) Test one specimen at 7 days for information and test two specimens at 28 days for acceptance. A strength test is the average of the strengths of the two cylinders tested at 28 days.
      - d) Perform one strength test for each 50 cu. yds. of concrete poured, unless waived by the Engineer, but not less than one test for each structure.
  - c. Make slump tests for each truck load upon truck arrival at the job-site and whenever consistency of concrete appears to vary in accordance with ASTM C 143.
  - d. Make air content tests for each truck load upon truck arrival at the job-site in accordance with ASTM C231 or ASTM C173.
  - e. Prepare and submit all reports required in the various standards and specifications referenced herein.
    - 1) Distribution of reports shall be:
      - a) Two copies to the Engineer.
      - b) One or more copies, as required, to the Contractor.
  - f. Immediately notify the Contractor and the Engineer of any test results which do not conform to the Specification requirements.

B. Evaluation and Acceptance:

1. The strength level of the concrete will be considered satisfactory if the averages of all sets of three consecutive strength tests equal or exceed specified strength and no individual strength test result is below specified strength by more than 500 psi.
2. If the concrete fails to meet the specified strength requirements the Engineer may require one or both of the following:
  - a. The Engineer shall have the right to order a change in the mix proportions for the remaining concrete being poured.
  - b. The Engineer may order tests on the in-place concrete. Testing shall be in accordance with ACI 301 at no increase in contract price.

### 3.07 REPAIR OF DEFECTIVE CONCRETE

A. Defective Concrete

1. Porous areas, open or porous construction joints and honeycombed concrete will be considered to indicate that the requirements for mixing, placing and handling have not

- been complied with and will be sufficient cause for rejection of the members of the structure thus affected.
2. Defective work exposed upon removal of forms shall be entirely removed or repaired within forty-eight hours after forms have been removed.
  3. Repaired areas will not be accepted if:
    - a. The structural requirements have been impaired by reducing the net section of compression members.
    - b. The bond between the steel and concrete has been reduced.
    - c. The area is not finished to conform in every respect to the texture, contour, and color of the surrounding concrete.
  4. If the above requirements are not satisfied or if there are excessive honeycombs or other defects, the Engineer may require that the members of unit involved be entirely removed and satisfactorily replaced at no additional expense to the City.
  5. The Engineer will determine the extent and manner of action to be taken for the correction of defective concrete as may be revealed by surface defects or otherwise.
    - a. Prior to repair of structural defects or defects which impair watertightness (shrinkage cracks, etc.), submit proposed material and repair methods to the Engineer.
  6. As soon as the forms have been stripped and the concrete surfaces exposed, remove fins and other projections, fill recesses left by the removal of form ties, and repair surface defects which do not impair structural strength. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete to the satisfaction of the Engineer.
  7. Hammer pack tie holes and other small cavities with a stiff mortar of the same material, but somewhat leaner than that in the concrete. Clean the cavity and the area wetted before mortar is placed.
  8. Repair and patch defective areas with cement mortar of mix proportions and materials identical to those used in the surrounding concrete. Produce a finish on the patch that is indistinguishable from the surrounding concrete.
  9. Where the honeycomb or voids are not excessive and repairs are authorized by the Engineer, chip out the defective areas in a square shape to sound solid concrete with a depth not less than 2 inches. Make edges of cuts perpendicular to concrete surface or slightly undercut to provide a key at the edge of the patch. Before placing cement mortar, thoroughly clean, dampen and brush coat area to be patched with neat cement grout. Other patching materials may be used if accepted by Engineer in writing prior to start of repair work. The patch should be kept damp for seven days at a temperature above 50°F.

**END OF SECTION**

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
0	5/9/2017		All	Final Submittal

FINAL CONCRETE MIX DESIGN SUBMITTAL FORM  
(One for each required mix design)

PROJECT: \_\_\_\_\_ Location: \_\_\_\_  
 General Contractor: \_\_\_\_  
 Mix design no.: \_\_\_\_\_ Design strength: \_\_\_\_\_

USE (Describe \*): \_\_\_\_  
 Mix Design Preparation: Based on Standard Deviation Analysis: \_\_\_\_\_  
 (Check one) or Based on Trial Mixture Test Data: \_\_\_\_\_

**MATERIALS:**

Aggregates: (Provide size, type, source, specification)

Coarse: \_  
 Fine: \_\_\_\_

Cement Type/Source: \_\_\_\_

Admixtures: (Provide product, manufacturer)

Water Reducer: \_  
 Air Entraining: \_  
 Accelerator: \_\_\_\_  
 Other: \_\_

**CONCRETE PROPERTIES**

Water/Cementitious Material Ratio: \_\_\_\_\_  
 Slump: \_\_\_\_\_ inches  
 Entrained Air: \_\_\_\_ %  
 Density \_\_\_\_\_ pcf

**SPECIFIC GRAVITIES**

Fine Aggregate \_\_\_\_\_  
 Coarse Aggregate: \_\_\_\_\_

**ADMIXTURES**

Accelerator \_\_\_\_\_ oz. per 100# cement  
 W. R. \_\_\_\_\_ oz. per 100# cement  
 A. E. \_\_\_\_\_ oz. per 100# cement  
 Other \_\_\_\_\_ oz. per 100# cement

**MIX PROPORTIONS**

	Weight	Absolute
Volume	(lbs)	(cubic
feet)		

Cementitious Material: \_\_\_\_\_  
 \_\_\_\_\_

Fine \*\*  
 Aggregate: \_\_\_\_\_

Coarse \*\*  
 Aggregate: \_\_\_\_\_

Water: \_\_\_\_\_

Entrained  
 Air: \_\_\_\_\_

Other: \_\_\_\_\_

TOTAL: \_\_\_\_\_

TEST RESULTS SUBMITTAL FORM

METHOD 1 - STANDARD DEVIATION ANALYSIS (ACI 318 Chapter 5):

Number of Test Cylinders Evaluated: \_ Standard Deviation: \_\_\_\_\_

(Attach Copy of All Test Results)

Mix Designs Proportioned to Achieve Both of the Following:

$$f'_{cr} = f'_c + 1.34s = \text{_____} \text{ psi}$$

$$f'_{cr} = f'_c + 2.33s - 500 = \text{_____} \text{ psi}$$

$$\text{Actual } f'_c = \text{_____} \text{ psi } (\leq f'_{cr})$$

$$\text{Slump} = \text{_____} \text{ in.} \quad \text{Air Content} = \text{_____} \%$$

METHOD 2 - TRIAL MIXTURE TEST DATA (ACI 318 Chapter 5):

Age (days)	Mix 1 (comp. str.)	Mix 2 (comp. str.)	Mix 3 (comp. str.)
7	_____	_____	_____
28	_____	_____	_____
28	=====	=====	=====
28 day avg.	_____	_____	_____

Mix Design Proportioned to Achieve the Following:

$$\begin{aligned} & f'_{cr} = f'_c + 1200 \text{ psi} \quad (\text{for } f'_c \leq 5000 \text{ psi}) \\ \text{or} & f'_{cr} = 1.1f'_c + 700 \text{ psi} \quad (\text{for } f'_c > 5000 \text{ psi}) \end{aligned}$$

$$\text{Slump} = \text{_____} \text{ in.} \quad \text{Air Content} = \text{_____} \%$$

REMARKS:

Note: Fill in all blank spaces. Use -0- (zero) or N.A. (not applicable). See Design and Control of Concrete Mixtures, Portland Cement Association, for assistance in filling out this form.

SUBMITTED BY:

Ready-Mix Supplier: Name \_\_\_\_

Address:

Phone Number:

SECTION 03 60 00  
GROUTING

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers the furnishing and placing of grout as specified on the drawings and in various other sections of these specifications.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 03 30 00 - Cast-in-Place Concrete.

1.02 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 308 - Recommended Practice for Curing Concrete.
  - 2. ACI 530-92 - Building Code Requirements for Masonry Structures.
- B. American Society for Testing and Materials:
  - 1. ASTM C33 - Concrete Aggregates.
  - 2. ASTM C150 - Portland Cement.
  - 3. ASTM C404 - Aggregates for Masonry Grout.
  - 4. ASTM C596 - Drying Shrinkage of Mortar Containing Portland Cement, Measuring.
  - 5. ASTM C827 - Early Volume Change of Cementitious Mixtures.
  - 6. ASTM C1019 - Standard Method of Sampling and Testing Grout.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive product data and current specifications covering named manufactured products specified in this Section. Include placing instructions. Submit product data for the following:
  - 1. Non-Shrink Non-Metallic Grout.
  - 2. Non-Shrink Metallic Grout.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Furnish the grout manufacturer's current independent laboratory test results indicating the grout as non-shrink from time of placement as conforming to the following:
  - 1. Indicating no expansion after final set, according to ASTM C 827.
  - 2. Indicating 4,000 psi strength developed with a trowelable mix within 24 hours, according to ASTM C 109.
  - 3. Indicating placement time based on initial set of not less than 60 minutes, according to ASTM C 191.

- B. Qualifying Test Results: Furnish from the grout manufacturer, test results indicating that in projects of similar scope and size, the effective bearing area was between 95 and 100 percent.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Prevent moisture damage and contamination of materials.
- B. Store materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

#### 1.06 PROJECT CONDITIONS

- A. Protect against high and low temperatures and bad weather in accordance with American Concrete Institute standards for placement of concrete.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Water: Potable quality, free from deleterious amounts of acids, alkalis, and organic substances.
- B. Non-Shrink Non-Metallic Grout: Factory premixed material containing no corrosive irons, aluminums, chemicals, or gypsums.
  - 1. Grouts containing water reducers, accelerators, or fluidifiers shall have no drying shrinkage greater than the equivalent sand cement and water mix as tested per ASTM C596.
  - 2. Grout shall be non-shrink before initial set and show no expansion after set as tested per ASTM C827.
  - 3. Initial set of grout not less than 60 minutes per ASTM C191 Test.
  - 4. Use Type I (Normal) cement in grout formulation.
  - 5. Acceptable Manufacturer:
    - a. Five Star Products, Inc., Five Star Grout
    - b. Master Builders
    - c. L & M Construction Chemicals
    - d. Or approved equal.
- C. Neat Cement:
  - 1. Portland Cement: ASTM C150 Type I.
  - 2. Water: As specified above.

#### 2.02 MIXES

- A. Non-Shrink Grout: Use ready-mix type requiring only the addition of water. Do not add other materials. Water requirement proportions shall conform to manufacturer's specifications for the desired mix consistency.

- B. Neat Cement: Mixture of Portland Cement and water in the same proportions used in cast-in-place concrete Class A with fine aggregate and coarse aggregate omitted.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Preparation of Surface:
  - 1. Normal Grout: Clean areas to be grouted free of oil, grease, laitance, dirt, and other contaminants. Remove loose material. Remove rust, paint, and oil from metal components in contact with grout.
  - 2. Non-Shrink Grout: Prepare in accordance with manufacturer's printed instructions.
- B. Forming:
  - 1. Use forming procedures that allow proper and complete placement of grout.
  - 2. Anchor support elements so no movement is possible.
  - 3. Remove supports only after grout has hardened.
  - 4. Pre-treat wood forms that may absorb moisture with forming oils.
- C. Grout Mixing: Use power-operated mechanical mixer of sufficient capacity to carry out batch mixing without interruption.
  - 1. Mix Non-Shrink Grout in accordance with manufacturer's instructions.
  - 2. Mix Grout (Sand/Cement) in accordance with requirements specified for concrete under Section 03 30 00.

**3.02 INSTALLATION**

- A. Grout (Sand/Cement): For grouting applications place and cure Grout as follows:
  - 1. Following surface preparation, saturate the concrete with water; then remove excess water and brush on a coat of Neat Cement. Place grout while Neat Cement is wet.
  - 2. Place Grout in a single pour. Straight-edge exposed Grout surface for trueness, consolidate and finish with a steel trowel.
  - 3. Cure and seal in accordance with ACI 308.
  - 4. In vertical applications, place Grout in monolithic pours.
- B. Non-Shrink Non-Metallic Grout: Perform grout placement in accordance with the recommendations of ACI and the manufacturer's published specification for mixing and placing. Place non-shrink non-metallic grout only where indicated on Drawings.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 05 50 00  
METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section covers the design, fabrication, and installation of miscellaneous metal fabrications, including steel shapes, plates, and bars, mechanical and adhesive anchoring systems, and fastening systems.
- B. This Section covers design, calculations, fabrication and installation of access platform, ladders, ladder cage, railings, grating, support members, anchoring and all associated metalwork for constructing downstream ladder access.
- C. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Individual miscellaneous metal items as specified in various other Sections of the general construction Specifications.
  - 3. Section 03 30 00: Cast-in-Place Concrete

1.02 REFERENCES

- A. American Society for Testing and Materials:
  - 1. ASTM A 36 – Carbon Structural Steel.
  - 2. ASTM A53 – Steel Pipe, Type E or S.
  - 3. ASTM A 167 – Stainless Steel Sheet and Plates.
  - 4. ASTM A 276 – Stainless Steel Sections.
  - 5. ASTM A 307 - Carbon Steel Externally Threaded Standard Fasteners.
  - 6. ASTM A 320 - Alloy-Steel Bolting Materials for Low-Temperature Service.
  - 7. ASTM A 325 - High-Strength Bolts for Structural Steel Joints.
  - 8. ASTM A 480 - Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
  - 9. ASTM A 489 - Carbon Steel Eyebolts.
  - 10. ASTM A 500 – Cold Formed Steel Tubing, Grade B.
  - 11. ASTM A 563 - Carbon and Alloy Steel Nuts.
  - 12. ASTM A 668 - Steel Forgings, Carbon and Alloy, for General Industrial Use.
  - 13. ASTM A 992 – Structural Steel Shapes.
  - 14. ASTM F 436 - Hardened Steel Washers.
- B. American Welding Society: AWS D1.1 - Structural Welding Code and AWS D1.6 – Structural welding Code – Stainless Steel.
- C. Federal Specifications:
  - 1. Fed. Spec. FF-S-92a - Screws, Machine: Slotted, Cross Recessed, or Hexagon Head.

2. Fed. Spec. FF-S-325 - Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge expansion anchors) Class 1 (One piece steel expander with cone taper integral with stud).

D. Aluminum Association (AA).

E. American National Standards Institute (ANSI).

1. A14.3 - Safety Requirements for Fixed Ladders.

### 1.03 SUBMITTALS

A. Shop Drawings and Product Data:

1. Shop drawings shall identify the detail as indicated on the Consultant's Drawings and be complete as to the detail of the product and location in the project, the size of members, the methods of joining various components, the quantity, finish, the location and type of anchors, and necessary measurements.
2. Shop assemblies which require markings for erection identification shall have easy-to-read markings on the shop and erection drawings.
3. Note on shop drawings variations in tolerances or clearances between various products.
4. Use standard welding symbols of the American Welding Society on shop drawings.
5. Furnish setting diagrams, templates, and directions for the installation of metal fabrications.
6. Submit product data on type of finish paint system for both shop painting and field touch-up painting.
7. Submit current Approved ICC Evaluation Reports for all expansion and adhesive anchors.
8. Submit anchor installer's certification of training completion.
9. Contractor shall submit shop drawings for the Access Platform indicating proposed anchorage layout locations, rework of existing guard rails, location of platform and ladder, member sizes, material used (stainless steel or aluminum), grounding consideration, isolation of aluminum from concrete surfaces, alternate access other than what is shown in the drawings, etc.
10. Contractor shall include with the Access Platform Structure shop drawing submittal, structural calculations for all members and connections used in that submittal. Calculation shall be signed and sealed by a Florida Registered Engineer and the shop drawings shall have a statement by that Florida Registered Engineer; that they have reviewed the drawings and that the structural members and connections listed are in accordance with the supplied calculations. Design platform for a non-reducible live load of 100 psf or 1000 pounds distributed over any 12 inch by 12 inch square area independent of uniform live load; design for the more restrictive of the two load conditions.

#### 1.04 QUALITY ASSURANCE

- A. Welder Qualifications: Welds shall be made only by welders, tackers, and welding operators who are currently qualified by tests as prescribed in the Structural Welding Code, AWS D1.1 of the American Welding Society to perform the type of work required.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store steel above the ground surface on platforms, skids, blocking, or other supports.
- B. Protect from exposure to conditions that produce rust.
- C. Store beams with webs vertical.
- D. Handle steel so no parts are bent, broken, or otherwise damaged, and avoid damage to other material and work.

#### 1.06 INSTALLER QUALIFICATIONS

- A. Contractors and/or their installers shall be certified, or otherwise qualified by the anchor Manufacturer verifying that the necessary training has been provided to install products per Manufacturer's requirements.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Miscellaneous Metal: Steel used for miscellaneous metal applications shall conform as follows:
  - 1. Rolled Steel Shapes, Plates and Bars: Wide flange beams shall conform to ASTM A 993,  $F_y = 50$  ksi; all other shapes shall conform to ASTM A 36.
  - 2. Checkered Steel Plate: ASTM A 36 with raised pattern to provide non-slip wearing surface. Thickness of the plate indicated on the Contract Drawings does not include raised portion.
  - 3. Stainless Steel Shapes and Bars: ASTM A 276, AISC Types 316.
  - 4. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
  - 5. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
  - 6. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- B. Fasteners and Welding Materials:
  - 1. Machine Screws: AISC Type 316 stainless steel conforming to Fed. Spec. FF-S-92a.
  - 2. Stainless Steel Threaded Rods: ASTM F593 Type 316.
  - 3. Stainless Steel Anchor Bolts: ASTM A320 Grade B8, AISC Type 316.
  - 4. Standard Steel Bolts, Nuts, and Washers: ASTM A 307.
  - 5. U-Bolts: Carbon steel with National Coarse Threads and zinc-coated finish.
  - 6. Eyebolts: Carbon steel with National Coarse Threads and zinc-coated finish: ASTM A 489.
  - 7. High-Strength Structural Steel Bolts, Nuts, and Washers:
    - a. ASTM A 325 Specification for Bolts.
    - b. ASTM A 563 Specification for Carbon and Alloy Steel Nuts.

- c. ASTM F 436 Specification for Hardened Steel Washers for Use with High-Strength Bolts.
  - 8. Stainless Steel Bolts, Nuts and Washers: ASTM A 320 Grade B8, AISC Type 316.
  - 9. Headed Stud Type Shear Connectors: Cold finished carbon steel, ASTM A 668, Class Designation B; similar to Nelson Stud Welding Systems.
  - 10. Welding Electrodes: Table 4.1.1 of AWS D1.1 as required for applicable base metals and welding process.
- C. Metal Grating: Removable type, fabricated panel sizes and thickness as indicated on Drawings. Where panel sizes are not indicated, limit panel weights to a maximum of 120 pounds each. Construction details in conformance with NAAMM Metal Bar Grating Manual.
- 1. Performance Criteria:
    - a. Grating depth designed for maximum deflection of 1/4 inch.
    - b. Maximum Stress: 20,000 psi for clear span shown on Drawings.
    - c. Bearing Bars: 3/16 inch thick, minimum.
    - d. Bar Spacing:
      - 1) Bearing Bars: 15/16 inch center-to-center.
      - 2) Cross Bars: 2 inch center-to-center.
    - e. Bar Connection: Mechanically lock cross bars to bearing bars.
    - f. Surface: Serrated Surface.
    - g. Anchor Clips: Stainless steel saddle clips, number as recommended by manufacturer. Anchor clips designed to take uplift force of 100 psf.
    - h. Banding: Grating bar ends banded same depth as bars. Openings cutting two or more bearing bars require banding. Openings for pipes, ducts, conduits, and similar objects require banding.
    - i. Openings through Panels: Split panels in two individual sections to facilitate removal of panels at pipes, ducts, conduits, and similar objects passing through grating panels.
    - j. Acceptable Manufacturers:
      - 1) Ohio Gratings, Inc.; SGSS Series.
      - 2) McNichols Company.
      - 3) Amico Grating.
      - 4) Or Approved Equal.
- D. Anchor System:
- 1. Mechanical Anchoring System
    - a. Steel Expansion Anchors and Stainless Steel Expansion Anchors: Provide zinc-plated torque-controlled mechanical expansion anchors, with Type 316 stainless steel wedge clips, that meet ACI 318 Appendix D requirements for cracked concrete and have approved ICC-ES Evaluation Report.
      - 1) Acceptable manufacturers:
        - a) Hilti Kwik-Bolt TZ, [www.hilti.com](http://www.hilti.com)
        - b) Simpson Strong Tie Strong-Bolt, [www.simpsonanchors.com](http://www.simpsonanchors.com)
        - c) Or Approved Equal.

- b. Steel Undercut Anchors and Stainless Steel Undercut Anchors: Provide self-undercutting anchors with undercutting teeth which expands by tightening the nut. Anchors shall meet ACI 318 Appendix D requirements for cracked concrete and have approved ICC-ES Evaluation Report.
  - 1) Acceptable manufacturers:
    - a) Hilti HDA Undercut Anchor, [www.hilti.com](http://www.hilti.com)
    - b) Simpson Strong Tie Torq-Cut, [www.simpsonanchors.com](http://www.simpsonanchors.com)
    - c) Or Approved Equal.
2. Adhesive Anchoring System: Provide adhesive anchors that meet ACI 318 Appendix D requirements for cracked concrete and that have a current approved ICC-ES Evaluation Report. The adhesive anchor setting system shall be composed of anchors and fasteners as specified in 2.01 B., and a self-contained cartridge system capable of dispensing epoxy components in the proper mixing ratio.
  - a. Anchor Assembly
    - 1) Standard Anchor Rod Assembly: Chamfered end threaded stud rod of ASTM F1554 Grade 36 steel with nut and washer. Stud size as indicated on Drawings.
    - 2) Stainless Steel Anchor/Fastener: Chamfered end threaded stud rod of AISI Type 316 stainless steel, with nut and washer of AISI Type 316 stainless steel.
    - 3) Deformed Reinforcing Bar conforming to ASTM A615.
    - 4) Anchor element shall meet a tested elongation of 14% and a reduction of area of at least 30% per ACI 318 Appendix D.
  - b. Adhesive Cartridge: The dual cartridge shall contain both hardener and resin and shall be dispensed from the dual cartridge through a static mixing nozzle.
    - 1) The Pre-mixed adhesive shall be injected directly into the prepared anchor hole. The anchor/fastener shall be inserted in the adhesive in accordance with the adhesive manufacturer's installation instructions. Only injection tools and static mixing nozzles as recommended by manufacturer shall be used.
  - c. Use of Fast-Setting Epoxies is expressly prohibited.
  - d. Use of Adhesive Anchors for overhead or direct tension applications is prohibited.
  - e. Adhesive anchors shall not resist gravity loads in fire-rated construction.
  - f. Acceptable Manufacturers:
    - 1) Hilti HIT-RE 500 V3, [www.hilti.com](http://www.hilti.com).
    - 2) Hilti HIT-HY 200-R, [www.hilti.com](http://www.hilti.com).
    - 3) Simpson Strong Tie SET-XP, [www.simpsonanchors.com](http://www.simpsonanchors.com).
    - 4) Or Approved Equal.

E. Stainless Steel Plate, Sheet and Strip: ASTM A 167 and A 480.

## 2.02 Ladders:

- A. Structural Performance of ladders: Metal ladders shall withstand the effects of loads and stresses within limits and under conditions specified in OSHA and ANSI A14.3.

- B. Rungs: Shall be flat surfaced, no less than 1-1/4-inches wide and no less than 18-inches long, deeply serrated to provide maximum grip and foot traction. Rungs shall be able to withstand a 1,000 lb load without failure, spaced 12-inches on centers, maximum.
- C. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. by means of welded or bolted wall brackets. Use welded or bolted brackets, designed for adequate support and anchorage, and to hold the ladder clear of wall surface with a minimum 7-inch clearance from wall to centerline of rungs. Extend siderails 42-inches above top rung and return siderails to wall or structure unless other secure handholds are provided. If the ladder exceeds 12-inches from grade, provide steel rungs 12-inches on center, maximum, to platform of ladder. If the adjacent structure does not extend above the top rung, goose-neck the extended siderails back to the structure to provide secure ladder access.
  - 1. Provide ladder manufacturer's wall mounted, bottom support, configured for anchorage to and compatibility with siderail and so that lowest ends of siderails are not required to be anchored to the finish floor.
- D. Stainless Steel:
  - 1. Space siderails 18 inches apart unless otherwise indicated.
  - 2. Siderails: Continuous, 3/8-by-3-inch flat bars, with eased edges.
- E. Aluminum:
  - 1. Space siderails 18 inches apart unless otherwise indicated.
  - 2. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
  - 3. Rungs: Extruded-aluminum tubes with ribbed tread surfaces.

#### 2.03 Ladder Safety Cages:

- A. Fabricate ladder safety cages to comply with OSHA and ANSI A14.3 requirements. Assemble by welding or with fasteners; fasteners shall match ladder material used.
- B. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.

#### 2.04 Access Platform

- A. Delegated Design: The Access Platform Structure shall include (hereinafter referred to include) design of platform, ladders, ladder cage, railings, grating, support members, anchoring and all associated metalwork, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria as indicated.
- B. The Access Platform Structure shall be either fully constructed of stainless steel Type 316 or aluminum metal.

- C. Structural Performance of Access Platform Structure shall withstand the effects of loads and stresses within limits and under conditions specified in OSHA and ANSI A14.3.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 20 deg F - 120 deg F, ambient; 180 deg F, material surfaces.

## 2.05 FABRICATION

- A. Insofar as possible, fit and shop assemble metal fabrications, ready for installation.
- B. Fabricate in accordance with details, approved shop drawings and referenced standards.
- C. Drill or punch holes required for the attachment of work of other trades and for bolted connections. Burned holes are not acceptable.
- D. Welding shall be in accordance with AWS D1.1. Aluminum welding shall be in accordance with AWS D1.2.
- E. Dress smooth welds and sharp corners.
- F. Make work square, plumb, straight, and true.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Inspect the installed work of other trades and verify that such work is complete to the point where this work may properly commence.

### 3.02 PREPARATION

- A. Field Measurements: Verify measurements in field before fabrication.
- B.

### 3.03 ERECTION

- A. Erect and install miscellaneous metal and metal fabrications in accordance with details, approved shop drawings and referenced standards aligning straight, plumb and level within a tolerance of one in 200.
- B. Provide suitable temporary braces and stays to hold metal fabrications in position until permanently secured.
- C. Draw threaded bolt connections up tight with lock washers or other means to prevent loosening. Screw fasteners in exposed or finished surfaces may be slot or Phillips head type, but in either case, screws must be countersunk design.
- D. Erect miscellaneous structural steel in accordance with the Drawings, pertinent regulations and referenced AISC standards.

### 3.04 INSTALLATION

#### A. Expansion Anchor Installation:

1. General: Install expansion anchors in strict accordance with manufacturer's published instructions and those listed in the applicable ICC-ES Evaluation Report and in accordance with the following.
2. Install in dry, interior locations only; tension is not permitted in overhead applications.
3. Install anchors only after concrete has reached its minimum specified 28-day compressive strength in accordance with Section 03 30 00.
4. Anchors shall not resist gravity loads in fire-rated construction.
5. Drilling Holes: Use rotary hammer type drill and drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed.
6. Minimum Installation Criteria: Unless otherwise indicated on Drawings, embed expansion anchors to 6.5 bolt diameters minimum. Anchors shall meet the manufacturer's published centerline to centerline spacing and edge distance requirements.
7. Scan concrete area using ground penetration radar (GPR) prior to start of work to avoid damaging existing reinforcing.

#### B. Adhesive Anchor Installation:

1. General: Install adhesive anchors in strict accordance with manufacturer's published instructions and those listed in the applicable ICC-ES Evaluation Report and in accordance with the following. Adhesive anchors shall not be installed in overhead and direct tension applications.
2. Install anchors only after concrete has reached its minimum specified 28-day compressive strength in accordance with Section 03 30 00.
3. Anchors shall be installed in dry concrete.
4. Drilling Holes: Use rotary hammer type drill and drill holes to the required diameter and depth as consistent with anchor manufacturer's instructions for size of anchors being installed. Use carbide-tipped drill
  - a. Prior to setting cartridge and anchor stud clean drilled holes free of loose material. Clean holes by blowing from the back of the borehole with oil-free compressed air (min. 90 psi at 3.5 CFM), fully retracting the air extension 2 times. Brush 2 times with properly sized round steel brush. Blow again with compressed air 2 times or until return air stream is free of noticeable dust.
5. Anchor Rod Installation: Following cartridge installations in in-prepared drill holes, set anchor rod to the required depth. Set anchor rod truly perpendicular (normal) to the base plate of item being anchored.
6. Scan concrete area using ground penetration radar (GPR) prior to start of work to avoid damaging existing reinforcing.
7. Minimum Installation Criteria: Unless otherwise noted on Contract drawings, embed adhesive anchors as shown below. Anchors shall meet the manufacturer's published centerline to centerline spacing and edge distance requirements.

Adhesive Anchor Diam. (Inches)	3/8	1/2	5/8	3/4	7/8	1
Embedment Depth (Inches)	4	5	6	7	8	10

**END OF SECTION**

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
0	4/14/2017		All	Final Submittal

SECTION 09 90 00

PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for the surface preparation and painting of exposed interior, exterior, buried, and embedded items and surfaces, including, but not limited to:
  - a. Concrete Embedded Metal
  - b. Exposed Metal
  - c. Buried Metal
  - d. Galvanized Metal
  - e. Aluminum and Dissimilar Metal Insulation
  - f. Fusion Bonded Coatings
  - g. Metal Trim and Structural Steel
  - h. Concrete Masonry
  - i. Gypsum Wallboard and Plaster
2. The surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Related Requirements:

1. General Provisions and Supplementary General Provisions

1.02 DEFINITIONS

A. Terms used in this section:

1. Batten: The use of thin strips of solid material, typically wood or plastic, used to protect materials.
2. Bituminous Coating: A coal tar or asphalt based coating material usually used in thick films.
3. Blast Cleaning: The cleaning and roughing of a surface by the use of sand, artificial grit or fine metal shot which is projected a surface by compressed air or mechanical means.
4. Build: The wet or dry thickness of a coating film.
5. Coverage: Total minimum dry film thickness in mils, or square feet per gallon.
6. FRP: Fiberglass Reinforced Plastic.
7. HCl: Hydrochloric Acid.
8. Holiday: Any discontinuity, bare or thin spot in a painted area.
9. MDFT: Minimum Dry Film Thickness.
10. MDFTPC: Minimum Dry Film Thickness Per Coat.
11. Mil: One-thousandth of an inch. 0.001 inches.
12. MIL-P: Military Specification -Paint.

13. Pot Life: The period of time during which paint remains useful after its original package has been opened or after a catalyst or other additive has been incorporated. Also known as spreadable life or usable life.
14. Primer: The first coat of paint applied to a surface, formulated to have good bonding, wetting and inhabiting properties.
15. PSDS: Paint System Data Sheet.
16. Running: Sagging and curtining of a coating or paint film, usually caused by improper thinning, excessive film build or poor application techniques.
17. SFPG: Square Feet Per Gallon.
18. SFPGPC: Square Feet Per Gallon Per Coat.
19. SP: Surface Preparation.
20. SSPC: Society of Protective Coatings.
21. Substrate: The surface to be painted

B. Reference Standards:

1. Occupational Safety and Health Administration (OSHA):
  - a. 29 CFR 1910 Occupational Health and Safety Standards.
  - b. 29 CFR 1926 Safety and Health Regulations for Construction.
2. SSPC: The Society for Protective Coatings (SSPC):
  - a. SSPC Painting Manual, Volume 1 – Good Painting Practice.
  - b. SSPC Painting Manual, Volume 2 – Systems and Specifications.

### 1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Review other Specification Sections in which primers or other coatings are provided to ensure compatibility of the total systems for various substrates.
  - a. Upon request, furnish information on the characteristics of specified finish materials to ensure compatible primers.
  - b. Notify the Construction Manager of problems anticipated using the materials specified.

### 1.04 SUBMITTALS

A. Shop Drawings:

1. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
2. Data Sheets:
  - a. Submit the following to the Construction Manager in accordance with the requirements of Section 01 33 00, Submittal Procedures:
    - 1) For each paint system, furnish a Paint System Data Sheet (PSDS), the manufacturer's Technical Data Sheets, and paint colors available (where applicable) for each product used in the paint system. The PSDS form is appended to the end of this section.

- 2) Furnish copies of paint system submittals to the coating applicator.
  - 3) Indiscriminate submittal of manufacturer's literature only is not acceptable.
3. Sample
- a. Submit the following to the Construction Manager in accordance with the requirements of Section 01 33 00, Submittal Procedures:
    - 1) Unless otherwise specified, before painting work is started, prepare minimum 8- by 10-inch samples with type of paint and application specified on similar substrate to which paint is to be applied.
    - 2) Furnish additional samples as required until colors, finishes and textures are approved.
    - 3) Approved samples to be the quality standard for final finishes
4. Quality Control Submittals
- a. Submit the following to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions, and Section 26 05 00, Basic Electrical Materials and Methods:
    - 1) If the manufacturer of finish coating differs from that of shop primer, provide both manufacturers' written confirmation that materials are compatible.
    - 2) Provide manufacturer's written instructions and special details for applying each type of paint.
5. Contract Closeout Submittals:
- a. Submit the following to the Construction Manager in accordance with the requirements of the General Provisions and all Supplementary General Provisions, and Section 26 05 00, Basic Electrical Materials and Methods:
    - 1) Special guarantee.
6. Maintenance Material Submittals:
- a. Submit the following to the Construction Manager in accordance with the requirements of the General Provisions and all Supplementary General Provisions, and Section 26 05 00, Basic Electrical Materials and Methods:
    - 1) Extra Stock Materials:
      - a) Furnish an additional 5 gallons of paint, as appropriate, of each type and color applied to the Owner.
        - (1) Furnish paint from the same production run as materials applied.
        - (2) Package this paint in unopened, factory-sealed containers suitable for storage, and identify the containers with labels describing the contents of each.

## 1.05 QUALITY ASSURANCE

### A. Qualifications:

1. Applicator's Experience: Minimum 5 years' experience in application of specified products.

B. Regulatory Requirements:

1. Meet federal, state, and local requirements limiting the emission of volatile organic compounds.
2. Comply with the Occupational Safety and Health Administration (OSHA) regulations stipulated in 29 CFR 1910 and 29 CFR 1926.
3. Perform surface preparation and painting in accordance with recommendations of the following:
  - a. Paint manufacturer's instructions.
  - b. SSPC-PA Guide No.3, Guide to Safety in Paint Applications.
  - c. Federal, state, and local agencies having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a protected area that is heated or cooled to maintain temperatures within the range recommended by paint manufacturer.
- B. Shipping:
  1. Where pre-coated items are to be shipped to the site, protect coating from damage. Batten coated items to prevent abrasion.
  2. Use nonmetallic or padded slings and straps in handling.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply paint in temperatures outside of manufacturer's recommended maximum or minimum allowable, or in dust, smoke-laden atmosphere, damp, wet or humid weather.
- B. Do not perform abrasive blast cleaning whenever relative humidity exceeds 85 percent, or whenever surface temperature is less than 5 degrees F above dew point of ambient air.

1.08 SPECIAL GUARANTEE

- A. Furnish manufacturer's extended guarantee or warranty, with the City named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the City, removal and replacement of Work specified in this Specification section found *defective* during a period of 2 years after the date of Substantial Completion.
- B. The Contractor and paint manufacturer shall jointly and severally furnish guarantee.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Coatings Manufacturers Code A (Able to supply most heavy-duty industrial coatings and architectural paints):

1. Ameron Protective Coatings, Brea, CA.
2. Carboline Coatings Co., St. Louis, MO.
3. Devoe & Reynolds Co., Louisville, KY.
4. DuPont Chemical Co., Wilmington, DE.
5. Hempel/Reliance Paints, Houston, TX.
6. Keeler and Long, Inc., Watertown, CT.
7. Master Builders, Inc., Cleveland, OH.
8. Plas-Chem Coatings, St. Louis, MO.
9. Poner-International, Louisville, KY.
10. Sigma Coatings, Inc., Harvey, LA.
11. Tnemec Coatings, Kansas City, MO.
12. Valspar Corp., Azusa, CA.
13. Wisconsin Protective Coatings, Green Bay, WI.
14. Or approved equal.

B. Paint Manufacturers Code B (Able to supply most architectural and institutional paints):

1. Ameritone, Long Beach, CA.
2. Benjamin Moore Paints, New York, NY.
3. Detroit Graphite Co., Rockford, IL.
4. Fuller/O'Brien Paint Co. San Francisco, CA.
5. Pittsburgh Paints, Pittsburgh, PA.
6. Pratt and Lambert, Inc., Buffalo, NY.
7. Rustoleum Corp., Evanston, IL.
8. Samuel Cabot, Inc., Boston, MA.
9. Sherwin Williams, Cleveland, OH.
10. Textured Coatings of America, Los Angeles, CA.
11. Thoro Systems, Miami, FL.
12. Or approved equal.

C. Specialty Manufacturers Code C:

1. Darwonh Co., Avon, CT.
2. Jasco Chemical Co., Mountain View, CA.
3. McCloskey Varnish Co., Philadelphia, PA.
4. Olympic Stain & Varnish. Seattle, WA.
5. Or approved equal.

D. Fusion Bonded Coating Applicators Code E:

1. Industrial Operation. Phoenix, AZ.
2. Waterworks Manufacturing, Marysville, CA.
3. Waterspecialties, Porterville, CA.
4. Or approved equal.

## 2.02 MATERIALS

A. General:

1. Material Quality: Manufacturer's highest quality products and suitable for intended service.

2. Materials Including Primer and Finish Coats: Produced by same manufacturer.
3. Thinners, Cleaners, Driers, and Other Additives: As recommended by manufacturer of the particular coating.

B. Products are listed below according to their approximate order of appearance in the systems. The letter designating the manufacturer code refers to Article MANUFACTURERS.

<b>Product</b>	<b>Definition</b>	<b>Manufacturer Code</b>
Coal-Tar Epoxy	Amine or phenolic epoxy type; 70 percent volume solids minimum, suitable for immersion service	A
Organic Zinc Rich Primer	Converted epoxy, epoxy/phenolic or urethane type, minimum 10 pounds metallic zinc content per gallon	A
Rust-Inhibitive Primer	Single-package steel primers with anticorrosive pigment loading	A, B
Alkyd Enamel	Optimum quality, gloss finish, medium long oil	A, B

<b>Product</b>	<b>Definition</b>	<b>Manufacturer Code</b>
Wash Primer	Vinyl butyral acid	A
Polyurethane Enamel	Two-component, aliphatic or acrylic based polyurethane; high gloss finish	A
Epoxy Primer	Polyamide, anticorrosive, converted epoxy primer containing rust-inhibitive pigments	A
Acrylic/Latex Finish	Semi-gloss, single-component	A, B
Bituminous Paint	Single-component, coal-tar pitch based	A
Block Filler	Primer-sealer designed for rough masonry surfaces, 100 percent acrylic emulsion	A, B
Alkyd (Semigloss)	Semigloss alkyd	A, B

Acrylic Latex (Flat)	Flat latex	A, B
Fusion Bonded Coating	100 percent solids, thermosetting, fusion bonded, dry powder epoxy or polyurethane resin, suitable for the intended service	E
Fusion Bonded, TFE Lube or Grease Lube	Tetrafluoroethylene. liquid coating; No. 62-4621-4830-5 as manufactured by 3M Co., St. Paul, MN; or open gear grease as supplied by McMaster-Carr Co., Elmhurst, IL; RL 736 manufactured by Arnrep, Marietta, GA	E

### 2.03 MIXING

#### A. Multiple-Component Coatings:

1. Prepare using the contents of the container for each component as packaged by paint manufacturer.
2. No partial batches will be permitted.
3. Do not use multiple-component coatings that have been mixed beyond their pot life.
4. Furnish small quantity kits for touchup painting and for painting other small areas.
5. Mix only components specified and furnished by paint manufacturer.
6. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

### 2.04 COLORS

- A. Formulate paints with colorants free of lead, lead compounds, or other materials that might be affected by presence of hydrogen sulfide or other gas likely to be present at the site.
- B. Colors shall be as noted in the Application Schedule. Colors not noted shall be as selected by the Construction Manager.

## PART 3 EXECUTION

### 3.01 EXAMINATION

#### A. Surface Preparation Verifications:

1. Inspect and provide substrate surfaces prepared in accordance with these Specifications and the printed directions and recommendations of paint manufacturer whose product is to be applied. The more stringent requirements shall apply.

### 3.02 PREPARATION

#### A. Shop Blast Cleaning:

1. Structural steel, metal doors and frames, metal louvers, and similar items may be shop prepared and primed. Centrifugal wheel blast cleaning is an acceptable alternate to shop blast cleaning.

#### B. Field Abrasive Blasting: Perform blasting for items and equipment where specified and as required to restore damaged surfaces previously shop or field blasted and primed.

#### C. Protection of Items not to be Painted:

1. Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted.
2. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.
3. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.
4. Mask openings in motors to prevent paint and other materials from entering the motors.

### 3.03 PREPARATION OF SURFACES

#### A. Metal Surfaces:

1. Where indicated, meet requirements of the following SSPC Specifications:
  - a. Solvent Cleaning: SP 1-82.
  - b. Hand Tool Cleaning: SP 2-89.
  - c. Power Tool Cleaning: SP 3-89.
  - d. White Metal Blast Cleaning: SP 5-91.
  - e. Commercial Blast Cleaning: SP 6-91.
  - f. Brush-Off Blast Cleaning: SP 7-91.
  - g. Pickling: SP 8-91.
  - h. Near-White Blast Cleaning: SP 10-91.
  - i. Power Tool Cleaning to Bare Metal: SP 11-91.
2. The words "solvent cleaning", "hand tool cleaning", "wire brushing", and "blast cleaning", or similar words of equal intent in these Specifications or in paint manufacturer's specifications refer to the applicable SSPC Specifications.
3. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacu-blast methods may be required. Coating manufacturers' recommendations for wet blast additives and first coat application shall apply.
4. Hand tool clean areas that cannot be cleaned by power tool cleaning.
5. Round or chamfer sharp edges and grind smooth burrs, jagged edges, and surface defects.

6. Welds and Adjacent Areas:
    - a. Prepare such that there is:
      - 1) No undercutting or reverse ridges on weld bead.
      - 2) No weld spatter on or adjacent to weld or any other area to be painted.
      - 3) No sharp peaks or ridges along weld bead.
    - b. Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.
  7. Pre-blast Cleaning Requirements:
    - a. Remove oil, grease, welding fluxes, and other surface contaminants prior to blast cleaning.
    - b. Cleaning Methods: Steam, open flame, hot water, or cold water with appropriate detergent additives followed with clean water rinsing.
    - c. Clean small isolated areas as above or solvent clean with suitable solvents and clean cloths.
  8. Blast Cleaning Requirements:
    - a. Type of Equipment and Speed of Travel: Design to obtain specified degree of cleanliness. Minimum surface preparation is as specified herein and takes precedence over coating manufacturer's recommendations.
    - b. Select type and size of abrasive to produce a surface profile that meets coating manufacturer's recommendations for particular primer to be used.
    - c. Use only dry blast cleaning methods.
    - d. Do not reuse abrasive, except for designed recyclable systems.
    - e. Meet applicable federal, state, and local air pollution and environmental control regulations for blast cleaning, confined space entry (if required), and disposition of spent aggregate and debris.
  9. Post-Blast Cleaning and Other Cleaning Requirements:
    - a. Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wipe with a tack cloth.
    - b. Paint surfaces the same day they are blasted. Re-blast surfaces that have started to rust before they are painted.
- B. Plastic Surfaces:
1. Hand sand plastic surfaces to be coated with a medium grit sandpaper to provide tooth for the coating system.
  2. Large areas may be power sanded or brushoff blasted, provided sufficient controls are employed so surface is roughened without removing excess material.
- C. Concrete Surfaces:
- a. Prepare concrete, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted.
    - 1) Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents.
    - 2) Roughen the surfaces as required to remove glaze.

- 3) If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
  - a) Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
- 4) Determine the alkalinity and moisture content of the surfaces by performing appropriate tests.
  - a) If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before applying the paint.
  - b) Do not paint surfaces where the moisture content exceeds that permitted in the manufacturer's written instructions.

### 3.04 SURFACE CLEANING METHODS

#### A. Brushoff Blast Cleaning:

1. Equipment, procedure, and degree of cleaning shall meet requirements of SSPC-SP 7-91, Brushoff Blast Cleaning.
2. Abrasive: Either wet or dry blasting sand, grit, or nut shell.
3. Select various surface preparation parameters such as size and hardness of abrasive, nozzle size, air pressure, and nozzle distance from surface such that surface is cleaned without pitting, chipping, or other damage.
4. Verify parameter selection by blast cleaning a trial area that will not be exposed to view.
5. Construction Manager will approve acceptable trial blast cleaned area and will use area as a representative sample of surface preparation.
6. Repair or replace surfaces damaged by blast cleaning.

#### B. Solvent Cleaning:

1. Consists of removal of foreign matter such as oil, grease, soil, drawing and cutting compounds, and any other surface contaminants by using solvents, emulsions, cleaning compounds, steam cleaning, or similar materials and methods which involve a solvent or cleaning action.
2. Meets requirements of SSPC-SP 1-82.

### 3.05 APPLICATION

#### A. General:

1. The intention of these Specifications is for new, interior and exterior metal surfaces to be painted, whether specifically mentioned or not, except as specified otherwise. Prime coat structural steel surfaces. Exterior concrete and masonry surfaces will not be painted unless specifically indicated.
2. Apply coatings in accordance with these Specifications and the paint manufacturers' printed recommendations and special details. The more stringent

requirements shall apply. Allow sufficient time between coats to assure thorough drying of previously applied paint.

3. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
4. Sand wood and metal lightly between coats to achieve required finish.
5. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
6. Fusion Bonded Coatings Method Application: Electrostatic, fluidized bed, or flocking.
7. Coat units or surfaces to be bolted together or joined closely to structures or to one another prior to assembly or installation.
8. On pipelines, terminate coatings along pipe runs to 1 inch inside pipe penetrations.
9. Keep paint materials sealed when not in use.
10. Where more than one coat of a material is applied within a given system, alternate color to provide a visual reference that the required number of coats have been applied.

B. Shop Primed and Factory Finished Surfaces:

1. Prepare surfaces and spot prime using specified primer.
2. Apply mist coat of primer, 1-mil dry film thickness.
3. After welding, prepare and prime holdback areas as required for paint system. Apply primer in accordance with manufacturer's instructions.

C. Film Thickness:

1. Number of Coats: Minimum required without regard to coating thickness. Additional coats may be required to obtain minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions.
2. Maximum film build per coat shall not exceed coating manufacturer's recommendations.
3. Visually inspect concrete, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained.
4. Give particular attention to edges, angles, flanges, and other similar areas. where insufficient film thicknesses are likely to be present, and ensure proper millage in these areas.

D. Porous Surfaces, Such As Concrete, Masonry:

1. Filler/Surfacer: Use coating manufacturer's recommended product to fill air holes, bug holes, and other surface defects.

2. Prime Coat: May be thinned to provide maximum penetration and adhesion.
  - a. Type and Amount of Thinning: Determined by paint manufacturer and dependent on surface density and type of coating.
3. Surfaces Specified to Receive Water Base Coating: Damp, but free of running water, just prior to application of coating.

E. Damaged Coatings, Pinholes, and Holidays:

1. Feather edges and repair in accordance with recommendations of paint manufacturer.
2. Apply finish coats, including touchup and damage-repair coats in a manner which will present a uniform texture and color-matched appearance.
3. Repair of damaged galvanized surfaces:
4. The galvanized coatings including nuts, bolts and washers damaged during installation shall be repaired.
  - a. Lubricants shall be removed in accordance with SSPC-SP1.
  - b. Rust shall be removed in accordance with SSPC-SP-2 or SSPC-SP-3.
  - c. The touch-up material shall be compatible with and from the same manufacturer as the coating system to be used for the structure.
  - d. Subsequent coatings shall be applied within the recoat time recommended by the manufacturer.

F. Operating Parts:

1. Do not paint operating parts unless approved by the equipment manufacturer and supplier.
2. Do not paint operating parts if painting will void or diminish the equipment warranty or system warranty.
3. Operating parts include the moving parts of operating equipment and the following:
  - a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.

G. Labels:

1. Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels, or name, identification, performance rating, or nomenclature plates on equipment.

H. Unsatisfactory Application:

1. If item has an improper finish color, or insufficient film thickness, clean surface and topcoat with specified paint material to obtain specified color and coverage. Obtain specific surface preparation information from coating manufacturer.

2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather the edges. Follow with primer and finish coat. Depending on extent of repair and appearance, a finish sanding and topcoat may be required.
3. Evidence of runs, bridges, shiners, laps, or other imperfections is cause for rejection.
4. Repair defects in accordance with written recommendations of coating manufacturer.
5. Leave staging and lighting up until the Construction Manager has inspected surface or coating. Replace staging removed prior to approval by the Construction Manager. Provide additional staging and lighting as requested by the Construction Manager.

### 3.06 FIELD QUALITY CONTROL

#### A. Testing Gauges:

1. Provide a magnetic type dry film thickness gauge to test coating thickness specified in mils, as manufactured by Nordson Corp., Anaheim, CA, Mikrotest.
2. Provide an electrical holiday detector, low voltage, wet sponge type to test finish coat, except zinc primer, high-build elastomeric coatings, and galvanizing for holidays and discontinuities as manufactured by Tinker and Rasor, San Gabriel, CA, Model M-1.
3. Provide a high voltage holiday detector for elastomeric coatings in excess of 25 mils dry film thickness. Unit to be as recommended by the coating manufacturer.

### 3.07 CLEANUP

- A. Place cloths and waste that might constitute a fire hazard in closed metal containers or destroy at the end of each day.
- B. Upon completion of the Work, remove staging, scaffolding, and containers from the site or destroy in a legal manner.
- C. Completely remove paint spots, oil, or stains upon adjacent surfaces and floors and leave entire job clean.

### 3.08 COATING SYSTEMS

- A. System No. 2 Concrete Embedded Metal:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Abrasive Blast, or Centrifugal Wheel Blast (SP 5)	Polyamide, Anticorrosive Epoxy Primer	1 coat, 2.5 MDFT
	Coal-Tar Epoxy	2 coats, 16 MDFT

B. System No.5 Exposed Metal -Mildly Corrosive:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Abrasive Blast, or Centrifugal Wheel Blast (SP 10-91)	Polyamide, Anticorrosive Epoxy Primer	1 coat, 2.5 MDFT
	Polyurethane Enamel	2 coats, 3 MDFT

C. System No.5A Exposed Metal -Mildly Corrosive:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
System No. 10	Polyurethane Enamel	2 coats, 3 MDFT

D. System No. 8 Buried Metal – General:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Abrasive Blast, or Centrifugal Wheel Blast (SP 10-91)	Standard Hot Coal-Tar Enamel -OR- Coal-Tar Epoxy -OR- Tape Coat System	AWWA C203-86  AWWA C210-84  AWWA C214-83
	For Acidic Soil, Brackish Water High Bacteria: Hot Coal- Tar. Double Felt	AWWA C203-86, App. A, Sec. A1.5
	For Highly Abrasive Soil, Brackish Water: Hot Coal-Tar, Fibrous Glass -OR- Tape Coat System	AWWA C203-86, App. A, Sec. A1.5  AWWA C214-83 with Double Outer Wrap

E. System No. 10 Galvanized Metal Conditioning:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Solvent Clean (SP 1) Followed by Hand Tool (SP 2) or Power Tool (SP 3)	Wash Primer or Coating Manufacturer's Recommendation	1 coat, 0.4 MDFT

F. System No. 11 Galvanized Metal Repair:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Solvent Clean (SP 1-82) Followed by Hand Tool (SP 2-89), Power Tool (SP 3-89). or Brushoff Blast (SP 7-91)	Organic Zinc Rich Primer	1 coat, 3 MDFT

G. System No. 27 Aluminum and Dissimilar Metal Insulation:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Solvent Clean (SP 1-82)	Wash Primer	1 coat, 0.4 MDFT
	Bituminous Paint	1 coat, 10 MDFT

H. System No. 29 Fusion Bonded Coating:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Abrasive Blast, or Centrifugal Wheel Blast (SP 10-91) or Acid Pickling (SP 8-91)	Fusion Bonded 100 percent Solids Epoxy or Polyurethane	1 or 2 coats, 7 MDFT

I. System No. 29A Fusion Bonded, Steel Dowel Coating:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Abrasive Blast, or Centrifugal Wheel Blast (SP 10-91) or Acid Pickling(SP 8-91)	Fusion Bonded 100 percent Solids Epoxy	1 or 2 coats, 7 MDFT
TFE Lube, Shop Applied; Grease Lube Alternative, Field Applied Just Prior to Installation	TFE Lube or Grease Lube	1 coat, as required

J. System No. 106 Galvanized Metal:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Solvent Clean (SP 1-82) Followed by Hand Tool (SP 2-89) or Power Tool (SP 3-89)	Wash Primer or Coating Manufacturer's Recommendation	1 coat. 0.4 MDFT
	Alkyd Enamel (Semigloss)	2 coats, 4 MDFT

K. System No. 107 Metal Trim and Structural Steel:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Abrasive Blast. or Centrifugal Wheel Blast (SP 6-91) -OR- Pickle (SP 8-91)	Rust-Inhibitive Primer	1 coat. 2 MDFT
Solvent Clean (SP 1-82) at Factory Primed Surfaces.	Alkyd Enamel (Semigloss)	2 coats, 4 MDFT

L. System No. 115 Gypsum Wallboard and Plaster, Semigloss:

Surface Prep.	Paint Material	Min. Coats, Cover
	Latex Primer / Sealer	1 coat. 300 SFPG
	Acrylic / Latex (Semigloss)	2 coats, 400 SFPGPC

3.09 APPLICATION SCHEDULE

- A. In accordance with the following application schedule. In the event of discrepancies or omissions in the following, request clarification from the Construction Manager before starting work in question.
- B. System No. 2 Concrete Embedded Metal: Use on the following items or areas:
  - 1. Concrete embedded surfaces of metallic items, such as wall pipes, pipe sleeves, access manholes, gate guides and thimbles, and structural steel.
- C. System No. 5 Exposed Metal-Mildly Corrosive: Use on the following items or areas:
  - 1. As noted in the Interior Finish Schedule on the Drawings.
  - 2. Cofferdam Piles and Panels: Paint color to match Ameritone IU52B, Mikado.
  - 3. Steel security fencing at dam abutments. Paint color to match Ameritone IU52B, Mikado.
  - 4. Security camera supports and enclosure. Paint color to match Ameritone IU52B, Mikado.
- D. System No. 5A, Exposed Metal - Mildly Corrosive: Use on galvanized items or areas specified to be painted.
- E. System No. 8 Buried Metal - General: Use on the following items or areas:
  - 1. Buried, below grade portions of steel items, except buried stainless steel or ductile iron.
- F. System No. 10 Galvanized Metal Conditioning: Use on galvanized surfaces requiring painting.
- G. System No. 11 Galvanized Metal Repair: Use on the following items or areas:
  - 1. Galvanized surfaces that are abraded, chipped, or otherwise damaged.
- H. System No. 27 Aluminum and Dissimilar Metal Insulation: Use on concrete embedded aluminum surface.
- I. System No. 29 Fusion Bonded Coating: Use on the following Items:
  - 1. Stainless steel bolts with fusion bonded coating.

- J. System No. 29A Fusion Bonded Steel Dowel Coating: Use on steel expansion joint dowels specified in Section 03 25 10, Concrete Joints.
- K. System No. 106 Galvanized Metal: Use on the following items or areas:
  - 1. As noted in the Interior Finish Schedule on the Drawings.
- L. System No. 107 Metal Trim and Structural Steel: Use on the following items or areas:
  - 1. As noted in the Interior Finish Schedule on the Drawings.
- M. System No. 109 Concrete Masonry, Semigloss: Use on the following items or areas:
  - 1. As noted in the Interior Finish Schedule on the Drawings.
- N. System No. 115 Gypsum Wallboard and Plaster, Semigloss: Use on the following item or areas:
  - 1. As noted in the Interior Finish Schedule on the Drawings.
- O. Surfaces Not Requiring Painting: Unless otherwise stated or shown, the following areas or items will not require painting or coating:
  - 1. Concrete and masonry surfaces.
  - 2. Reinforcing steel.
  - 3. Nonferrous and corrosion-resistant ferrous alloys such as copper, bronze, monel, aluminum, chromium plate, atmospherically exposed weathering steel, and stainless steel, except where:
    - a. Required for electrical insulation between dissimilar metals.
    - b. Aluminum and stainless steel are embedded in concrete or masonry. or aluminum is in contact with concrete or masonry.
    - c. Color coding of equipment and piping is required.
  - 4. Nonmetallic materials such as glass, PVC, wood, porcelain, and plastic (FRP) except as required for architectural painting or color coding.
  - 5. Prefinished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches (if prefinished in OSHA yellow), acoustical tile, cabinets, elevators, building louvers, and wall panels; color coding of equipment is required.
  - 6. Nonsubmerged electrical conduits attached to unpainted concrete surfaces.
  - 7. Cathodic protection anodes.
  - 8. Items specified to be galvanized after fabrication, unless specified elsewhere or subject to immersion.
  - 9. Insulated piping and insulated piping with jacket will not require exterior coating, except as required for architectural painting or color coding.

**END OF SECTION**

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
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**PAIN T SYSTEM DATA SHEET**

Complete and attach manufacturer's Technical Data Sheet to this PSDS for **each** coating system.

Paint System Number (from Spec.):		
Paint System Title (from Spec.):		
Coating Supplier:		
Representative:		
Surface Preparation:		
<b>Paint Material (Generic)</b>	<b>Product Name/Number (Proprietary)</b>	<b>Min. Coats, Coverage</b>

SECTION 25 00 05

COMMON WORK RESULTS FOR PROCESS MONITORING AND CONTROL SYSTEMS

PART 1 GENERAL REQUIREMENTS

1.01 SUMMARY

- A. Section Includes: The work specified in this Section consists of the supply of material, the installation, scope of work of the Process Monitoring and Control System herein designated as PMCS.
- B. Allen-Bradley PLC Systems, as called out on the drawings and in the specifications shall be provided, no exceptions. This is provided to meet the current City standards, and to match the current manufacturer in the modified PLC panel.
- C. All programming of the current PLC/HMI system shall be provided by the City; the Contractor shall modify the current PLC control panel hardware and wiring as required to meet I/O requirements.
- D. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 25 00 60 – Process Control Panels and Hardware
  - 3. Section 35 22 26 – Sluice Gates

1.02 REFERENCES

- A. Instrument Society of America (ISA):
  - 1. S5.1, Instrumentation Symbols and Identification (NRC ADOPTED).
  - 2. S50.1, Compatibility of Analog Signals for Electronic Industrial Process Instruments.
  - 3. RP55.1, Hardware Testing of Digital Process Computers, Recommended Practice.
  - 4. S5.3 Graphic Symbols for Distribution Control/Shared Display Instrumentation, Logic and Computer Systems.
  - 5. RP7.3, Quality Standards for Instrument Air.
- B. National Electrical Manufacturers Association (NEMA): NEMA 250-85, Enclosures for Electrical Equipment (1,000 Volts Maximum).
- C. Underwriters Laboratory Inc. (UL): UL 508, Standards for Safety, Industrial Control Equipment.
- D. Deutsche Industrie-Norm (DIN), VDE 0611, Specification for modular terminal blocks for connection of copper conductors up to 1,000V ac and up to 1,200V dc.

1.03 DEFINITIONS

- A. Abbreviations:
  - 1. ANSI - American National Standards Institute.
  - 2. FAT - Factory Acceptance Test.
  - 3. HMI - Human Machine Interface.

4. IEEE - Institute of Electrical and Electronic Engineers.
5. ISA - Instrument Society of American Standards.
6. I&C - Instrumentation and Control.
7. I/O - Input and Outputs.
8. JIC - Joint Industrial Council.
9. NEC - National Electrical Code.
10. NEMA - National Electrical Manufacturers Association.
11. OSHA - Occupational Safety and Health Act.
12. O&M - Operation and Maintenance.
13. PC - Personal Computer.
14. PMCS – Process Monitoring and Control System.
15. P&ID - Process and Instrumentation Diagram.
16. PLC - Programmable Logic Controller.
17. UL - Underwriter's Laboratories, Inc.
18. CSA - Canadian Standards Association.
19. OIT – Operator Interface Terminal

B. Enclosure: Control panel, console, cabinet, or instrument housing.

C. Work Day: 8 hours of actual work.

D. Rising/Falling: Terms used to define action of discrete devices about their set point.

1. Rising: Contacts close when an increasing process variable rises through set point.
2. Falling: Contacts close when a decreasing process variable falls through set point.

E. Signal Types:

1. Analog Signals, Current Type:
  - a. 4 to 20 mA dc signals conforming to ISA S50.1.
  - b. Unless otherwise indicated for specific PMCS Subsystem components, use the following ISA 50.1 options:
    - 1) Transmitter Type: Number 2, two-wire.
    - 2) Transmitter Load Resistance Capacity: Class L.
    - 3) Fully isolated transmitters and receivers.
2. Analog Signals, Voltage Type: 1 to 5 volts dc within panels where a common high precision dropping resistor is used.
3. Discrete signals, two-state logic signals using 120Vac or 24Vdc sources as indicated.

#### 1.04 GENERAL REQUIREMENTS

#### 1.05 SCOPE OF WORK

A. General

- a. Equipment Shop Drawing Submittal Schedule
- b. Wiring Diagram Submittal Schedule

2. Field cables and raceways shall be supplied and installed as called out on the drawings. Control panels supplied by the PMCS provider shall be installed by the this Provider. The Contractor shall provide coordination support for the installation of control panels, cables and raceways for the PMCS system.

**B. Requirements**

1. Provide the following equipment and services required under this Section and related sections:
  - a. Required Submittals.
  - b. Equipment as indicated on the Project Drawings.
  - c. Instructions, details, and recommendations to, and coordination with, Contractor for Certificate of Installation.
  - d. Verify readiness for operation.
  - e. Verify the correctness of final power and signal connections (lugging and connecting).
  - f. Adjusting and calibrating.
  - g. Starting up.
  - h. Testing and coordination of testing.
  - i. Training.

**C. Interconnections Coordination**

1. Verify the following work not provided by the Contractor is provided:
  - a. Correct type, size, and number of signal wires within their respective raceways.
  - b. Correct electrical power circuits and raceways.
  - c. Correct type, size, and number of fiber optic cables/strands and their raceways.
  - d. Correct size, type, and number of related pipes, valves, fittings, and tubes.
  - e. Correct size, type, materials, and connections of process mechanical piping for in-line primary elements.

**D. Equipment Coordination**

1. For equipment not provided under this section, but directly connected to equipment required by PMCS:
  - a. Obtain from provider, manufacturers' information on installation, interface, function, and adjustment.
  - b. Coordinate with provider to allow required interface and operation with PMCS.
  - c. For operation and control, verify that installations, interfacing signal terminations, and adjustments have been completed in accordance with manufacturer's recommendations.
  - d. Test to demonstrate required interface and operation with PMCS.
  - e. Examples of items in this category, but not limited to the following:
    - 1) Valve operators, position switches, and controls.

- a) Demonstrate remote control of the valve operators and remote valve position control from the water plant/central site; and from the remote hand station, in coordination with the City.

## 1.06 SUBMITTALS

- A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions.
- B. Submit shop drawings for the system which is documented in accordance with Instrument Society of America (ISA) Standard ISA-S5.1/.2/.3/.4.
  1. Product Data: For each electrical component, include manufacturers descriptive literature; product specifications; published details; technical bulletins; performance and capacity rating curves, charts, and schedules; catalogue data sheets; and other submittal materials as required to verify that the proposed products conform to the quality and function ability of the specified products.
  2. Identification: Clearly indicate by an arrow on submissions covering more than one product type or style exactly which product is being submitted for approval.
  3. Equipment Characteristics: Size, location, weight, and electrical requirements.
  4. Manufacturer: Include the catalogue name, company name, address, and telephone number for each product submitted.
- C. Submit copies of the Equipment O&M manuals for equipment supplied within four (4) weeks prior to start up and final acceptance test. The submission and approval of this manual is considered to be an integral part of furnishing and delivery of the system equipment. Include the following elements in each manual in addition to all submittal items listed above.
  1. Erection and installation sequence and instructions.
  2. Exploded view drawings and illustrations with sequence description for assembly and disassembly of equipment.
  3. Comprehensive parts and materials list for each equipment element indicating manufacturer and manufacturer's identification number. Include name, address, and telephone number of sales and service office nearest to the final destination of the PMCS, for each major equipment item.
  4. Schedules of recommended spare parts to be stocked, including part number, inventory quantity, and ordering information.
  5. Performance rating and nameplate data for each major system component.
  6. Procedures for starting, operating, adjusting, calibrating, testing, and shutting-down system equipment.
  7. Emergency operating instructions and trouble-shooting guide.
  8. Schedule of routine maintenance requirements and procedures, and preventative maintenance instructions required to insure satisfactory performance and equipment longevity.
  9. Maintenance instructions for extended out-of-service periods.
  10. Complete listing of all software programming.
  11. Complete Operator's Supervisors Manual for the Control System which includes system hardware and software, and a "how to" description of the system.

12. Testing Reports.
13. "As-built" drawings of control panels, wiring, instruments, etc. Final as-built drawing shall be provided on compact disks in AutoCAD format.
14. PLC Control Panels: Provide the following information for each individual supplied control panel.
  - a. System Architecture Diagram (if applicable)
  - b. Enclosure and Panel Layout Drawing(s)
  - c. Equipment Build Sheet
  - d. Equipment manufacturers' product information
  - e. Power Distribution Ladder Drawing(s)
  - f. I/O Module Wiring Diagrams (Loop Drawings)

#### 1.07 QUALITY ASSURANCE

- A. The drawings and specifications are based on instrumentation and control equipment manufactured by the first named manufacturer. Any changes to the structure, piping, electrical work, etc., required for other approved manufactures shall be borne by the Contractor. The Contractor shall submit drawings to the Engineer, showing changes in the equipment, piping, structure and electrical work.
- B. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory unless products meeting the requirements of these testing laboratories are not readily available or unless standards do not exist for the products. Provide products that are listed and labeled or approved as stated above for the location installed in and listed and labeled or approved as indicated and specified for the applications the items are intended for.
- C. All components (i.e. hardware, software, etc.) of the PMCS shall be the most current proven design available at the time of installation of the system. The Contractor shall provide a warranty for all PMCS components for a period of one year after start up and City acceptance. In addition, the Contractor shall provide software upgrades for a period of one year after plant start up and City acceptance at no additional cost to the City. All components shall be suitable for the intended application and shall be installed and wired in strict accordance with the manufacturer's requirements.

The PMCS equipment shall be the standard products of a manufacturer who has been regularly engaged in the successful production of high quality equipment and systems of the type specified for at least 10 years, has supplied such equipment for at least five years of the ten year period, and has at least three similar system installations in successful operation for at least five years.

- D. The Contractor shall assume complete system responsibility for the adequate and proper operation of all equipment furnished regardless of original source or manufacturer.

#### 1.08 DELIVERY STORAGE AND HANDLING

- A. Store all PMCS equipment and accessories specified in this Section, which are delivered to the project site prior to the time the Contractor is ready to install them, as specified in Section 01 66 00, Product Storage and Handling Requirements. Verify from the Manufacturer the maximum and minimum temperature and maximum relative humidity for storing the equipment, and conform to the Manufacturer's requirements. In any case, the minimum storage requirements will be those specified in Section 01 66 00, Product Storage and Handling Requirements and the minimum storage temperature shall not be less than 50 degrees F. Protect the equipment from humid conditions which might cause corrosion of the electrical and electronic parts of the equipment. Failure to store equipment in the specified or approved manner shall be sufficient reason for not accepting the equipment, regardless of the outside appearance or warranty of the manufacturer. Protect all electronic equipment from a dusty environment by sealing the equipment in plastic, etc.

#### 1.09 PROJECT/SITE CONDITIONS

- A. Environmental Design Requirements: The following defines certain types of environments. PMCS Subsystems refer to these definitions by name to specify the environments requirements for individual equipment units.
  - 1. Inside:
    - a. Temperature: 20 to 104 degrees F.
    - b. Relative Humidity: 10 to 95 percent non-condensing.
    - c. NEC Classification: Non-hazardous.
  - 2. Outside:
    - a. Temperature: Minus 20 to minimum of 122 degrees F.
    - b. Relative Humidity: 10 to 100 percent rain, snow, freezing rain.
    - c. NEC Classification: Non-hazardous.

#### 1.10 WARRANTY

- A. The Contractor shall provide a warranty for all PMCS equipment for a period of one (1) year after start-up and City acceptance.

#### 1.11 SYSTEM CONTROL CONCEPT

- A. The purpose of the System Control Concept is to provide a written description of how the process equipment should be monitored and controlled by the PMCS.
- B. The Operation of the Control System is written in the Valve Operators specification, reference section 35 22 26.
- C. All PLC programming and HMI programming and screen development shall be provided by the COT.

**PART 2 PRODUCTS**

**2.01 GENERAL**

- A. The Contractor shall check and verify that all manufacturers' part numbers indicated on the drawings and specifications are current for the specified application.

**2.02 SPARE PARTS**

- A. Provide spare parts as specified in this section and the related sections.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install equipment as shown on the Drawings and approved shop drawings and as directed by the manufacturer's representative.
  - 1. Mount enclosures on 1/4-inch (6mm) minimum spacers or U-channel supports to provide a space between enclosures and mounting surfaces.
  - 2. Set the top of enclosures 6' above the finished floor or grade unless otherwise indicated or specified.

**END OF SECTION**

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
0	4/14/2017		All	Final Submittal

SECTION 25 00 60  
PROCESS CONTROL PANELS AND HARDWARE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: General requirements for Control Panels.
  - 1. Modify existing PLC control panel to accommodate the I/O shown on the drawings; utilize existing spare digital inputs/outputs and utilize spare analog input on the current Allen Bradley PLC.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 25 00 05 - Common Work Results for Process Monitoring and Control Systems

1.02 REFERENCES

- A. Institute of Electrical and Electronic Engineers/American National Standards Institute (IEEE/ANSI)
- B. Instrumentation Society of America (ISA)
- C. National Electrical Code (NEC)
- D. International Electrotechnical Commission (IEC)
- E. National Electrical Manufacturers Association (NEMA)
- F. Computer and Business Equipment Manufacturers Association (CBEMA)
- G. Underwriters Laboratory, Inc. (UL)

1.03 DEFINITIONS

- A. Abbreviations:
  - 1. Controller - The logic processor that monitors and controls the input/output signals of a PLC.
  - 2. I/O - Input and Output modules and signals of a PLC.
  - 3. Interposing Control Relay – An electrically actuated relay whose coil is energized in order to provide a dry (un-powered) isolated digital control signal (on/off) to another electrically actuated device.
  - 4. Module - An individual electronic card in the PLC rack.
  - 5. PCP - Process Control Panel, the enclosure containing the PLC.
  - 6. PLC - Programmable Logic Controller; includes the controller and the I/O modules.

7. Chassis - The housing which contains the controller and I/O modules of a PLC.
8. Slot - The portion/section of a PLC rack into which a controller or I/O module is inserted.

#### 1.04 SUBMITTALS

- A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions.
- B. Submit shop drawings for all components as follows:
  1. Product Data: For each component, include manufacturers descriptive literature; product specifications; published details; technical bulletins; performance and capacity rating curves, charts, and schedules; catalogue data sheets; and other submittal materials as required to verify that the proposed products conform to the quality and function ability of the specified products.
  2. Identification: Clearly indicate by an arrow on submissions covering more than one product type or style exactly which product is being submitted.
  3. Equipment Characteristics: Size, location, weight, and electrical requirements.
  4. Manufacturer: Include the catalogue name, company name, address, and telephone number for each product submitted.
- C. Arrangement Drawings:
  1. Provide Arrangement Drawing for external front panel, and internal side and rear mounting sub-panels.
  2. Provide Bill of Materials, on Arrangement Drawing, identifying equipment shown and all software specified in this section. Equipment shall be referenced by a numerical item number. Material schedule shall include the following information:
    - a. Item
    - b. Identity
    - c. Quantity
    - d. Description
    - e. Manufacturer
    - f. Catalog Number
    - g. Remarks
  3. Provide nameplate schedule, on the Arrangement Drawings, and include the following information:
    - a. Item
    - b. Quantity
    - c. Line 1 Text
    - d. Line 2 Text
    - e. Line 3 Text
    - f. Text Height
    - g. Nameplate Size
  4. Provide Legend schedule, on the Arrangement Drawings, and include the following information:
    - a. Item

- b. Quantity
- c. Line Text

D. Ladder Diagrams:

1. Provide power distribution diagrams, relay control wiring diagrams, and PLC I/O wiring diagrams drawn with circuitry arranged in functional sequence on ladder-type diagrams. Assign each horizontal line or “rung” on the ladder diagram a sequential number and write that number to the left the ladder.
2. For Power distribution and relay control wiring diagrams, use the rung number to develop the wire numbers. Form the first wire number on any rung by adding a “1” to the end of the rung number. When a wire passes through any device capable of breaking the circuit (i.e. circuit breaker, fuse, switch, relay contact), number the wire on the opposite side of that device with the next wire number in the sequence. Form the second wire number on any rung by adding a “2” to the end of the rung number. Continue the wire numbering in this manner from left to right along the circuit on that particular rung. Generated rung numbering on all wiring diagrams using the following sequence:
  - a. Use rung numbers 000 to 099 for power distribution drawings.
  - b. Use rung numbers 100 to 199 on the drawing for the module in Slot 1.
  - c. Use rung numbers 200 to 299 on the drawing for the module in Slot 2.
  - d. Use rung numbers 300 to 399 on the drawing for the module in Slot 3.
  - e. Use rung numbers 400 to 499 on the drawing for the module in Slot 4.
  - f. Use rung numbers 500 to 599 on the drawing for the module in Slot 5.
  - g. Use rung numbers 600 to 699 on the drawing for the module in Slot 6.
  - h. Use rung numbers 700 to 799 on the drawing for the module in Slot 7.
  - i. Use rung numbers 800 to 899 on the drawing for the module in Slot 8.
  - j. Use rung numbers 900 to 999 on the drawing for the module in Slot 9.
  - k. Use rung numbers 1000 to 1099 on the drawing for the module in Slot 10.
  - l. Continue rung numbering on each drawing for subsequent slots in the same manner as indicated above.
3. Draw relay coils on the right side of the ladder. Show the rung numbers on which the relay contacts appear to the right of each coil. Designate a normally closed contact by drawing a diagonal line through the contact. Designate a timed contact by adding the letters "TR" to the right and below the contact.
  - a. Number relay coils on power distribution and digital control wiring drawings shall be numbered sequentially from R-01 to R-99.
  - b. Number relay coils on PLC digital output module I/O wiring drawings by an “R” followed by the slot number followed by a dash followed by the two digit point number.
    - 1) Examples are “R1-02” or “R2-15”, where:
      - a) “R1” or “R2” designate the digital output module slot number and
      - b) “02” or “15” designate the digital output module point number.
4. Show field and control panel terminal blocks on the drawing with the terminal numbers of devices.
5. Show all standard symbols used on the drawings on a symbols sheet.
6. Show field wiring as a dashed line with cable number identified.

7. Draw PLC input modules on the right side of the ladder and PLC output modules on the left side of the ladder.
8. Draw the AC power line voltage (120VAC) wire on the left side of the ladder and the AC power neutral (120VAC) wire on the right side of the ladder.
9. Draw the DC power positive (24VDC+) wire on the left side of the ladder and the DC power negative (24VDC-) wire on the right side of the ladder.

E. Loop Diagrams

1. Draw analog signals as loops that conform to ISA S5.4 and project drawings.
2. Field and control panel terminal blocks shall be shown on the power distribution and I/O module wiring drawings along with the terminal numbers on all associated devices.
3. Show all field wiring as dashed lines with cable numbers properly identified using a leader from the dashed lines to the cable number identifier.
4. Coordinate all Analog and Digital Signal Cable numbers with the field instrument to which they terminate. Format the cable number to include the PCP number (or designator) followed by a dash and the instrument designation followed by a dash and the instrument number.
  - a. Examples are “009-LIT-611” or “BPS-LSH-902”, where:
    - 1) “009” or “BPS” designate the PCP number or name,
    - 2) “LIT” or “LSH” designate the instrument type and
    - 3) “611” or “902” designate the instrument number.
5. Coordinate all signal conductors in Analog Signal Cables with the Slot and Point numbers to which they terminate in the PCP cabinet. Format the conductor number to include the I/O type designator followed by a colon, followed by the slot number, followed by a forward slash (/) followed by the point number followed by the polarity designation contained in parenthesis.
  - a. Examples are “O:1/2(+)” or “I:2/15(-)”, where:
    - 1) “O” or “I” designate the I/O type,
    - 2) “1” or “2” designate the I/O module slot number,
    - 3) “2” or “15” designate the I/O point number and
    - 4) “(+)” or “(-)” designate the polarity of the signal wire.
6. Coordinate the power conductor (hot wire) in a Digital Input Signal Cable the rung number from which the power conductor originates.
7. Coordinate the signal conductor (signal wire) in a Digital Input Signal Cable with the Slot and Point numbers to which it terminates in the PCP cabinet. Format the conductor number to include the I/O type designator followed by a colon, followed by the slot number, followed by a forward slash (/) followed by the point number.
  - a. Examples are “I:1/2” or “I:2/15”, where:
    - 1) “I” designate the I/O type,
    - 2) “1” or “2” designate the I/O module slot number and
    - 3) “2” or “15” designate the I/O point number.
8. Coordinate the signal conductor (signal wire) from a Digital Output point to the coil of the associated interposing control relay with the Slot and Point numbers from which it originates in the PCP cabinet. Format the conductor number to

include the I/O type designator followed by a colon, followed by the slot number, followed by a forward slash (/) followed by the point number.

- a. Examples are “O:1/2” or “O:2/15”, where:
    - 1) “O” designate the I/O type,
    - 2) “1” or “2” designate the I/O module slot number and
    - 3) “2” or “15” designate the I/O point number.
  9. Coordinate the two isolated control conductors from a Digital Output interposing control relay with the rung number from which they originate. The first wire number on that rung shall be formed by adding a “1” to the end of the rung number. The second wire number on that rung shall be formed by adding a “2” to the end of the rung number.
- F. Test Documentation
1. Provide a complete set of test documentation to the Engineer after testing is completed and shipment of the control panel.
- G. Operations and Maintenance Manual
1. Submit the following As Built documentation to be included in the O & M manual.
    - a. System Architecture Diagram (if applicable)
    - b. Enclosure and Panel Layout Drawing(s)
    - c. Equipment Build Sheet
    - d. Equipment manufacturers’ product information
    - e. Power Distribution Ladder Drawing(s)
    - f. I/O Module Wiring Diagrams (Loop Drawings)

## 1.05 QUALITY ASSURANCE

- A. The drawings and specifications are based on the components manufactured by the first named manufacturer. Any changes to the required for other approved manufactures shall be borne by the Contractor in accordance with Section 01 25 00, Substitution Procedure of these Specifications. The Contractor shall submit drawings to the Engineer, showing changes in the equipment, piping, structure and electrical work.
- B. Manufacturer Qualifications
1. The control panels shall be the standard products of a manufacturer who has been regularly engaged in the successful production of high quality control panels of the type specified for at least 3 years.
- C. Examination of Equipment for Safety
1. Control Panels(only new) shall be UL-508A listed and labeled by the Supplier. The Control panel shall be built in compliance with NEC Article 409.
  2. Equipment and materials installed within the control panel shall be U.L. Listed, Labeled or identified.

3. Equipment and materials shall have been tested by a testing laboratory; and shall meet, or exceed, nationally recognized standards, or have been found suitable for use in the specific manner as intended by the Engineer.
4. Equipment and materials utilized shall be included within published listings prepared by testing laboratories, inspection agencies or other organizations concerned with product evaluations.

#### 1.06 DELIVERY STORAGE AND HANDLING

- A. Store all control panels and accessories specified in this Section, which are delivered to the project site prior to the time the Contractor is ready to install them, as specified in Section 01 66 00, Product Storage and Handling Requirements. Verify from the Contractor the maximum and minimum temperature and maximum relative humidity for storing the equipment, and conform to the Contractor's requirements. In any case, the minimum storage requirements will be those specified in Section 01 66 00, Product Storage and Handling Requirements and the minimum storage temperature shall not be less than 50 degrees F. Protect the equipment from humid conditions which might cause corrosion of the electrical and electronic parts of the equipment. Failure to store equipment in the specified or approved manner shall be sufficient reason for not accepting the equipment, regardless of the outside appearance or warranty of the manufacturer. Protect all electronic equipment from a dusty environment by sealing the equipment in plastic, etc.
- B. The control panel shall be internally wired before delivery to the job site. Field modifications to existing equipment or internal wiring shall be the responsibility of the Contractor. Field work shall be performed under the prevailing labor conditions.

#### 1.07 PROJECT/SITE CONDITIONS

- A. Environmental Design Requirements: The following defines certain types of environments. Refer to these definitions by name to specify the environments requirements for individual devices.
  1. Inside:
    - a. Temperature: 20 to 104 degrees F.
    - b. Relative Humidity: 10 to 95 percent non-condensing.
    - c. NEC Classification: Non-hazardous.
  2. Outside:
    - a. Temperature: Minus 20 to 104 degrees F.
    - b. Relative Humidity: 10 to 100 percent rain, snow, freezing rain.
    - c. NEC Classification: Non-hazardous.
  3. Outside, Corrosive:
    - a. Temperature: Minus 20 to 104 degrees F.
    - b. Relative Humidity: 0 to 100 percent, rain, snow, freezing rain.
    - c. Corrosive Environment: Chlorine gas.
    - d. NEC Classification: Non-hazardous.
  4. Outside, Hazardous:
    - a. Temperature: Minus 20 to minimum 104 degrees F.

- b. Relative Humidity: 0 to 100 percent rain, snow, freezing rain.
- c. NEC Classification: Class 1, Division 1, Group D.

## 1.08 WARRANTY

- A. The Contractor shall provide a warranty for all components for a period of one (1) year after start-up and the City's acceptance.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. There is one existing PLC control panel in the existing control building; modify this panel for the I/O as shown on the drawings.
- B. If three or more manufacturers are called out, then only any one of those manufacturers can be provided and therefore there shall be "no substitutes".

### 2.02 FUSES

- A. Construction:
  - 1. All fuses shall be sized per NEC Code, in accordance with equipment manufacturer's recommendations, and as required for the application.
  - 2. Provide midget fuses, rated 300 VAC or higher.
- B. Spare Parts:
  - 1. Provide 10% spare fuses and not less than 10 of each type provided with the system.
- C. Manufacturers:
  - 1. Bussman
  - 2. Littlefuse
  - 3. Gould / Ferraz / Shawmut
  - 4. Or Approved Equal

### 2.03 FUSE HOLDERS

- A. Construction:
  - 1. Provide midget enclosed fuse holders for general control enclosure fuse applications up to 30 Amperes.
  - 2. Provide fuse holders as indicated on the project drawings and as required to make a complete project.
  - 3. The fuse holders shall be able to be used as a disconnecting means.
  - 4. Provide fuse holders with blown fuse indication.
  - 5. Identify each fuse holder with a permanent machine printed marking in accordance with the terminal fuse block number shown on the project drawings.
- B. Spare Parts:

1. Provide 10% installed spare fuse holders in each enclosure for each type used i.

C. Manufacturers:

1. Marathon MIK5
2. Phoenix
3. Allen Bradley
4. Square D
5. Weidmuler
6. Or Approved Equal

## 2.04 TERMINAL BLOCKS

A. Construction:

1. Terminal blocks shall be provided for all external connections. The spare points shall be so arranged that each series of blocks in a given area shall have a reasonable proportion of the spare points. Each spare input/output and annunciator point shall be wired to identified terminal blocks for connections.
2. Terminal blocks shall be rated for 300 volts, 30 amperes, barrier-type screw terminals. Terminal blocks shall be furnished with compression terminals. Where possible, solderless spade tongue connectors with insulating sleeves shall be used for connecting wires to terminal blocks. Each terminal shall be identified by a suitable engraved or painted wire number on the marking strip attached to the block. No more than two wires shall be connected to any one terminal. Electrical power, control and alarm wiring shall be terminated in terminal block assemblies separate and apart from terminal blocks used for analog signal wiring. Splices are not permitted in control panels, all wiring shall terminate on terminals.

B. Spare parts:

1. Provide 20% installed spare terminal blocks in each control panel for each type of terminal block provided on the panel.

C. Manufacturers:

1. Marathon MIK5
2. Phoenix
3. Allen Bradley
4. Square D
5. Weidmuler
6. Or Approved Equal

## 2.05 DC POWER SUPPLIES

A. Construction:

1. Provide linear regulated power supplies
2. Provide redundant DC power supplies for all control enclosures.
3. Provide separate DC power supplies as required to power instruments requiring external power.

4. Power supplies shall convert nominal 120 VAC, 60 Hertz power to 24 VDC power.
5. Output, overvoltage, and overcurrent protective devices shall be provided with the power supply to protect the instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.
6. Power supplies shall be sized with a minimum of 100% spare capacity. Submit load calculations showing margin with product information shop drawing.
7. Power supplies shall be configured for DIN rail mounting.
8. Power supplies shall be mounted in accordance with the manufacturer's recommendations to meet or exceed the manufacturers' ventilation and heat dissipation requirements.
9. Power Supply shall be UL listed
10. Ambient Operational Temperature: -20 °C to 71 °C (-4 °F to 160 °F)

B. Spare parts

1. Provide 10 percent spare, but not less than one complete unit of each type of power supply provided on the project.

C. Manufacturers:

1. Accopian, Gold Box
  - a. Reference drawings for part # and size
2. Phoenix Contact
3. Or Approved Equal

## 2.06 GENERAL PURPOSE RELAYS

A. Construction:

1. Provide all relays which may be required to make a complete system.
2. Relays shall be designed for multiple switching applications as indicated on the drawings.
3. Standard contact arrangement shall be DPDT rated at a minimum of 10 Amps at rated voltage, with pilot light indicating on/off status.
4. Relays shall plug into an 8 or 11 pin single tier screw terminal socket.

B. Spare Parts:

1. Provide 10% spare, but not fewer than 2, of each type provided on the project.

C. Manufacturers:

1. Square D class 8501 (2 & 3 pole); Square D Telemecanique (> 3 poles)
2. Allen Bradley 700-HA
3. Releco
4. Tyco (Potter & Brumfield KRPA)
5. Tyco (Agastat)
6. Or Approved Equal

## 2.07 SIGNAL ISOLATORS

- A. Construction:
  - 1. Provide isolators in the control panels for 4 to 20 mA signals where required to prevent ground loop problems, i.e., 4 wire transmitter with grounded signal common or loading problems.
  - 2. Isolators shall be modular design to allow easy replacement of the unit.
  - 3. Provide isolators with field configurable input and output ranges.
  - 4. Provide isolators that are DIN mounted and 24 VDC powered unless otherwise shown on the drawings.
- B. Spare parts:
  - 1. Provide 10% spare, but not less than two of each type provided on the project.
- C. Manufacturers:
  - 1. Phoenix Contact
  - 2. AGM
  - 3. Action Instruments
  - 4. PR Electronics
  - 5. Or Approved Equal

## 2.08 BRANCH CIRCUIT POWER SURGE PROTECTIVE DEVICES (SPD-A1)

- A. Construction:
  - 1. Provide 120VAC or other primary voltage rated power line surge protective devices (SPDs) where shown on the drawings and for power input to every control enclosure.
  - 2. SPDs are to be ANSI/IEEE C62.41 category A3 rated and series connected.
  - 3. SPDs are to be UL 1449 3<sup>rd</sup> edition compliant
  - 4. Minimum Performance Specifications:
    - a. Provide clamping envelope that follows the AC sine-wave contour.
    - b. Maximum Continuous Current: as indicated on the drawings.
    - c. Maximum Continuous Operating Voltage: 150Vac.
    - d. Short Circuit Current Rating: 5kA
    - e. Rated Single-Pole Transient Energy (10/1000 micro-Second, Joules): L-N 336J, L-G 168J, N-G 168J.
    - f. Noise Rejection @ 50 Ohms, 5kHz to 100MHz: -20dB to -40dB.
    - g. Operating Frequency Range: 50/60Hz.
    - h. Peak Clamping Voltage (8/20 micro-Second, 3000 Amps, Volts): L-N 330V, L-G 330V, N-G 400V.
    - i. Operating Temperature Range: -10 to 60 Degrees C.
  - 5. Provide visual alarm when surge protection is lost. Provide isolated contact for remote monitoring. Device shall continue to provide power to the load in the event that surge protection is lost.
- B. Spare Parts:
  - 1. Provide ten percent spare, but not less than one of each type used on the project.

C. Manufactures:

1. Leviton Cat. No. 51020-WM
2. Phoenix Contact: PT2-PE/S-120VAC
3. Cutler Hammer, Aegis
4. Or Approved Equal

2.09 ANALOG SIGNAL AND DATALINE SURGE PROTECTIVE DEVICE (SPD-A2)

A. Construction:

1. All 4-20mA instrument loop analog signal and EIA RS-232, RS-422, RS-423, RS-485 standard interface data communication surge protectors shown on the drawings or provided as part of this work are to be ANSI/IEEE C62.41 category A3 rated and series connected SPD..
2. Minimum Performance Specifications @ 28V L-G and 25 degrees C:
  - a. Provide heavy-duty, multi-staged protection.
  - b. Surge Life (10/1000 micro-Second): >100 operations with 200 Amps.
  - c. Surge Life (8/20 micro-Second): >10 operations with 10,000 Amps.
  - d. DC Leakage Current at Rated L-G Voltage: >10 micro-Amps.
  - e. Signal/Data Attenuation at Maximum Data Rate : 3dB with 600 Ohm termination.
  - f. Operating Temperature Range: -40 to 60 Degrees C.
  - g. Response Time: 50 pico-Seconds.
  - h. Maximum Data Rate: 4 MHz.
  - i. Peak Clamping Voltage (8/20 micro-Second, 5000 Amps): L-L 55 Volts.
  - j. Peak Clamping Voltage (8/20 micro-Second, 1000 Amps): L-L 45 Volts.
  - k. Load Current: 150 mA.
  - l. Series Resistance: 22 Ohms.

B. Spare Parts:

1. Provide ten percent spare, but not less than one of each type used on the project.

C. Manufacturers:

1. Phoenix Contact: PT 1x2-24VDC-ST or PT 2x2-24VDC-ST
2. Bourns, 1800 Series
3. Or Approved Equal

2.10 NAMEPLATES

A. General: All nameplates shall conform to ISA Recommended Practice publication ISA-RP60.6.

B. Construction:

1. Nameplates shall be used to display basic information including function.
2. Letters shall be gothic upper case (capital letters), minimum height shall be 1/8 inch with a 3/64 inch space between lines.
3. Nameplates shall be made of laminated engraving stock having a black core with a white surface.

4. The characters shall be engraved using an industry standard engraving machine.
5. Nameplates shall be attached to the enclosure using double-faced pressure-sensitive tape. Where the environment is not conducive to tape i.e. outdoors, NEMA 4, 4X, and 3R environments stainless steel screws shall be used in place of the tape.
6. Enclosure identification nameplates shall be larger sized letters, 3/16 inch minimum.
7. Abbreviations shall conform to appendix B of ISA Recommended Practice publication ISA-RP60.6.
8. Margins shall conform to the following:
  - a. With holes
    - 1) Top/bottom - 1/16" min
    - 2) Sides left/right - 5/16" min
  - b. Without holes
    - 1) Top/bottom - 1/16" min
    - 2) Sides left/right - 1/8" min

## 2.11 LEGEND PLATES

- A. General: All legend plates shall conform to ISA Recommended Practice publication ISA-RP60.6.
- B. Construction:
  1. Legend plates shall be used to display basic functions of push buttons, selector switches and pilot lights.
  2. Letters shall be gothic upper case (capital letters), minimum height shall be 1/8 inch with a 3/64 inch space between lines.
  3. Legend plates shall be made of laminated engraving stock having a black core with a white surface.
  4. The characters shall be engraved using an industry standard engraving machine.
  5. Legend plates shall be held to the enclosure by the ring nuts used to hold the operator in place.
  6. All legend plates for a particular panel shall be of the same size and shape.
  7. Standard Selector Switch legends shall include: (1) Hand/Off/Auto; (2) Local/Remote; (3) Off/On.
  8. Standard Push Button legends shall include: (1) Start; (2) Stop; (3) Stop Lockout; (4) Low; (5) High; (6) Reset

## 2.12 WIRE MARKERS

- A. General: All wire markers & tags shall conform to ISA Recommended Practice publication ISA-RP60.6.
- B. Construction:
  1. Each wire shall be identified on both ends of the wire with heat shrink, thermal transfer tube type wire markers. Do not heat-shrink to cable, leave loose for accessing cable ID number.

2. Adhesive labels are not acceptable.
3. The wire markers shall be white with black lettering. Hand marking of the label is not acceptable.
4. The wire marker number shall be a unique number, incorporates the instrument / equipment tag number if applicable, shall be easily cross referenced with schematic drawings, and shall have the same number on both sides of the wire.

C. Manufacturers:

1. Brady
2. Or approved equal

## 2.13 ADHESIVE LABELS

A. General: All labels shall conform to ISA Recommended Practice publication ISA-RP60.6.

B. Construction:

1. Adhesive labels shall be used inside the panel to identify equipment.
2. The labels shall be smudge proof and shall have an adhesive back. The printing on the labels shall be done by mechanical means only.

## 2.14 WIRE

A. All wiring shall conform to Nation Electric Code's latest revision Article 310 - "Conductors for General Wiring," table 310-17. All wire shall be copper.

B. Power Wiring shall be annealed, tin coated, class B stranded, soft copper, conforming to ASTM Stranded B-8. Conductor size shall be #12AWG through 750kcmil. Insulation shall be rated 600V.

C. Control wiring inside of the control panel assemblies shall be annealed, tin coated, class B stranded, soft copper, conforming to ASTM Stranded B-8. Conductor size shall be #16AWG. Insulation shall be rated 600V.

D. All analog signal wiring shall be stranded soft copper. Conductor size shall be #16AWG. The insulation shall be 300V. Drain wires shall be grounded at the panel only. Exposed shield wire shall be protected with a PTFE electrical insulation tubing for the continuous length until terminated, to help guard against ground noise.

## 2.15 WIRE DUCT

A. Wires shall be run in open slot vinyl wire duct with covers. AC wireways shall be gray and labeled with "AC" and DC wireways shall be white and labeled with "DC". Wireduct shall be held to the back plate with round head machine screws and washers. Wireduct shall be filled no more than 75%. Where it is not practical to use wireduct, wire ties shall be used to bundle the wires together in a neat and professional manor.

B. Manufacturer:

1. Panduit
2. Thomas & Betts
3. Or Approved Equal

## 2.16 GROUNDING PRODUCTS

- A. Two 1/4" thick x 1" wide x required length (for required ground wires plus 10% spare mounting points) minimum copper ground bus bars shall be supplied with each enclosure.
- B. One ground bus shall be a chassis (non-isolated) ground bus that is electrically bonded to the panel and shall be used to ground all equipment. All equipment ground wires shall be run directly from the equipment to the chassis ground bus.
- C. The other ground bus shall be an isolated ground bus and shall be used to ground the drain wire of signal wiring. No more than 5 drain wires shall be jumpered together before being run to the isolated ground bus. The isolated ground bus shall be connected to the chassis ground bus with one piece of 6 gauge green wire.
- D. Connect the following SPD devices to the chassis ground bus with a dedicated green colored ground conductor that is a minimum #6 AWG:
  1. Branch Circuit Power Surge Protective devices (SPD-A1)
  2. In existing WCP's utilize the current ground bar for SPD grounding.
- E. Connect the following SPD devices to the chassis ground bus with a dedicated green colored ground conductor that is a minimum #12 AWG:
  1. Analog Signal and Dateline Surge Protective device (spd-A2)
- F. The SPD ground conductor shall be as short as possible. Reliance on the SPD mounting channel alone for the ground connection is not acceptable.
- G. Manufacturer:
  1. Harger
  2. Georgia Copper, LLC
  3. TGB & TMGB
  4. Storm Copper Components, Co.
  5. Chatsworth Products, Inc.
  6. Or Approved Equal

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install as shown on the approved shop drawings and according to the manufacturer's requirements.

### 3.02 EQUIPMENT INSTALLATION

- A. Control panels with 480V supply source shall have a well designed disconnecting means that extends through the panel front cover. This disconnect will shut off a main circuit breaker inside the control panel and be lockable in the off position with a standard padlock.
- B. Control voltages shall not exceed 120 VAC. Control transformers shall be sized one size larger than the computed load and be protected by properly sized fuses or circuit breakers on the primary and secondary sides.
- C. Fasten all devices inside the enclosure with steel screws, steel bolts, and/or other means as appropriate. For devices without distinct means for fastening, provide suitable metal bracket or mounting adapter as a means for fastening. Fasten devices that plug directly onto power receptacles with self-locking nylon tie wraps to the receptacle or support for the receptacle. No device shall be permitted to be laid loose inside the enclosure.
- D. All exposed electrical terminations in the enclosure shall be guarded or covered to eliminate the possibility of accidental contact by an object the size of an average finger. Provide appropriate additional protection where this requirement is not met. Provide appropriate warning labels for voltage levels used within the enclosure.
- E. Enclosure components that are electrically connected to devices external to the building that the enclosure is located shall be protected with surge protectors in accordance with the SPD specifications of this Section. Segregate all SPD devices by types and size. Locate the SPD devices as close, as practical, to the non-isolated ground bus in the enclosure.
- F. Provide fuse and fuse terminal blocks with blown fuse indicators for all PLC analog inputs, PLC analog outputs, and PLC discrete inputs provided in the control panel.
- G. All PLC discrete outputs provided in the control panel shall be provided with an interposing relay, unless otherwise noted on the drawings.
- H. Provide fuse and fuse terminal blocks with blown fuse indicators for each power circuit required for field instruments powered by the control panel.
- I. Bond the negative of the 24 VDC power supplies to ground.

### 3.03 WIRING

- A. Drain wires shall be grounded at the panel only. Exposed shield wire shall be protected with a PTFE electrical insulation tubing for the continuous length until terminated, to help guard against ground noise.
- B. All wiring shall conform to the following color code:
  - 1. 480 VAC power, 3-phase: Phase A-Brown; Phase B-Orange; Phase C-Yellow

2. 120 VAC power, 1-phase: Line-Black: Neutral-White
  3. 120 VAC control wires – red
  4. 120 VAC externally powered – yellow
  5. 24 VDC – (+)-Blue; (-) or common-Blue/white
  6. Ground – Green
- C. To avoid inductive pickup AC power wiring or AC control wiring shall have a maximum possible separation from DC analog signal or DC control wiring. A practical distance is not less than 6 in. If power wiring has to cross the signal wiring, the crossing should be as close to a right angle as possible.
- D. A maximum of two conductors shall be connected to any one terminal.
- E. Wire splices are not permitted within the enclosure.
- F. Wire and cable mounting methods
1. Metallic Enclosures: The use of self-adhesive type cable tie mounting pads is prohibited. Wires, wire bundles, and cables that are not routed through wire duct shall be supported utilizing stud-mounted nylon or neoprene bushed steel loop-type cable clamps. The maximum distance between mounting points shall be 12 inches. Cables mounted on enclosure doors shall have a minimum of three mounting points.
    - a. Threaded mounting studs shall be 1/8 inch in diameter or larger as required and made of the same material as the cabinet. The cable clamp shall be retained with:
      - 1) One nylon washer between the nylon clamp and panel
      - 2) One metal washer and metal/nylon locking nut on top of the clamp
  2. Non-Metallic Enclosures: The use of self-adhesive type cable tie mounting pads is prohibited. Wiring, wire bundles, and cables that are not routed through wire duct shall be supported utilizing epoxy type cable mounting systems that are designed for the application. The maximum distance between mounting points shall be 12 inches. Cables mounted on enclosure doors shall have a minimum of three mounting points. The mounting surface of the enclosure where the epoxy type cable mount is going to be installed shall be prepared in accordance with the manufacturer's written instructions.
- G. Where wire is required to flex often (i.e. around door hinges) or susceptible to damage; high strand wire and spiral wrap shall be used. Route and secure wires so that they will twist and not bend around the hinge.
- H. Provide at least 20% installed spare I/O of each type in each control enclosure by adding spare I/O modules as necessary. Spare and not-used I/O is to be fully wired to terminal blocks in the same manner as the used I/O.
- I. Wires that are not de-energized by the main breaker shall be of the same color and labeled with a warning label stating same.

- J. Control power and neutral shall not be jumped from device to device. Power distribution blocks shall be used.
  - 1. Manufacturers:
    - a. Square D class 9080
    - b. Allen Bradley Bulletin 1492
    - c. Phoenix Contact
    - d. Weidmuller

3.04 PAINTING

- A. Interior and exterior surfaces of all enclosures shall be thoroughly cleaned and painted with rust-inhibitive primer. The interior and mounting plates shall be painted white with polyurethane enamel. All pits and blemishes in the exterior surface shall be filled. Exterior surface shall be smooth and painted with two coats to a film thickness of 4 mils. Paint color for carbon steel enclosures shall be ANSI 61 Gray, polyurethane enamel. One pint of finish color paint shall be furnished with the panels to repair future scratches. Stainless Steel enclosures shall not be painted, but shall have a “brushed” finish.

3.05 TESTING

- A. Test all outputs and inputs to demonstrate that the sluice gate operator performs all control functions as programmed by the COT; also demonstrate local operation from the Operator and from the remote Hand Station. Demonstrate that the 4-20mA feedback signal is calibrated to 0-100% open and reads on the HMI.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for basic electrical materials, material handling, and other basic electrical materials and methods.
2. Contractor shall provide necessary supports/stands for the valve operator disconnect as called out on the drawings. Affix the baseplates into the concrete walkway as required using stainless steel expansion bolts/anchors, size, length, and quantity as required.

B. Related Sections:

1. General Provisions and Supplementary General Provisions
2. Section 09 90 00 – Paints and Coatings.
3. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
4. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
5. Section 26 05 28 – Hangers and Supports Systems for Electrical Systems
6. Section 26 05 63 – Acceptance Testing of Electrical Systems.
7. Section 26 05 33.13 – Conduits for Electrical Systems.

1.02 REFERENCES

A. America National Standards Institute (ANSI):

1. ANSI Z535.4, Product Safety Signs and Labels.

B. American Society of Mechanical Engineers (ASME):

1. ANSI/ASME Y14.2M, Line Conventions and Lettering.
2. ANSI/ASME Y14.24M, Types and Applications of Engineering Drawings.
3. ANSI/ASME Y14.34M, Associated Lists.
4. ANSI/ASME Y14.35M, Revision of Engineering Drawings and Associated Documents.
5. ANSI/ASME Y14.100, Engineering Drawing Practices.

C. Institute of Electrical and Electronic Engineers (IEEE):

1. ANSI/IEEE 18, Standard for Shunt Power Capacitors.

2. ANSI/IEEE 141, Recommended Practice for Electric Power Distribution for Industrial Plants - Red Book.
3. ANSI/IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems - IEEE Buff Book.
4. ANSI/IEEE 399, Recommended Practice for Power Systems Analysis - Brown Book.
5. ANSI/IEEE 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
6. IEEE 1036, Guide for Application of Shunt Power Capacitors.
7. ANSI/IEEE 1584, Guide for Arc-Flash Hazard Calculations.
8. ANSI/IEEE C37.10, Guide for Diagnostics and Failure Investigation of Power Circuit Breakers.
9. ANSI/IEEE C37.13, Low-Voltage AC Power Circuit Breakers Used in Enclosures.
10. ANSI/IEEE C57.12.00, General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers.
11. ANSI/IEEE C57.12.59, Standard for Dry-Type Transformer Through-Fault Current Duration

D. InterNational Electrical Testing Association, Inc. (NETA):

1. ANSI/NETA ETT Standard for Certification of Electrical Testing Technicians.

E. National Electric Manufacturer's Association (NEMA).

1. ANSI/NEMA MG 1, Motors and Generators.
2. NEMA ICS 6, Industrial Control and Systems: Enclosures.

F. National Electrical Contractors Association (NECA)

1. ANSI/NECA 100 Symbols for Electrical Construction Drawings.

G. National Fire Protection Association (NFPA):

1. NFPA 70, National Electrical Code (NEC).
2. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.

H. The Society for Protective Coatings (SSPC):

1. SSPC-SP 2, Hand Tool Cleaning.

I. Other Published References:

1. Electrical Safety Handbook, by John Cadick, McGraw Hill, Inc., Article on Safety Electrical One-Line Diagrams.

### 1.03 SUBMITTALS

- A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
1. Product Data:
    - a. Submit Product Data, including catalog cuts, for all products provided for the electrical work of this Contract and as specified in other Sections.
      - 1) Clearly indicate the specific products proposed for the project by use of arrow, circle or underline. Indicate usage of each product on each submittal.
  2. Shop Drawings:
    - a. Submit Shop Drawings for the electrical work of this Contract as specified in other Sections.
  3. Quality Assurance/Control Submittals:
    - a. Certificates:
      - 1) Testing agency quality verification that all products meet requirements or manufacturer disclaimer statements.
    - b. Qualification Statements:
      - 1) Testing agency qualifications.
  4. Closeout Submittals:
    - a. Operation and Maintenance Manuals.

### 1.04 SUBSTITUTIONS, BASIS OF DESIGN, AND ACCEPTABLE MANUFACTURERS

- A. All substitutions to identified materials or equipment shall comply with the applicable requirements of the General Provisions and all Supplementary General Provisions. In any case of conflict between such requirements of the General Provisions and all Supplementary General Provisions and this paragraph, the more stringent requirements shall govern.
- B. Whenever an item of material or equipment is identified by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the identification or description contains or is followed by words reading that no like, equivalent or “or-equal” item or no substitution is permitted, material or equipment of other Suppliers may be proposed.

- C. Where substitutions to identified items are permitted, any proposed substitution or alternate must fully comply with the following in order to be considered by the Engineer:
1. Be of a reputable manufacturer,
  2. Be fully compliant with the requirements of this Section and the Drawings,
  3. Be fully compatible with all interfacing items and work, and with the installation environment,
  4. Be appropriate (as determined by the Engineer) for the proposed application, and
  5. Be equivalent (as determined by the Engineer) in character, performance, and quality to any identified Basis of Design.
- D. Where a specific manufacturer or product is identified as the Basis of Design or listed first in a list of acceptable manufacturers, the overall project design is based on the identified manufacturer or product. If the Contractor elects to substitute a manufacturer or product which differs from the identified Basis of Design, the Contractor shall bear all efforts and costs of any design changes necessary in order to achieve finished work which is equal in character, performance, and quality to the original design depicted in the Contract Documents. Such changes shall include, but not necessarily be limited to: changes to ratings and/or features of other equipment, changes to material sizes and/or types, new material and/or equipment, and changes to structural and/or architectural features (including room sizes). Approval by the Engineer of a proposed substitute item shall not relieve the Contractor of this responsibility.
- E. The listing of specific manufacturers is solely intended to identify reputable manufacturers who are known to provide quality products of the general type specified. Such listing is in no way intended to imply that the identified manufacturer's product(s) have been verified to satisfy the specified requirements, or to be equivalent to any identified Basis of Design manufacturer. Nor does such a listing imply acceptance of products which do not meet the specified requirements, ratings, features, dimensions, and functions as indicated.

## 1.05 QUALITY ASSURANCE

- A. Qualifications:
1. Testing Agency Qualifications:
    - a. Use a NETA accredited testing agency, or approved equal, that is accredited for the region in which the Contract work is performed.
    - b. Submit the testing agency's qualifications to the Engineer for approval.

B. Regulatory Requirements:

1. Perform all electrical work in conformance with the requirements of NFPA 70, the National Electrical Code.

C. Certifications:

1. Submit evidence with all Product Data that the products represented meet testing agency quality verification requirements, including agency listing and labeling requirements.
  - a. Such evidence may consist of either a printed mark on the data or a separate listing card.
  - b. Submit a written statement from those product manufacturers that do not provide evidence of the quality of their products that indicates why an item does not have quality assurance verification.
    - 1) Such statements provided in lieu of quality assurance verification are subject to the acceptance of the Engineer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and equipment to the work site in accordance with the requirements of the General Provisions and Supplementary General Provisions.

1. Deliver materials and equipment in a clean condition.
  - a. Provide packaging that plugs, caps, or otherwise seals openings both during shipping and temporary storage.
2. Provide equipment needed for unloading operations, and have such equipment on the work site to perform unloading work when the material and equipment is delivered.
  - a. If possible, clearly identify pick-points or lift-points on electrical equipment crating and packaging.
  - b. In the absence pick-points or lift-points on equipment crating and packaging, identify pick-points or lift-points on the equipment itself.

B. Handle materials and equipment in accordance with the requirements of General Provisions and Supplementary General Provisions.

1. Handle materials and equipment in accordance with manufacturer's written instructions.
2. When unloading materials and equipment, provide special lifting harnesses or apparatus as required by manufacturers.

- C. Store electrical materials and equipment, whether on-site or off-site, in accordance with the General Provisions and Supplementary General Provisions and the following:
  - 1. Follow the manufacturer's written instructions for storing the items.
  - 2. Store electrical equipment and products under cover.
    - a. Except for electrical conduit, store electrical equipment and products in heated warehouses or enclosed buildings with auxiliary heat and that provide protection from the weather on all sides.

#### 1.07 SYSTEM STARTUP

- A. Energize the following items in the presence of the Engineer:
  - 1. Equipment rated over 300 Volts.
  - 2. Equipment rated over 1-horsepower.
- B. Startup the following items in the presence of the Engineer:
  - 1. Process equipment.

#### 1.08 COMMISSIONING

- A. Commission electrical systems in accordance with the requirements of Section 26 08 00.

#### 1.09 MAINTENANCE

- A. Operation and Maintenance Manuals:
  - 1. Prepare Operation and Maintenance Manuals in conformance with the requirements of Section 01830, and other Contract requirements, and as follows:
    - a. Organize Operation and Maintenance Manuals by Specification Section and equipment number as designated on the Contract Drawings.
    - b. Include suppliers, supplier addresses, and supplier telephone numbers for the equipment and products furnished.
  - 2. 60 days prior to the request for final payment, prepare and submit two copies of the proposed Operation and Maintenance Manuals to the Engineer for approval.
  - 3. Upon approval of the proposed Operation and Maintenance Manuals, submit six corrected copies as follows:
    - a. Submit one set to the Engineer.
    - b. Place one set in the spare parts and fuse cabinet in the new electrical service building
    - c. Deliver the remaining four copies to the City.

4. Insert final record drawings in each set of Operation and Maintenance Manuals at Project Closeout.

## PART 2 PRODUCTS

### 2.01 MATERIALS

#### A. Grounding and Bonding Materials:

1. Provide grounding and bonding materials in accordance with the requirements of Section 26 05 26.

#### B. Hangers and Supports:

1. Provide hangers and supports for electrical equipment in accordance with the requirements of Section 26 05 28.

#### C. Electrical Identification Materials:

1. Coordinate identification of electrical work products with the City.

#### D. Wire and Cable:

1. Provide low-voltage electrical wire, cable, and accessories in accordance with the requirements of Section 26 05 19.

#### E. Conduit and Raceway:

1. Provide conduit and raceway as indicated, as appropriate for the application per NFPA 70, and in accordance with the following:
  - a. Conduit and Tubing: Provide electrical conduit and tubing in accordance with the requirements of Section 26 05 33.13.

### 2.02 SHOP FINISHING

- A. For electrical equipment, factory-apply paint and coating systems that at a minimum meet the requirements of the NEMA ICS 6 corrosion-resistance test and the additional requirements specified in individual Specification Sections.

## PART 3 EXECUTION

### 3.01 INSTALLATION

#### A. Field-Applied Finishes:

1. Except for factory-finished items that have been completely finished with factory-applied primer and final finish coatings, finish installed electrical materials,

equipment, apparatus, and items in the field in accordance with the requirements of Section 09 90 00.

- a. Apply paint material matching the composition of the factory-applied products.
    - 1) Obtain factory-supplied paint for this work whenever available.
  - b. Comply with the paint manufacturer's instructions for mixing, thinning, surface preparation, application, spreading rate, drying time, and environmental limitations concerning application of the paint.
  - c. Apply paint in such a manner so that the finished appearance will match as nearly as possible the factory finish.
    - 1) Poorly applied paint may be required to be repaired and re-applied by the Contractor in accordance with Article 3.02 at no additional cost to the City.
2. Coordinate the painting of large areas with the Engineer to minimize the duration of exposure of other workers to toxic paint fumes.

### 3.02 REPAIR/RESTORATION

- A. If the factory finish of factory-finished items is damaged for any reason, refinish the item.
  1. If an item that has several surfaces has damage on one surface, refinish the entire damaged surface.
    - a. Surface Preparation:
      - 1) Outside the damaged area, lightly sand the entire surface and perform additional sanding to profile the damaged paint edge.
      - 2) Prepare the surfaces of damaged areas in accordance with SSPC-SP 2.

### 3.03 FIELD QUALITY CONTROL

- A. Perform electrical testing as detailed in Section 26 05 63 and in each Specification Section.
- B. Have electrical work inspected as required by the local Authority Having Jurisdiction (AHJ).
  1. Submit a copy of the certification of inspection with the final project closeout documents, and post the original in the electrical room on-site protected by a metal frame with a protective plate glass cover.

- C. The quality of finishing and refinishing work is subject to approval by the Engineer.

3.04 MANUFACTURERS' FIELD SERVICES

- A. Provide the services of a qualified field engineer and necessary tools and equipment to test, calibrate, and adjust the protective relays and circuit breaker trip devices as recommended in the Final Project Report of the power system study.

3.05 RECORDING OF CONDUCTOR LENGTHS

- A. Measure and record the lengths of all feeder and branch circuit conductor as follows:
  - 1. Low voltage (600V and less) circuits
    - a. Feeders to panelboards, switchboards, switchgear, motor control centers, transformers, and similar distribution equipment.
    - b. Branch circuits rated 40A or more.
    - c. Branch circuits to motors rated 20hp or more.
  - 2. All medium voltage circuits
- B. Measure lengths of conductors by pulling a conduit measuring tape into the raceway prior to installing the conductors. Remove the tape from the raceway prior to, or during, installation of the conductors. Use a tape which is marked in maximum 1-foot increments.
- C. Record the measured length of raceway at the time of measuring. Measure and record the conductor lengths between the ends of the raceway and the conductor terminations as a separate notation when the conductors are installed.
- D. Submit recorded lengths in a typewritten spreadsheet format, with five separate columns:
  - 1. Circuit identification
  - 2. Measured raceway length
  - 3. Measured length from end of raceways to conductor terminations at first end
  - 4. Measured length from end of raceways to conductor terminations at second end
  - 5. Total length

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
  - 1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting low voltage cable, shielded cable, and accessories.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 26 05 00 – Common Work Results for Electrical.
  - 3. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
  - 4. Section 26 05 53 – Identification for Electrical Systems.
  - 5. Section 26 05 63 – Acceptance Testing for Electrical Systems.
  - 6. Section 26 05 33.23 – Boxes for Electrical Systems

1.02 REFERENCES

- A. American Society for Testing Materials (ASTM):
  - 1. ASTM B 8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- B. Institute of Electrical and Electronic Engineers (IEEE):
  - 1. IEEE 383 - Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations.
  - 2. IEEE 1202 - Standard for Flame-Propagation Testing of Wire and Cables.
- C. National Electrical Manufacturer's Association (NEMA):
  - 1. NEMA WC 26/EEMAC 201 - Binational Wire and Cable Packaging Standard.
  - 2. ANSI/NEMA WC 57 - Standard for Control, Thermocouple Extension, and Instrumentation Cables.
- D. National Fire Protection Association (NFPA):
  - 1. NFPA 70 - National Electrical Code (NEC).
- E. Underwriter's Laboratories, Inc. (UL):
  - 1. UL 13 - Standard for Power-Limited Circuit Cables.
  - 2. UL 1277 - Standard for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
  - 3. UL 1569 - Standard for Metal-Clad Cables.
  - 4. UL 1581 - Reference Standard for Electrical Wires, Cables, and Flexible Cords.
  - 5. UL 1685 - Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables.
  - 6. UL 2250 - Standard for Instrumentation Tray Cable.

- F. Insulated Cable Engineers Association (ICEA):
  - 1. ICEA T-29-520 - Vertical Cable Tray Flame Test @ 210,000 BTU.

### 1.03 DESIGN REQUIREMENTS

- A. Conductors in Raceway and Conduit Systems:
  - 1. Provide conduit systems for installing the wiring that is outside of equipment.
  - 2. Except for raceway or conduit for control wires or where otherwise indicated on the Contract Drawings, design raceway and conduit systems so that the maximum number of low-voltage current carrying conductors (per NFPA 70, Article 310) in each raceway or conduit does not exceed three, plus a ground.
- B. Cable Tension Design Requirements:
  - 1. Design conduit runs so that the tension limits set by the wire and cable manufacturers will not be exceeded.
    - a. Provide additional pulling points as required to limit the tension to acceptable levels.
  - 2. Generate and submit tension cable pulling calculations for all underground power runs.
    - a. Include pull loads, tension, and safety factors for all cables with the calculations.
- C. Product Data and Catalog Cuts:
  - 1. Submit low-voltage ground, power, and control wiring product data as listed below for the products provided as the Work of this Section; and clearly indicate the usage of each product on the data submitted.
    - a. Wires and cables.
    - b. Lugs.
    - c. Connectors.
    - d. Tapes.
    - e. Pulling lubricant.
    - f. Tools used to crimp connectors.
- D. Use of Trade Names:
  - 1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
    - a. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

### 1.04 SUBMITTALS

- A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
  - 1. Product Data:
    - a. Wires and cables.
    - b. Lugs
    - c. Connectors.
    - d. Tape.

- e. Pulling lubricant.
- 2. Samples:
  - a. Wire samples.
- 3. Quality Assurance/Control Submittals:
  - a. Design Data.
    - 1) Tension cable pulling calculations for all underground power runs.
  - b. Certificates.
    - 1) Testing agency/quality verification.
  - c. Manufacturer's Instructions.
    - 1) Cable manufacturer's recommendations.
  - d. Qualification Statements.
    - 1) Documented experience of the installing firm.
    - 2) Qualifications of the licensed electricians supervising the Work.

### 1.05 QUALITY ASSURANCE

#### A. Qualifications:

- 1. Installer Qualifications:
  - a. To install the Work of this Section, employ the services of a firm specializing in installing wire, cable, and accessories, and that has a minimum of 3 years experience doing so.
    - 1) Submit the documented experience of the firm installing the wire, cable, and accessories.
  - b. To supervise installation of the Work of this Section, employ licensed electricians.
    - 1) Submit the qualifications of the licensed electricians supervising the Work of this Section.

#### B. Regulatory Requirements:

- 1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70, and to all other applicable state, local, and national governing codes and regulatory requirements.

#### C. Certifications:

- 1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.
  - a. Provide copper conductors listed and labeled by UL for all wiring.
- 2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.
  - a. For items without such evidence, submit a written statement from the product manufacturer that indicates why it does not have quality assurance verification.

#### D. Field Samples:

1. Submit one 36-inch long sample of each type of wire to be used.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
  1. Imprint insulated conductors with the date of manufacture, the wire type, and the manufacturer.
  2. Package wire and cable in conformance with the requirements of NEMA WC 26/EEMAC 201.
  3. Protect items from damage during delivery, handling, and installation.
    - a. Comply with the cable manufacturer's recommendations for inspection, handling, storage, temperature conditioning, bending and training limits, pulling limits, and calculation parameters for installing cable.
    - b. Submit the cable manufacturer's recommendations for inspection, handling, storage, temperature conditioning, bending and training limits, pulling limits, and calculation parameters for installing cable
- B. Acceptance at Site:
  1. Wire and cable manufactured more than 12 months before delivery to the Site is unacceptable for use under this Contract, and will be rejected.
- C. Storage and Protection:
  1. Store products indoors on blocking or pallets.
  2. Protect items from damage during storage.

#### 1.07 PROJECT ENVIRONMENTAL REQUIREMENTS

- A. Install armored instrumentation cable only when the temperature is above -40 degrees Celsius.

### PART 2 PRODUCTS

#### 2.01 LOW VOLTAGE CONDUCTORS

- A. Conductor Design Requirements:
  1. Provide conductors of the proper size and ampacity ratings based on Article 310 of NFPA 70.
    - a. Provide copper conductors that have 98 percent conductivity.
    - b. Unless otherwise indicated on the Contract Drawings, at a minimum provide conductors of the following American Wire Gauge (AWG) sizes:
      - 1) For power and branch feeder circuits: 12 AWG.
        - a) For power and branch feeders, provide solid or stranded copper low-voltage conductors for sizes up to and including 10 AWG, provide stranded copper low-voltage conductors for 8 AWG and larger sizes.
      - 2) For control circuits: 12 AWG.
      - 3) For alarm and status circuits: 14 AWG.
      - 4) For single conductor instrument wiring: 14 AWG.
      - 5) For multiple conductor instrument wiring: 16 AWG.

B. Insulation Design Requirements:

1. Provide low voltage ground, power, and control wiring having the proper insulation types as follows:
  - a. For exterior, wet, and damp locations, including NEMA 4X locations: Type THWN.
  - b. For underground wiring:
    - 1) For sizes 14 AWG through 10 AWG: Type XHHW-2.
    - 2) For sizes 8 AWG and larger: Type RHW-2 or XHHW-2.
  - c. For wiring that is wholly in dry indoor locations: Type XHHW-2, or dual-rated Type THHN/THWN.
  - d. For ground wires: THW may be used at the Contractor's option.
2. Color Coding of Wires
  - a. [Insulation shall be colored black and wrapped with colored tape per Tables 26 05 19-1, 26 05 19-2 and/or 26 05 19-3 below.]
  - b. [Insulation shall be factory colored per Tables 26 05 19-1, 26 05 19-2 and/or 26 05 19-3 below. The use of tape for color coding is prohibited.]

C. Manufacturers

1. Acceptable Manufacturers:
  - a. Continental Wire & Cable Company
  - b. SouthWire
  - c. General Cable
  - a. CME Wire & Cable Inc.
  - b. Or approved Equal

2.02 MATERIALS

A. 600 Volt Rated Multi-Conductor Cable:

1. Provide multi-conductor cable that is suitable for use indoors or outdoors; exposed or concealed; as open wiring; in any raceway, underground duct, or cable tray; direct buried; or embedded in concrete.
  - a. Provide cable that is UL listed as Type MC in compliance with the requirements of UL 1569, and is UL listed for 90 degrees Celsius dry or wet, for direct burial, for cable tray use, and as sunlight resistant.
2. Assemble the cable with non-hygroscopic fillers and binder tape.
  - a. Insulated Conductors:
    - 1) Provide uncoated stranded copper conductors, complying with the requirements of ASTM B 8 for Class B conductors.
    - 2) Provide cross-linked polyethylene type XHHW-2 insulation rated for 600 volts.
  - b. Grounding Conductors:
    - 1) Provide uninsulated copper conductors.
  - c. Cover the overall assembly with a single strip of interlocked aluminum tape, and then apply an outer final jacket of black flame-retardant PVC.
3. Manufacturers:
  - a. General Cable Technologies Corporation,
  - b. The Okonite Company,

- c. Or approved equal.
- B. Shielded Instrumentation Cable (2/C Cable):
- 1. Provide 100 percent shielded, two-conductor, 16 AWG twisted pair cable.
    - a. Provide 600V rated NFPA 70 (NEC) Type TC cable.
      - 1) Sunlight resistant
      - 2) Suitable for installation in wet locations
      - 3) Temperature Ratings
        - a) -30 to +75 degree Celsius wet
        - b) -30 to +90 degree Celsius dry
      - 4) Flame Test
        - a) UL 1277 or 1685
        - b) C(UL) FT4
        - c) IEEE 1202
      - 5) Non-plenum
    - b. Conductors:
      - 1) Provide stranded (7 or 19 strand) tin-coated copper conductors.
    - c. Shielding:
      - 1) Provide aluminum-polyester foil shielding that incorporates an 16 AWG stranded tinned copper drain wire.
    - d. Insulation:
      - 1) Provide color coded insulation rated for 600 volts and consisting of either PVC/Nylon or EPR.
      - 2) Provide an overall sunlight resistant PVC or CPE outer jacket.
  - 2. Acceptable Manufacturers:
    - a. Belden, Inc., Part Number 9342 or 1118R
    - b. Houston Wire and Cable
    - c. Alpha Wire
    - d. West Penn
    - e. Or approved Equal

## 2.03 ACCESSORIES

- A. CABLE PULLING LUBRICATION AND LUBRICANT:
- 1. Lubricant shall provide reduced tension on all types of cable jackets, dry to a thin lubricating film that retains its lubricity for an extended period and won't cement in the cables.
  - 2. The cable pulling lubricant shall produce a low coefficient of friction on a wide variety of cable jacket materials. The lubricant shall be UL listed. It shall be easy to handle and adhere well to the cable. Where appropriate, it shall also be tested and approved for use with CSPE (chlorosulfonated polyethylene) fire-retardant cable jackets where these materials are utilized.
  - 3. The lubricant shall be UL or CSA Listed and Labeled and shall pass the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. It shall pass physical compatibility tests on LLDPE, XLPE, CPE, and PVC cable jacket or sheath materials. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when

the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

4. Lubricant to be specification-grade type that does not promote flame propagation when used with fire-retardant cables and systems, is harmless to humans, environmentally safe, and compatible with all common cable jacket materials
5. The lubricant shall contain no waxes, greases, silicones, or polyalkylene glycol oils or waxes. The lubricant shall have less than a 6.0% solids residue after drying for 24 hours at 105°C.
6. Where CPE insulated wire and/or cable is rated for Low Smoke / Zero Halogen type, only Polywater Type LZ shall be utilized.
7. Specific lubricants for fiber-optic and other special cable installations shall be determined by the cable / lubricant manufacturers and the Contractor shall provide submittal information, including MSDS documentation and other information verifying suitability of products and general specification compliance as outlined herein.
8. Acceptable Manufacturers:
  - a. PolyWater - DynaBlue
  - b. 3M - Type WL
  - c. Greenlee - Type GEL
  - d. Or approved Equal

B. Grounding Braid:

1. Provide conformable, all-metal (tinned copper wires), corrosion resistant, woven grounding braid having a high current-carrying capacity approximately that of 6 AWG wire, such as.
2. Manufacturers:
  - a. 3M, Scotch, Scotch<sup>®</sup> 25 Electrical Grounding Braid,
  - b. Plymouth
  - c. Permacel
  - d. Or approved equal.

C. Tapes:

1. Arc Proofing Tape:
  - a. Provide fire retardant arc proofing tape, such as Scotch<sup>®</sup> 77 Fire Retardant Electric Arc Proofing Tape, that is capable of protecting cables from fault arc generated heat and flames and of protecting adjacent wrapped cables and accessories exposed to fault arcs until limiting devices can interrupt the faulted circuit.
2. Vinyl Insulating Tape:
  - a. Provide UL-listed flexible polyvinyl chloride (PVC) backed insulating tape with a pressure sensitive adhesive, such as black Scotch<sup>®</sup> 33+ Vinyl Electrical Tape, that is resistant to abrasion, acids, alkalis, and copper corrosion; resistant to, hot, cold and wet weather; and resistant to damage from UV sunlight exposure.
3. Rubber Splicing Tape:
  - a. Provide highly conformable, linerless, self-bonding, ethylene rubber (EPR), high-voltage (through 69 kV) insulating tape formulated to provide excellent thermal dissipation of splice heat, and designed to insulate splices and

terminate cables whose overload temperatures can reach 130 degrees Celsius, such as Scotch<sup>®</sup> 130C Linerless Rubber Splicing Tape.

4. Manufacturers:
  - a. 3M, Scotch
  - b. Plymouth
  - c. Permacel
  - d. Or approved equal.

D. Tubing:

1. Heat Shrinkable Tubing:
  - a. Provide flexible, flame retardant, polyolefin heat shrinkable thin wall tubing that has good resistance to common fluids and solvents, and has a high dielectric strength.
2. Waterproof Splice Kits:
  - a. Provide heat shrinkable thin wall polyolefin electrical cable splice kits.
3. Manufacturers:
  - a. Tyco Electronics, CGPT
  - b. Thomas & Betts Corp.
  - c. Or Approved equal.

E. Wire and Cable Connections:

1. Grounding Connectors:
  - a. Provide grounding connectors conforming to the requirements of Section 26 05 26 Grounding and Bonding for Electrical Systems.
2. Connectors for Service Wires and Cables, and for Wires and Cables Larger Than Number 6:
  - a. Split Bolt Connectors or Compression Type Connectors:
    - 1) Provide UL-listed split bolt connectors or compression type connectors for making parallel or butt splices of stranded copper wire.
    - 2) Use companion preformed plastic insulating covers or tape insulation conforming to NFPA 70 (NEC) requirements.
  - b. Mechanical compression connectors:
    - 1) Provide mechanical compression connectors that are capable of connecting single or multiple conductors, and of being installed with one wrench.
      - a) Type: Compact, two-hole mechanical compression connectors having two clamping bolts.
        - (1) Connector Body: Provide a high copper bronze or brass alloy body.
        - (2) Bolts: Provide brass or bronze bolts; plated steel screws are unacceptable.
        - (3) Fasteners: Provide silicon-bronze fasteners for bolting connectors to connections.
  - c. Crimped Compression Connectors:
    - 1) Provide two-hole crimped compression type connectors fabricated from high conductivity, seamless, electrolytic wrought copper, electrolytically tin-plated, and color coded to match the dies.

- 2) Provide crimped compression type connectors with adequate area to conduct the electrical current.
- 3) To crimp connectors, provide crimping tools from the same manufacturer that manufactured the connectors.
3. Control Wiring Connections:
  - a. For control wiring connections at terminal boards, provide crimped nylon-insulated ring terminals.
  - b. For control wiring splices, provide nylon insulated butt splices with insulation grips.
  - c. For joining more than two control wires, provide junction boxes with terminal boards.
4. Instrumentation Cable Connectors:
  - a. For connecting instrumentation cable and the equipment being furnished under this Contract, provide companion type connectors.
    - 1) For equipment controllers/enclosures that are furnished under other Sections of this Contract, furnish the connectors for connecting cable to the equipment with the equipment.
    - 2) Terminate the wiring as required for proper operation.
  - b. Manufacturers:
    - 1) Thomas & Betts Corp.
    - 2) AMP Inc.
    - 3) IlSCO Corp.
    - 4) Ideal Industries, Inc.
    - 5) Or Approved Equal
5. Connectors for Other Conductors:
  - a. Any of the applicable types listed for larger wire may be provided.
  - b. Screw Terminal Connections:
    - 1) For making terminal connections of stranded copper wire to screw terminals, provide nylon insulated crimped compression terminals with copper barrel on the wire.
    - 2) For making terminal connections of solid copper wire to screw terminals, provide screw lock connectors.
  - c. Wire Nuts:
    - 1) For making splices of copper wire, provide pre-insulated, UL-listed, solderless connectors of the spring-lock or compression type that can be installed by hand or using tools.
    - 2) For site lighting, wire nuts used in underground or below grade locations is prohibited. There only permitted use for site lighting is within a pole base.
  - d. Manufacturers:
    - 1) Thomas & Betts Corp.
    - 2) Tyco Electronics, AMP Inc.
    - 3) IlSCO Corp.
    - 4) FCI-Burndy® Products
    - 5) Or approved equal.

## 2.04 SOURCE QUALITY CONTROL

### A. Tests:

1. 600 Volt Rated Multi-Conductor Cable:
  - a. 70,000 BTU/hr Vertical Tray Flame Test:
    - 1) 600 Volt rated multi-conductor cable must pass the vertical tray flame test requirements of UL 1569, IEEE 383, and IEEE 1202.
  - b. 210,000 BTU/hr Vertical Tray Flame Test:
    - 1) 600 Volt rated multi-conductor cable must pass the vertical tray flame test requirements of ICEA T-29-520.
2. Shielded Instrumentation Cable (2/C Cable):
  - a. Vertical Tray Flame Test:
    - 1) Shielded instrumentation cable must pass the vertical tray flame test requirements of UL 1685 with UL loading.

## PART 3 EXECUTION

### 3.01 INSTALLERS

- A. Install the work of this Section only under the supervision of licensed electricians.

### 3.02 EXAMINATION

- A. Inspect all conduits, junction boxes, electrical vaults, and handholes to verify that they are clean, that they do not have burrs, that conduits are properly aligned, and that they are complete.
  1. Ensure that on all conduits without threaded hubs, two locknuts are installed.
  2. Ensure that in all conduits with wires larger than No. 10, bushings are installed.
  3. Ensure that grounding bushings and fittings are installed at all places specified in Section 26 05 26, Grounding and Bonding.
  4. Verify that proper sized boxes are installed.
- B. Verify that boxes and conduit fittings conform to the bending requirements specified in Article 314 of NFPA 70 (NEC).

### 3.03 PREPARATION

- A. Verify that pulling calculations have been made and are available for long conduit runs and pulls as indicated in this Section.
- B. Do not begin installing wiring until other work which might cause damage to the wires, cables, or conduits has been completed.
  1. Correct deficiencies in conduits, junction boxes, electrical vaults, and handholes that have been discovered by the inspection required in Paragraph 3.02.A.
- C. Prepare conduits to receive wire and cable.
  1. Swab the conduits with a nylon brush and steel mandrel.
  2. Pre-lubricate the conduits for which the pulling tension calculations are based on a coefficient of friction less than that of a dry conduit.

- D. Verify that a means of controlling the pulling tension on the wire or cable is installed on the mechanical assist devices furnished for pulling cable.
- E. Take the necessary precautions to prevent water, dirt, or other foreign material from accumulating in the conduits during the execution of wiring work.

### 3.04 INSTALLATION

- A. Low Voltage Ground, Power, and Control Wiring:
  - 1. Install Type CL2P, FPLP, or CMP cable as required by the application in accordance with the requirements of NFPA 70 (NEC).
    - a. For exposed low voltage wiring, use plenum cable.
    - b. For low voltage wiring concealed from view, only install wiring in the accessible locations permitted by the Contract Drawings.
  - 2. Neutral Conductors:
    - a. For each single-phase and each multi-phase feeder, provide separate neutrals.
    - b. For branch circuits, except at three-phase wye-connected panelboards, provide separate neutral conductors.
      - 1) For the three-phase wye-connected panelboards, provide common neutrals from 3 adjacent single-pole circuit breakers or from the poles of the same multi-pole circuit breaker.
    - c. Except for feeders with a small unbalanced and single-phase load, size each neutral the same as the largest phase conductor.
      - 1) For feeders with a small unbalanced and single-phase load, size the feeders to the largest of the following:
        - a) The size of any three-phase load connected to the neutral, which contains lighting, computer power outlets, instrumentation, or other electric loads.
        - b) The size required for 125 percent of the maximum unbalanced load.
  - 3. Equipment Ground Conductors:
    - a. Provide a green equipment ground conductor with all runs.
      - 1) Provide the equipment ground conductor wire type as specified in Section 26 05 26, Grounding and Bonding.
- B. Special Cable Installation Requirements:
  - 1. In addition to the other installation requirements specified within this Section, comply with the manufacturer's installation instructions for bending, pulling, connector types, and grounding when installing armored variable frequency drive cable.
    - a. Submit the manufacturer's installation instructions for armored variable frequency drive cable.
- C. Pulling Cable:
  - 1. Establish a feed-in point at the manhole, handhole, or building located at the highest elevation of the run, and pull cables down grade using flexible cable feeds to convey the cables into the duct runs through the feed-in point opening.
    - a. Furnish quadrant blocks located properly along the cable run.

- b. Limit cable pulling tensions to the maximum pulling tensions recommended by the cable manufacturer.
    - 1) Measure the cable pulling tension on all runs pulled with mechanical assistance and for all cable runs where calculations are required to be submitted by using a dynameter.
    - 2) Remove cables subjected to excessive bending and tension and that are cracked or have damaged or nicked outer jackets from the Site, and replace these cables with new undamaged cables.
      - a) If pulling tension is exceeding during pulling, remove the affected cables and mark them as not to be reused.
  - c. Lubricate cables with lubricants during pulling.
- D. Installing Cables in Manholes:
- 1. Install cable along the manhole wall that provides the longest route and the maximum spare cable length.
  - 2. Form cables so they closely parallel the walls, and do not interfere with duct entrances.
  - 3. Support cable on brackets and insulators spaced at a maximum of 2 feet apart.
  - 4. Use pulling lubricants approved by the cable manufacturer.
- E. Terminating Cable:
- 1. Terminate cable using materials and methods indicated or specified herein, or in accordance with the written instructions of the cable manufacturer or termination kit manufacturer.
    - a. For equipment connections, provide split bolt or compression type connectors, mechanical compression connectors, or crimped compression type connectors as specified and approved by the equipment manufacturer; for all other types of connections provide connectors of one of the types specified:
  - 2. Protect insulated power and lighting cable terminations from accidental contact, deterioration of coverings, and moisture by using proper terminating devices and materials.
- F. Splicing Wire and Cable:
- 1. All new conductors shall be continuous from end to end without splices, except where indicated on the drawings or with the special written permission of the Engineer on a case-by-case basis where the Contractor can demonstrate that installation without splices is not practical.
  - 2. If permitted as noted above, splice cables in accessible locations.
  - 3. Below-Grade Splices:
    - a. In underground systems, locate splices above the 100 year flood level.
    - b. Make below-grade splices using a compression connector on the conductor.
    - c. Insulate and waterproof below-grade splices by methods suitable for continuous submersion in water using either of the methods that follow:
      - 1) Gravity Pour Method:
        - a) Provide an approved commercial waterproof splice kit with the necessary materials and equipment, including a mold suitable for the cables to be spliced.

- (1) When the mold is in place around the joined conductors, prepare and pour the resin mix into the mold.
- 2) Cast-Type Splice Insulation:
  - a) Provide an approved commercial waterproof splice kit with the necessary materials and equipment, including a thermosetting epoxy resin insulating material applied by a gravity pour method or by a pressure injection method.
  - b) Fix cables in place until the splicing materials have completely set.
4. Within outlet or junction boxes, make wire and cable splices that conform to the requirements of NFPA 70 (NEC).
  - a. Install these outlet or junction boxes in accessible locations.

G. Wiring Identification:

1. Color code all feeder wires and cables as indicated in Table 26 05 19-1, Table 26 05 19-2 and/or Table 26 05 19-3.

<b>Table 26 05 19-1 Feeder Wire and Cable Color Coding</b>		
<b>Phase</b>	<b>480Y/277 Volts</b>	<b>208Y/120 Volts</b>
A	Brown	Black
B	Orange	Red
C	Yellow	Blue
Neutral	Gray or White with Yellow Tracer	White
Electrical Ground Conductor	Green	Green

<b>Table 26 05 19-2 Feeder Wire and Cable Color Coding</b>	
<b>Phase</b>	<b>120/240 Volts Single-Phase</b>
A	Black
B	Red
Neutral	White
Electrical Ground Conductor	Green

<b>Table 26 05 19-3 Feeder Wire and Cable Color Coding</b>	
<b>Phase</b>	<b>240/120 Volts Three-Phase High Leg</b>
A	Black
B	Red
C	Blue
Neutral	White
Electrical Ground Conductor	Green
High Leg	Add Orange tape to color indicated above

2. Identify all power wiring by circuit and panelboard, switchboard, and motor control center numbers.
3. Identify all control wiring with wire numbers.
4. Provide additional electrical identification of cabling and wiring as specified in Section 26 05 53, Identification for Electrical Systems.

- H. Refer to Section 26 05 00 for requirements for measuring and recording of conductor lengths.

3.05 FIELD QUALITY CONTROL

- A. Site Tests:
1. Prior to energizing wire and cable, field test the wire and cable as specified in Section 26 05 63 Acceptance Testing of Electrical Systems.
- B. Inspection:
1. Record the actual installed elevations and locations of grounding cables and rods, both concealed and exposed, on the record drawings specified in Specific Provision SP-26.
- C. Verify that the control wiring wire numbers correspond to the numbers indicated in the record drawings.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
  - 1. Requirements for connecting, energizing, testing, cleaning, and protecting grounding and bonding systems.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 26 05 00 – Common Work Results for Electrical.
  - 3. Section 26 05 63 – Acceptance Testing of Electrical Systems.
  - 4. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
  - 5. Section 26 05 33.13 – Conduits for Electrical Systems.

1.02 REFERENCES

- A. American Public Works Association (APWA):
  - 1. APWA Public Works Management Practices Manual.
- B. American Society for Testing Materials (ASTM):
  - 1. ASTM B 1; Standard Specification for Hard-Drawn Copper Wire.
  - 2. ASTM B 3; Standard Specification for Soft-Drawn Copper Wire.
  - 3. ASTM B 8; Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
  - 4. ASTM C 653; Standard Guide for Determination of the Thermal Resistance of Low-Density Blanket-Type Mineral Fiber Insulation.
  - 5. ASTM D 5; Standard Test Method for Penetration of Bituminous Materials.
  - 6. ASTM D 149; Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
  - 7. ASTM D 257; Standard Test Methods for D-C Resistance or Conductance of Insulating Materials.
  - 8. ASTM D 570; Standard Test Method for Water Absorption of Plastics.
- C. InterNational Electrical Testing Association, Inc. (NETA):
  - 1. ANSI/NETA ETT Standard for Certification of Electrical Testing Technicians.
- D. National Fire Protection Association (NFPA):
  - 1. NFPA 70, National Electrical Code (NEC).
- E. National Electrical Manufacturing Association (NEMA):
  - 1. NEMA TC-2; Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.

2. NEMA TC-3; Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
3. NEMA TC-14; Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
4. NEMA WC-7; Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

F. Underwriter's Laboratories, Inc. (UL):

1. UL 467, Standard for Grounding and Bonding Equipment.
2. UL 486A-486B, Wire Connectors.
3. UL 486C, Standard for Splicing Wire Connections.
4. UL 486D, Standard for Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations.
5. UL 486E, Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.

### 1.03 DESIGN REQUIREMENTS

- A. Design the electrical system installation to conform to Article 300 of NFPA 70, Wiring Methods, and to other applicable articles of NFPA 70 governing methods of wiring.
- B. Ground the conduit systems, metal enclosures, equipment frames, motors, and receptacles in accordance with Article 250 of NFPA 70, Grounding.
  1. Ground all metallic conduits, wiring channels, and armored cables continuously from outlet to outlet, and from outlets to cabinets, junction boxes, or pull boxes.
    - a. Bond each run of raceways to form a continuous path for ground faults from end to end.
    - b. When liquid tight flexible metal conduit sizes larger than 1-inch or flexible metal conduit are installed, provide external bond wires.
  2. Grounding Bushings:
    - a. Provide all 1-inch or larger metallic conduits with grounding bushings unless they enter metallic enclosures via integral threaded hubs.
    - b. Provide grounding bushings for conduits entering the bottom of freestanding equipment.
    - c. Bond wire from every grounding bushing to the equipment ground stud or ground bus in the enclosure.
    - d. Bond the grounding bushings to ground studs or ground buses in the enclosures.
  3. Provide insulated, internal equipment ground wire in all conduits.
    - a. Bond the internal wire to all pullboxes, junction boxes, equipment enclosures, and other enclosures as required by NFPA 70.
- C. Equipment Grounds:
  1. Design all feeders and branch circuits to include an equipment grounding conductor consisting of a copper wire within a raceway or cable and sized as specified herein.

- a. Where conductors are run in parallel in multiple raceways, run the equipment grounding conductor in parallel to the related conductors.
  - b. Size each of the parallel equipment grounding conductors on the basis of the ampere rating of the circuit overcurrent protecting device.
  2. Ground enclosing cases, mounting frames, rack mounted components, rack struts, switches, breakers, control panels, motors, and other electrical or electrically operated equipment by providing an equipment grounding conductor with phase conductors from an established equipment ground source.
- D. Ground Wire Sizes:
1. The minimum size for bonding jumpers, equipment ground conductors, grounding electrode conductors, and ground grid conductors is as follows:
    - a. Under 600 volts:
      - 1) Provide #12 AWG, minimum.
      - 2) Control power circuits, Provide #14 AWG, minimum.
    - b. Over 600 volts:
      - 1) For transformers, provide #2 AWG ground wire, minimum.
      - 2) For motors, provide #4 AWG ground wire, minimum.
  2. When the ground wire size is not specified or indicated on the Contract Drawings, provide wire sized in accordance with the requirements of NFPA 70.
- E. Within 60 days of the Contract award, submit the following:
1. The Submittals required by Section 26 05 00.
    - a. Include Product Data and Catalog Cuts for all products provided, and describe the usage of each product.
  2. Shop Drawings for the ground well grid installation in unpaved areas.
  3. Shop Drawings for the ground well grid installation in paved areas.
  4. Shop Drawings for the ground bus installation.
- F. Project Record Documents:
1. Prepare and submit record drawings showing the actual installed elevations and locations of grounding cables and rods for both concealed and exposed work provided under this Contract.
- G. Project Closeout:
1. Submit Operation and Maintenance Manuals that include the record drawings and all Product Data in accordance with Section 01830.

#### 1.04 SUBMITTALS

- A. Submit the following information to the Engineer in accordance with the requirements of Section 3 of the General and Supplementary General Provisions:
1. Product Data:
    - a. Manufacturer's product data
  2. Shop Drawings:
    - a. Ground well grid installation in unpaved areas.
    - b. Ground well grid installation in paved areas.

- c. Ground bus installation.
- 3. Quality Assurance/Quality Control Submittals:
  - a. Certificates:
    - 1) Testing agency product certification
  - b. Qualification Statements:
    - 1) System installers' qualifications
    - 2) Installation supervisors' resumes
- 4. Closeout Submittals:
  - a. Operation and Maintenance Manuals

#### 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications:
    - a. Employ installers who specialize in the work of this Section, and who can demonstrate a minimum of three years documented experience.
    - b. Submit the system installers' qualifications.
  - 2. Supervisor's Qualifications:
    - a. Employ supervisor to supervise the installation work who are skilled licensed electricians.
    - b. Submit the installation supervisors' resumes.
  - 3. All products are to be certified by Underwriters Laboratories, Inc. (UL),
- B. Regulatory Requirements:
  - 1. All grounding and bonding Work must comply with the requirements of NFPA 70, the National Electrical Code.
- C. Certifications:
  - 1. Testing Agency Product Certification:
    - a. Verify product quality by certifying products as meeting the requirements of one of the following:
      - 1) Underwriters Laboratories, Inc. (UL).
        - a) Provide products listed and labeled by UL.
    - b. Testing agency product certification must include agency listing and labeling, either by a printed mark on the data or by a separate listing card.
      - 1) If an item does not have this quality assurance verification, provide a written statement from the product manufacturer indicating why not; such manufacturer's statements are subject to the approval of the Engineer.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
  - 1. Transport materials, both on site and from Contractor's storage to site, in accordance with the recommendations of the respective manufacturers.
- B. Storage and Protection:

1. Store materials, both on and off site, in accordance with manufacturer's written instructions.
2. Store products indoors on blocking or pallets.

## PART 2 PRODUCTS

### 2.01 UNDERGROUND WARNING TAPE

- A. Metal detectable polyester material, with minimum one-inch high lettering. Overcoated graphics to read, "CAUTION-BURIED ELECTRIC LINE" for electric lines, "CAUTION - BURIED TELEPHONE" for telephone lines and/or "CAUTION - BURIED FIBER-OPTIC CABLES" for fiber-optic lines. APWA color to be red for electric lines and orange for telecommunication or fiber-optic lines.
- B. Acceptable Manufacturers:
  1. Brady
  2. LEM Products, Inc
  3. Seton
  4. Or Approved Equal

### 2.02 MATERIALS

- A. Conduit and Conduit Fittings:
  1. For conduit and conduit fittings that enclose single ground wires without accompanying circuit conductors provide one of the following:
    - a. Schedule 80, non-metallic conduit and fittings conforming to the requirements of Section 26 05 33.13 and the conduit additionally conforming to the requirements of NEMA TC-2, and the fittings additionally conforming to the requirements of NEMA TC-3.
    - b. Fiberglass reinforced plastic (FRP) conduit and fittings conforming to the requirements of NEMA TC-14 and Section 26 05 33.13.
  2. For other conduit and conduit fittings, provide conduit of the types specified or indicated and that conform to the requirements of Section 26 05 33.13.
- B. Wire:
  1. Bare Ground Wire:
    - a. Soft drawn copper, Class A or Class B stranded, meeting the requirements of ASTM B3 for sizes #6 or larger.
    - b. Soft drawn solid copper, meeting the requirements of ASTM B3 for sizes #8 or smaller.
  2. Insulated Ground Wire:
    - a. Provide insulated Class B copper stranded wire rated for 600 volts that conforms to the requirements of NEMA WC-7, and is green in color. Insulation type shall be as specified in Section 26 05 19.
  3. Acceptable Manufacturers:
    - a. Continental Wire & Cable Company [www.continentalwire.com](http://www.continentalwire.com)
    - b. SouthWire [www.southwire.com](http://www.southwire.com)

- c. General Cable [www.generalcable.com](http://www.generalcable.com)
- d. Okonite Co. [www.okonite.com](http://www.okonite.com)
- e. Or Approved Equal

C. Clamps and Non-Welded Connectors:

1. Provide bronze or brass clamps and connectors that are UL listed for use below grade.
  - a. All bolts and other material must be bronze or brass, plated steel screws are unacceptable.
  - b. Fabricate multi-bolt, solderless compression clamps from high strength electrical bronze, and provide silicon bronze clamping bolts and hardware.
2. Provide bolts, nuts, lock-washers, and similar hardware designed not to damage ground wire.
3. Acceptable manufacturers:
  - a. IlSCO.
  - b. Framatone Connectors Inc. (FCI), Burndy.
  - c. Or Approved equal.

D. Exothermic Welding Kits:

1. Provide molds, thermite packages, and other material for exothermic welds that are rated to carry 100 percent of the cable ratings, and which are letter-coded exothermic welded type.
2. Provide all items such as tees, crosses, splices, and cable connections necessary for connecting ground and bonding cables to the following items:
  - a. Ground rods.
  - b. Reinforcing steel bars.
  - c. Ground-bus.
  - d. Structural steel.
  - e. Water pipe.
  - f. Bonding to the main-ground-grid.
  - g. Bonding to Copper Grounding Bus Bar
3. Provide all exothermic welding molds, thermite packages, and other material used throughout the Work from a single manufacturer.
4. Acceptable Manufacturers:
  - a. Erico, Cadweld<sup>®</sup>.
  - b. Continental Industries, Inc., Thermoweld<sup>®</sup>.
  - c. Or Approved equal.

E. Ground Rods:

1. Provide UL listed, sectional ground rods fabricated using a electrolytic plating process to copper clad a medium carbon steel core
2. Diameter: 3/4 inch.
3. Length: 10 feet.
  - a. To obtain longer length rods, join rod sections using copper clad rod couplers.
4. Acceptable Manufacturers:

- a. Erico International Corp.
- b. Galvan Industries, Inc.
- c. South Atlantic, LLC
- d. A.B. Chance Co.
- e. Or Approved Equal

F. Concrete Protective Boxes (Ground Wells):

- 1. Provide precast concrete boxes with flush cast iron covers rated for heavy traffic H2O areas and having slots for conduit entrances.
  - a. Minimum size: 10” diameter by 12” high with maximum depth up to 36”.
  - b. Cover legend: Provide the cast-in legend “GROUND TEST WELL” in the cast iron covers provided.
- 2. Acceptable Manufacturers:
  - a. National Lightning Protection Corporation
  - b. East Coast Lightning Equipment
  - c. Or Approved Equal

G. Coating Compound:

- 1. Provide permanently pliable, moldable, un-backed, black rubber based coating materials for covering or coating grounding clamps and connectors.
- 2. Coating Physical Properties:
  - a. Solids/Density: 100 percent; 12 pounds per gallon.
  - b. Penetration: Within 90 to 130 when tested in accordance with ASTM D 5.
  - c. Water Absorption: 0.10 percent, maximum, when tested in accordance with ASTM D 570.
  - d. Dielectric Strength: 500 volts/mil when tested in accordance with ASTM D 149.
  - e. Volume Resistivity: 2,000 megohm-inches, or 5,000 megohms-cm, when tested in accordance with ASTM D 257.
  - f. Service Temperature: Minus 40 degrees to 160 degrees Fahrenheit; and having no melting point; flammability, or slow burning when tested in accordance with ASTM C 653.
  - g. Chemical Resistance:
    - 1) Resistant to alcohol, water, aqueous hydrochloride, and sodium hydroxide.
    - 2) Dissolved by carbon tetrachloride, naphtha gasoline, mineral spirits, and benzene.
  - h. Cohesive/Adhesive: Adheres to metals, concrete, and itself.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Site Verification of Conditions:

- 1. The Contract Drawings are generally indicative of the Work, but due to their small scale, it is not possible to indicate some offsets and fittings required nor the minor structural obstructions that may be encountered.

- a. Perform field measurements to discover offsets and fitting requirements not shown.
- b. Locate all on-site utilities and other obstructions in the area of construction, and verify that interferences will not occur.

### 3.02 PREPARATION

- A. Layout electrical work to suit actual field conditions and in accordance with accepted standard practice.

### 3.03 INSTALLATION

- A. Perform required earthwork including excavation, backfill, and compaction, as specified in Section 31 23 33 and 33 71 19.
- B. Construct each ground system and connection so it is mechanically secure and electrically continuous.
  1. Secure grounds to boxes in such a manner that each system is electrically continuous from the point of service to each outlet.
  2. Terminate conduits using double locknuts and bushings.
    - a. Unless a conduit run enters a metallic enclosure via integral threaded hubs, provide the conduit run with two locknuts.
  3. Clean paint, grease and such other insulating materials from the contact points of grounds.
- C. Ground Grids:
  1. Installing Ground Rods:
    - a. Drive ground rods head to 6 inches below grade by using a ground rod cap to protect the head of the rod.
      - 1) If the top of the rod is damaged during driving operations, cut it off.
  2. Installing Ground Wells:
    - a. Install a concrete protective box for the ground well flush with the grade and 4 inches above the top of the ground rod designated on the Contract Drawings.
  3. Installing Ground Wires:
    - a. Excavate the trenches for the ground grid cables, and lay the ground cable in the trenches from ground rod to ground rod without splice, and from one side of the grid to the other as shown on the Contract Drawings.
      - 1) Lay the ground grid cables cable allowing 10 percent slack.
      - 2) Form 12-inch minimum radius bends at changes in direction.
      - 3) At intersections, place cables so they diverge 60 degrees or more from other cables at the intersection.
      - 4) Connect service entrance grounds directly to the ground grids without splices in the cable.
    - b. Route connecting cables from the ground grid in the trenches to the building structure.

- 1) Route exposed cables parallel to the building lines, except for bends; form all bends with a 12-inch minimum radius.
  - 2) Wherever the cable breaks grade, provide schedule 80 conduit from 2-feet below finished grade to 3-feet above finished grade for protection; and provide conduit at other points where the cable may be subject to damage.
  - c. Clamp the conduit to the building structure's wall at the ends and at intervals not to exceed 5 feet.
    - 1) Whenever cable exits from the conduit, clamp the cable to the wall at intervals not to exceed 5 feet and at each entrance to equipment.
    - 2) Allow a 1/4 inch space between ground cables, conduit, and the surface it is mounted on.
  - d. Remove any damaged or kinked cable.
  4. Welding ground wires to the ground rods and equipment connections.
    - a. Follow the procedures of the exothermic welding kits manufacturer.
    - b. Prior to welding ground wires to the ground rods and equipment connections perform the following:
      - 1) Clean the proposed welding area of combustible and flammable materials; and block access to personnel to protect them from harm; and provide a shield to prevent damage to other materials.
      - 2) Clean insulation from ground wire for a distance of 12 inches, and clean the exposed wire to a bright finish.
      - 3) Clean paint, grease, and other similar insulating materials from contact points.
      - 4) Inspect the molds for damage; and discard any faulty mold or any molds used over 40 times.
    - c. Exothermically weld the ground wires to the ground rods as shown on the Contract Drawings, including to ground rods at grid crossings, to ground rods at grid intersections on the sides of the ground grid, and at all equipment connections.
    - d. After completing the welding, replace the insulation removed from insulated wires, and coat connections and the area around connections with coating compound.
      - 1) Coating Thickness: 1/8-inch, minimum.
      - 2) Make sure the coating is free from pin-holes and holidays.
  5. Make all connections to electrical equipment and ground buses with compression, two-hole lugs and studs.
    - a. Clean paint, grease, and other similar insulating materials from the contact points for the ground lugs and studs.
    - b. Clean all wires to a bright finish prior to construction the connections.
- D. Equipment Ground Buses:
1. Whenever several pieces of equipment, other than service grounds, require external bond wires in an area, provide an equipment ground bus.
  2. Wherever 5 or more conduits enter a box or enclosure, provide an equipment ground bus.

- a. Connect all equipment ground wires and conduit bond wires within the box or enclosure to a single ground stud or single common ground bus.
3. Size ground buses to carry 100 percent of the rating or setting of the largest over current device in the circuit(s) ahead of the equipment, conduit, or other item, and as indicated on the Contract Drawings.

E. Equipment Grounds:

1. Install equipment grounds in spaces accessible to authorized personnel only.
2. Equipment Grounding Connectors:
  - a. Only use approved grounding connectors.
    - 1) Terminate grounds with closed lugs with star washers on both sides and a 1/4-20 bolt and nut, minimum; spade lugs are not allowed.
    - 2) For portable electrical equipment, provide electric cords having an equipment grounding conductor and a NEMA and UL approved cord cap.
  - b. Do not install grounding lugs on flanges, mounting screws, or standoffs in switches, distribution boxes, or panels.
  - c. Cover or coat grounding clamps and connectors with coating compound.
3. Equipment Grounding Conductors:
  - a. Unless using multi-conductor cable, run equipment grounding conductors inside the same conduit or wiring channel enclosing the power conductors.
  - b. In multi-conductor cable, locate grounding conductor inside the sheath or cable.
  - c. Do not use a system neutral or a current carrying conductor as the equipment grounding conductor.
    - 1) Do not ground the electrical and electronic equipment neutral to chassis, racks, equipment ground conductor, or any non-current carrying conductor on the equipment.
4. Grounding Lighting Fixtures:
  - a. Provide the housing of each lighting fixture with a separate, factory-installed grounding device and ground conductor.
  - b. Use the factory-installed grounding device for connecting a separate grounding conductor meeting applicable grounding requirements of the NEC to the fixture.
    - 1) Provide a green covered grounding conductor of the same wire gauge as the two power feed wires.
    - 2) Provide a continuous ground for the fixture construction.
5. Grounding Motors:
  - a. Install equipment grounding wire within conduit supplying power to motor.
  - b. Install bonding connectors across the liquid tight flexible conduit supplying motors.
6. Grounding and Bonding Pumps:
  - a. Provide a bond from each pump to its motor using a conductor equal in size to the motor circuit equipment grounding conductors.
7. Grounding Transformers:

- a. If a transformer is a separately derived system as defined in NFPA 70, provide a ground wire in both the primary and secondary conduits; and bond the ground wire and metallic conduits, if used, to the nearest effectively grounded metallic water pipe or nearest effectively grounded structural steel column.
  - b. Provide an additional bond between cold or hot water pipes and structural steel located near a transformer bond connection.
8. Grounding Isolated Ground Receptacles:
- a. Ground the receptacle grounding terminal via an insulated equipment grounding conductor routed with the circuit conductors within the raceway.
    - 1) This grounding conductor may pass through one or more panelboards without being connected to the panelboard grounding terminal in order to terminate directly at an equipment grounding conductor terminal of the applicable separately derived system or service within the same building or structure.
  - b. Use of isolated equipment grounding conductors does not remove the requirement for grounding the raceway system and outlet box.

### 3.04 REPAIR/RESTORATION

- A. Replace any finished exothermic welded splice connections that inspections find to be defective.
- B. After inspection by Engineer, backfill the direct buried cables and around ground rod protectors.
  - 1. Begin backfilling with clean washed sand to 6 inches above the ground rods or to the depth shown on the Contract Drawings, whichever is greater.
  - 2. Backfill using select fill in accordance with the requirements of Section 31 23 33.
  - 3. Slope the finish grade away from ground rods at a slope of 1 inch in 18 inches for a distance of 27 inches from the rods in all directions.
- C. Install underground warning tape above all buried cables/conduits at a depth of 12" below finished grade.

### 3.05 FIELD QUALITY CONTROL

- A. Site Testing:
  - 1. Prior to energizing any system, test the resistance to ground for the system in accordance with Section 26 05 63.
    - a. Perform a continuity test from all utilization and distribution equipment to the ground grid on a run-by-run basis.
- B. Inspection:
  - 1. Prior to completion of the Work of this Section, inspect the items provided for conformity to the Contract Drawings and Specifications.
    - a. Leave in-place "made grounds" open until they have been inspected and approved by the Engineer.

- b. Clean the surfaces involved in "made grounds" before connecting the grounds, and finish the installation with touch up painting or another protective coating to prevent corrosion.
- 2. Inspect finished exothermic welded connections for the following defects:
  - a. Conductors appear within the splice area.
  - b. Top of splice risers are below conductors.
  - c. Surfaces exhibiting more than 20 percent slag material.
  - d. Surfaces with over slag material that has flowed into conductors.
  - e. Mold blowouts.
  - f. Excessive porosity.
    - 1) Small pores less than 1/32 inch are permitted.

3.06 PROTECTION

- A. Protect finished insulated wires from being painted.
- B. Protect all ground grid wells from damage during paving and landscaping.
- C. Protect all ground grid installations and ground wires from damage during the work of other Sections.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 26 05 28

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
  - 1. Requirements for furnishing, installing, cleaning, and protecting hanger and support systems for electrical wiring, conduit boxes, and equipment.
- B. Related Section:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 26 05 00 – Common Work Results for Electrical

1.02 REFERENCES

- A. American Iron and Steel Institute (AISI):
  - 1. AISI Standard Steels (Handbook).
- B. American Society for Testing Materials (ASTM):
  - 1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated - Welded and Seamless.
  - 3. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 4. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 5. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
  - 6. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi, Minimum Tensile Strength.
  - 7. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 8. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.
  - 9. ASTM A 575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
  - 10. ASTM A 576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
  - 11. ASTM A 635/A 635M - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled.
  - 12. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - 13. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

14. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. American Welding Society (AWS):

1. AWS D1.1/D1.1M - Structural Welding Code - Steel.

D. National Electrical Manufacturers Association (NEMA):

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts maximum).

E. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code (NEC).

2. NFPA 258 - Standard Research Test Method for Determining Smoke Generation of Solid Materials.

F. Society of Automotive Engineers International (SAE):

1. SAE J 429 - Mechanical and Material Requirements for Externally Threaded Fasteners.

G. The Society for Protective Coatings (SSPC):

1. SSPC Painting Manual.

a. SSPC-SP 2 - Hand Tool Cleaning.

b. SSPC-Paint 15 - Paint Specification No. 15, Steel Joist Shop Paint, Type I, Red Oxide Paint, Type II, Asphalt Coating.

c. SSPC-Paint 20 - Paint Specification No. 20, Zinc-Rich Primers (Type I, "Inorganic," and type II, "Organic").

H. Underwriters Laboratory, Inc. (UL):

1. UL 568 - Nonmetallic Cable Tray Systems.

2. UL 635 - Standard for Insulating Bushings.

3. UL 870 - Standard for Wireways, Auxilliary Gutters, and Associated Fittings.

4. UL 884 - Standard for Underfloor Raceways and Fittings.

5. UL 1479 - Standard for Fire Tests of Through-Penetration Firestops.

6. UL 2239 - Hardware for the Support of Conduit, Tubing, and Cable.

I. U. S. General Services Administration (GSA)

1. Federal Specifications:

a. A-A-1922A - Shield, Expansion (Caulking Anchors, Single Lead).

b. FF-S-107C(2) - Screws, Tapping and Drive.

### 1.03 SUBMITTALS

A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions, and Section 26 05 00, Basic Electrical Materials and Methods:

1. Product Data:

a. Provide product data and catalog cuts for the products provided under this Section.

2. Shop Drawings:

a. Provide Shop Drawings.

- b. Provide Shop Drawings of hanging supports for conduit.
- 3. Quality Assurance/Control Submittals:
  - a. Design Data:
    - 1) Provide structural calculations for the following items:
      - a) Equipment backboards and support structures not directly fastened to the walls.
      - b) Hanging supports for conduit.
    - 2) Detailed drawings of proposed departures from the original design.
  - b. Certificates:
    - 1) Testing Agency/Quality Verification:
      - a) With the product data for electrical hangers and supports, provide evidence of quality verification, listing, and labeling by the Electrical Testing Agency (ETA); either by a printed mark on the data, or by a separate listing card.
      - b) If an item does not have ETA quality assurance verification, provide a written quality assurance verification statement from the product manufacturer indicating why the item does not have the specified quality assurance verification.
        - (1) Such quality assurance verification statements are subject to approval by the Engineer.
    - 2) Manufacturers' Certificate of Compliance.
  - c. Qualification Statements:
    - 1) Manufacturers' qualifications.

#### 1.04 QUALITY ASSURANCE

- A. Qualifications;
  - 1. Electrical Testing Agency (ETA) Qualifications:
    - a. Use the Electrical Testing Agency (ETA) qualified as specified in Section 26 05 00, Basic Electrical Materials and Methods.
  - 2. Manufacturers' Qualifications:
    - a. Provide electrical support framing made by manufacturers that have been manufacturing support framing for a minimum of 5 years, and who carefully controls their operations to ensure that excellent product engineering, quality, safety, and reliability are achieved.
    - b. Submit the manufacturer's qualifications to the Engineer.
- B. Certifications:
  - 1. Electrical Testing Laboratory (ETL) Certification:
    - a. Provide products that are listed and labeled by Underwriters Laboratory, Inc. (UL) or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) unless products meeting the requirements of these testing laboratories are not readily available or unless standards do not exist for the products.
  - 2. Manufacturers Certificate of Compliance:
    - a. Submit a manufacturer's Certificate of Compliance certifying that both the galvanizing and the products meet the requirements of the ASTM standards.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Packaging, Shipping, Handling, and Unloading:
  - 1. Deliver, store, and handle the hangers and supports in accordance with Section 26 05 00 Common Work Results for Electrical, and as specified herein.
  - 2. Deliver material to Site in the original factory packaging.
- B. Storage and Protection:
  - 1. Shelter and store the components under cover, and supported off the ground and floors on blocking.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Carbon Steel Shapes:
  - 1. Provide shapes of the sizes specified and as indicated on the Contract Drawings:
  - 2. Provide steel shapes complying with the following material specifications for the type of steel shape listed:
    - a. Steel Sections: ASTM A36/A 36M.
    - b. Steel Tubing: ASTM A 500, Grade B.
    - c. Plates: ASTM A 283/A 283M.
    - d. Sheets: ASTM A 1011/A 1011M.
    - e. Pipe: ASTM A 53/A 53M, Grade B, Schedule 40, hot-dipped, zinc-coated.
- B. Welding materials:
  - 1. Provide welding materials complying with the requirements of AWS D1.1/D1.1M for the type of material being welded.

### 2.02 MANUFACTURED UNITS

- A. Metal U-Channel Electrical Support Framing Systems and Fittings:
  - 1. Carbon Steel U-Channel Support Framing Systems:
    - a. Provide 1-5/8-inch nominal size U-channel supports fabricated from 12 gauge carbon steel electrolytically galvanized with a zinc-coating thickness commensurate with Service Condition SC 1 (mild) in conformance with the requirements of ASTM B 633.
      - 1) For Type II ASTM B 633 galvanized finishes, fabricate the framing from steel complying with the requirements for Grade 33 specified in ASTM A 1011/A 1011M.
      - 2) For Type III ASTM B 633 galvanized finishes, fabricate the framing from steel complying with the requirements of ASTM A 575, ASTM A 576, ASTM A 635/A 635M, or ASTM A 36/A 36M.
    - b. Where combination members are required, spot-weld the members on 3-inch centers.
    - c. Provide 1-3/8-inch or larger depths, except where supports are mounted directly to walls 13/16-inch or larger depths may be provided.

- d. Provide metal framing systems and fittings for metal framing systems from a single manufacturer.
  - e. Manufacturers:
    - 1) Unistrut Corporation, Unistrut<sup>®</sup> Metal Framing System, [www.unistrut.com](http://www.unistrut.com).
    - 2) Thomas & Betts, Kindorf<sup>®</sup>, <http://elec-cat.tnb.com>.
    - 3) Cooper B-Line<sup>®</sup>, Inc., [www.b-line.com](http://www.b-line.com).
    - 4) Power-Strut, [www.power-strut.com](http://www.power-strut.com).
    - 5) Or Approved Equal
  - 2. Stainless Steel U-Channel Support Framing Systems:
    - a. Provide U-channel supports, fittings, threaded rod, and hardware fabricated from Type 316 stainless steel.
  - 3. PVC-Coated Steel U-Channel Support Framing Systems:
    - a. Provide U-channel supports, fittings, threaded rod, and hardware fabricated from PVC-coated carbon steel.
- B. Nonmetallic Electrical Support Framing Systems and Fittings:**
- 1. Fiberglass Reinforced Polyester Angles, Channels, and Bars:
    - a. Provide non-metallic angles, channels, and bars fabricated from a high impact strength, fiberglass reinforced polyester formulation having a glass to resin ratio of 45 to 55 percent by weight.
    - b. Provide angles, channels, and bars that meet or exceed a Class 1 flame spread rating of less than 25 determined according to the requirements of ASTM E 84, and a smoke rating of 5 determined according to the requirements of the Smoke Chamber Test specified in NFPA 258.
    - c. Manufacturers:
      - 1) Enduro Systems, Inc., [www.endurocomposites.com](http://www.endurocomposites.com).
      - 2) Robroy Industries, [www.robroy.com](http://www.robroy.com).
      - 3) Or Approved equal.
  - 2. Pre-Engineered Glass-Fiber-Reinforced Supporting Systems:
    - a. Pre-engineered, UL-listed supporting systems fabricated from glass-fiber-reinforced composites may be used in lieu of field-fabricated support systems.
    - b. Manufacturers:
      - 1) Unistrut, [www.unistrut.com](http://www.unistrut.com).
      - 2) Allied Electrical Group, Aickinstrut Fiberglass Framing System, [www.alliedtube.com](http://www.alliedtube.com).
      - 3) Enduro Systems, Inc., [www.endurocomposites.com](http://www.endurocomposites.com).
      - 4) Power-Strut, [www.power-strut.com](http://www.power-strut.com).
      - 5) Or Approved Equal
- C. Conduit Supports:**
- 1. Malleable Iron Conduit Supports:
    - a. Provide one-hole style galvanized malleable iron fasteners with pipe straps similar to those as manufactured by Thomas & Betts.
    - b. Provide support devices consisting of threaded rods, channel supports, and conduit straps/fasteners.
  - 2. Stamped Steel Conduit Supports:

- a. Provide one-hole style galvanized stamped steel fasteners with pipe straps similar to those as manufactured by Thomas & Betts.
  - b. Provide support devices consisting of threaded rods, channel supports, and conduit straps/fasteners.
  3. Special Finishes:
    - a. Where PVC-coated RGS conduits are to be installed, provide 40-mil PVC coated conduit supports including the threaded rods, channel supports, and conduit straps/fasteners.
  4. Manufacturers:
    - a. Thomas & Betts, <http://www-public.tnb.com/contractor/docs/superstrut.pdf>.
    - b. Or Approved equal.
- D. Cable Supports:
1. Provide voltage rated cable supports fabricated from hot-dip galvanized malleable iron with a threaded collar.
  2. Provide tapered wedging cable plugs fabricated from hard fiber, impregnated hardwood, or canvas bakelite for the cable supports.
  3. Manufacturers:
    - a. EGS Electrical Group, O-Z/Gedney, Inc., Type "M"
    - b. Or Approved equal.
- E. Bolts, Nuts, and Washers:
1. For bolts, nuts, and washers smaller than 1/4-inch trade size, provide 316 stainless steel fasteners complying with the requirements of ASTM A 325.
  2. For fastening galvanized components, provide galvanized bolts, nuts, and washers galvanized in accordance with the requirements of ASTM A 325.
- F. Anchors and Fasteners:
1. Drive (Deep-Pitch) Screws:
    - a. Provide Type 316 stainless steel self-tapping type drive (deep-pitch) screws that comply with the requirements of FF-S-107C(2).
  2. Drilled-In Anchors and Fasteners:
    - a. Provide drilled-in anchors and fasteners that comply with the requirements of FF-S-107C(2).
    - b. Masonry Anchors:
      - 1) Provide masonry anchors designed to accept both machine bolts and threaded rods as fasteners.
        - a) Provide SAE J 429 Grade 2 machine bolt fasteners fabricated from AISI Type 316 stainless steel.
        - b) Provide nuts and washers conforming to the requirements of ASTM A 563.
      - 2) Provide masonry anchors consisting of an expansion shield and expander nut contained inside the shield.
        - a) Expander Nuts:
          - (1) Fabricate square expander nuts with their sides tapered inward from the bottom to the top.

- (2) Design the expander nuts to simultaneously climb the bolt or rod thread and expand the shield as soon as the threaded expander nut reaches and bears against the shield bottom when being tightened.
- b) Expansion Shields:
  - (1) Provide expansion shield bodies consisting of four legs, the inside of each tapered toward the shield bottom, or nut end.
  - (2) The end of one leg shall be elongated and turned across shield bottom. Outer surface of shield body shall be ribbed for grip-action.
- 3) Masonry Anchor Material:
  - a) Provide die cast Zamac No. 3 zinc alloy having a 43,000 psi minimum tensile strength.
- 4) Manufacturers:
  - a) U.S.E. Diamond, Inc., FORWAY System, , [www.mktfastening.com](http://www.mktfastening.com).
  - b) Or Approved Equal
- c. Concrete Anchors:
  - 1) Carbon Steel Anchor/Fastener:
    - a) Provide UL listed one-piece studs (bolts) with integral expansion wedges, nuts, and washers.
    - b) Provide carbon steel anchor/fasteners complying with the physical requirements specified in FF-S-325 for Group II, Type 4, Class 1.
  - 2) Stainless Steel Anchor/Fastener:
    - a) Provide one-piece AISI Type 303 or 304 stainless steel studs (bolts) with integral expansion wedges, AISI Type 316 stainless steel nuts, and AISI Type 316 stainless steel washers.
    - b) Provide stainless steel anchor/fasteners complying with the physical requirements of FF-S-325 for Group II, Type 4, Class 1.
  - 3) Acceptable Manufacturers:
    - a) U.S.E. Diamond, Inc.; SUP-R-STUD, [www.mktfastening.com](http://www.mktfastening.com).
    - b) Hilti Fastening Systems; KWIK-BOLT, [hilti.com](http://hilti.com).
    - c) Molly Fastener Group; PARABOLT.
    - d) Phillips; RED HEAD Wedge-Anchor, [www.phillipsfastener.com](http://www.phillipsfastener.com).
    - e) Or Approved Equal
3. Hammer drive-type explosive charge drive-type anchors and fastener systems are unacceptable.
4. Lead shields, plastic-inserts, fiber-inserts, and drilled-in plastic sleeve/nail drive systems are unacceptable.

## 2.03 ACCESSORIES

### A. Wall Seals:

1. Provide a hydrostatic seal to fill the annular space between conduit and through structure openings.
2. Manufacturer:
  - a. PSI-ThunderLine/Link-Seal Corp., Link-Seal<sup>®</sup>, [www.linkseal.com](http://www.linkseal.com).
  - b. Or Approved Equal

B. Fire Seals:

1. Where conduit penetrates fire-rated walls, floors, partitions, and ceiling, provide approved fire seals to ensure that the fire rating is maintained.
2. Provide a fire seal system which is UL-listed for the application.
  - a. Provide fire seal compound or a mechanical seal for fire rating of 2 hours or less.
3. Manufacturers:
  - a. Compound Fire Seals:
    - 1) Dow Corning Corporation, [www.dowcorning.com](http://www.dowcorning.com).
    - 2) 3M, [http://solutions.3m.com/en\\_US/](http://solutions.3m.com/en_US/).
    - 3) Or Approved Equal
  - b. Mechanical Fire Seals:
    - 1) PSI-ThunderLine/Link-Seal Corp., [www.linkseal.com](http://www.linkseal.com).
    - 2) Or Approved Equal
  - c. Through-Wall Barrier Fire Seals:
    - 1) Cooper Crouse-Hinds, <http://crouse-hinds.com>.
    - 2) Or Approved Equal

2.04 FABRICATION

- A. Fit and shop assemble items in the largest sections practical for delivery to the Site.

2.05 FINISHES

- A. Prime paint non-galvanized steel items.
1. Prepare surfaces to be primed in accordance with the requirements of SSPC-SP 2.
    - a. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
  2. Prime Painting: Apply one coat of primer.
- B. Galvanizing items specified above as galvanized.
1. Galvanize the items after fabrication in accordance with the requirements of ASTM A 123/A 123M.
  2. Provide a minimum galvanized coating of 1.25 ounces per square foot (380 grams per square meter).
- C. Touch-Up Primer:
1. For un-galvanized metal surfaces: Provide primer complying with the requirements of SSPC-Paint 15 for Type I, Red Iron Oxide.
  2. For galvanized surfaces: Provide primer complying with the requirements of SSPC-Paint 20 for Type I, Inorganic Zinc-Rich Primer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Field Measurement:
1. Although the Contract Drawings are generally indicative of the Work, take field measurements to verify actual conditions.

- a. Due to the small scale of the Contract Drawings it is not possible to indicate all offsets, fittings, and apparatus required or the minor structural obstructions that may be encountered during the Work.
2. Carefully investigate the structural and finish conditions, and other construction work, at the Site which may affect the work of this Section.

### 3.02 PREPARATION

- A. After carefully investigating structural and finish conditions and other in-place construction work, produce detailed Shop Drawings showing proposed departures from the original design due to field conditions or other causes.
  1. Layout the electrical work according to accepted standard electrical trade practice to suit actual field measurements.
  2. Arrange the electrical work to consider existing conditions and to preserve access to other equipment, rooms, areas, and similar features of the construction.
  3. Provide plan and profile views of duct banks, and show equipment backboards and support structures not directly fastened to the walls on the Shop Drawings.
  4. Indicate the location and details of conflicting utility construction and slopes on the Shop Drawings.
  5. Submit the Shop Drawings to the Engineer prior to performing the Work of this Section.
- B. Obtain roughing-in dimensions of electrically operated equipment, including equipment being installed by both electrical and other construction trades.
  1. Set conduit and boxes only after receiving approved dimensions and checking such equipment locations.
  2. Arrange electrical Work accordingly and furnish such fittings and apparatus as required to accommodate such conditions and to preserve access to other equipment, rooms, areas, and similar spaces.

### 3.03 INSTALLATION

- A. Install electrical Work in conformance to the requirements of NFPA 70 for wiring methods general requirements, and to other applicable Articles of the NEC governing methods of wiring.
- B. Installing Anchors and Fasteners:
  1. For anchoring or fastening applications in masonry and hollow-core precast concrete structural elements, provide masonry anchors as specified herein.
  2. For anchoring or fastening applications in cast-in-place concrete and solid precast concrete structural elements, provide concrete anchors as specified herein.
  3. Threaded Bolts:
    - a. Draw threaded bolted connections up tight using 316 stainless steel lock washers to prevent the bolt or nut from loosening.
  4. Drilled-In Expansion Anchors:
    - a. Install expansion anchors in strict accordance with manufacturer's instructions and the following.

- 1) Drill holes to the required diameter and depth in accordance with anchor manufacturer's instructions for the size of anchor being installed.
- 2) Minimum Embedment:
  - a) Embed expansion anchors to four and one-half bolt diameters minimum unless otherwise indicated on the Contract Drawings.

C. Installation of U-Channel Support Framing Systems in accordance with Table 26 05 28-1 below:

<b>Table 26 05 28-1 U-Channel Support Framing Selection</b>		
<b>Condition 1</b>	<b>Condition 2</b>	<b>Type</b>
Aboveground	Outside vertical support within 6" of concrete	Stainless Steel
	Outside other locations	Stainless Steel
	Interior NEMA 1/12	Carbon steel,
	Interior NEMA 4X	Stainless Steel

D. Installing Conduit Supports:

1. For exterior locations provide malleable iron conduit supports.
2. For interior locations, provide stamped steel conduit supports.

E. Panelboard/Enclosure Feed Risers:

1. Furnish and install cable supports in feeder risers as required by the underwriters.

F. In areas designated as wet, NEMA 3, NEMA 3R, NEMA 4X, NEMA 12, or NEMA 13 as defined in NEMA 250; secure equipment and conduit to no fewer than two 7/8-inch minimum depth, non-metallic channels mounted vertically on the walls.

G. Field Fabrication:

1. Fabricated Items:
  - a. Fabricate backboards, backboard supports, equipment supports, conduit supports, and the other items as detailed on the Contract Drawings.
    - 1) Hot-dip galvanize mild-steel fabrications in accordance with the requirements of ASTM A 153/A 153M.
  - b. Fabricate backboard posts as detailed on the Contract Drawings from concrete filled steel pipe with a crowned cap; and apply a prime paint finish.
  - c. Supply components required for the anchorage of fabrications.
    - 1) Except where specifically noted otherwise, fabricate anchors and related components from the same material as the fabrication and apply the same finish.
2. Tightly fit and secure joints.
  - a. Make exposed joints butt tight, flush, and hairline.
  - b. Weld fabricated assemblies in accordance with AWS D1.1/D1.1M.
    - 1) Continuously seal joined members using intermittent welds and plastic filler.

- 2) Dress welds smooth and free of sharp edges and corners.
- c. Grind exposed joints flush and smooth with the adjacent finish surface.
- 3. Ease exposed edges to a small uniform radius.
  - a. Cut all backboard corners to a 1-inch radius.
- 4. For the attachment of work and for bolted connections, accurately drill or punch holes for the fasteners as required.
  - a. Burned holes are unacceptable.
  - b. Provide holes no more than 3/32-inch larger than the fasteners.
- 5. Exposed Mechanical Fastenings:
  - a. Except where specifically noted otherwise in the Contract Documents, provide flush countersunk screws or bolts; unobtrusively located, and consistent with the design of the component.
- 6. Fabrication Tolerances:
  - a. Squareness: 1/8 inch (3 mm), maximum difference in diagonal measurements.
  - b. Maximum offset between faces: 1/16 inch (1.5 mm).
  - c. Maximum misalignment of adjacent members: 1/16 inch (1.5 mm).
  - d. Maximum bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
  - e. Maximum deviation from plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

3.04 REPAIR/RESTORATION

- A. Coatings:
  - 1. Repair damage to coatings.
    - a. Touch up damaged coating surfaces using the specified primer for primed steel surfaces, and using zinc-rich primer for galvanized steel surfaces.

3.05 FIELD QUALITY CONTROL

- A. Inspection:
  - 1. Verify the adequacy of coatings.
  - 2. Inspect the items provided under this Section for adherence to the fabrication tolerances specified above, and correct any discrepancies:

3.06 PROTECTION

- A. Protect the items provided under this Section from damage during the work of other trades.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 26 05 33.13  
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for furnishing, installing, energizing, and testing conduit, tubing, and fittings for communication lines and electrical transmission, distribution, and service lines.

B. Related Section:

1. General Provisions and Supplementary General Provisions
2. Section 26 05 00 – Common Work Results for Electrical
3. Section 26 05 26 – Grounding and Bonding for Electrical
4. Section 26 05 28 – Hangers and Supports for Electrical Systems
5. Section 26 05 63 – Acceptance Testing of Electrical Systems

1.02 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
2. ANSI C80.1 - Rigid Steel Conduit - Zinc-Coated (GCR).
3. ANSI C80.3 - Electrical Metallic Tubing - Zinc Coated (EMT).
4. ANSI C80.6 - Intermediate Metal Conduit - Zinc Coated (IMC).

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

1. ASTM A 568/A 568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold Rolled, General Requirements for.
2. ASTM D 1784 - Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

C. National Electric Manufacturer's Association (NEMA):

1. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
2. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit.

D. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code (NEC).

E. Underwriters Laboratory, Inc. (UL):

1. ANSI/UL 6 - Standard for Rigid Metal Conduit.
1. ANSI/UL 360 - Standard for Liquid-Tight Flexible Steel Conduit.
2. ANSI/UL 498 - Standard for Safety for Attachment Plugs and Receptacles.
3. ANSI/UL 514A - Metallic Outlet Boxes.
4. ANSI/UL 797 - Electric Metallic Tubing - Steel.

5. ANSI/UL 886 - Standard for Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.
6. ANSI/UL 1203 - Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
7. ANSI/UL 1242 - Standard for Electrical Intermediate Conduit – Steel

F. Institute of Electrical and Electronics Engineers (IEEE):

1. IEEE C2 - National Electrical Safety Code.

1.03 DEFINITIONS

- A. Definitions for all items are as stated in NFPA 70, IEEE C2, and in other reference documents unless otherwise stated, specified, or noted.

1.04 DESIGN REQUIREMENTS

A. Conduit Systems:

1. Provide conduit of the type and material shown in Table 26 05 33.13-1, 26 05 33.13-2, 26 05 33.13-3, 26 05 33.13-4 and 26 05 33.13-5 for the application indicated, or as indicated on the Contract Drawings.
2. Provide conduit fittings made of material identical to that of the conduit system with which they are used.

**Table 26 05 33.13-1 Conduit System Selection**

<b>Location</b>	<b>Condition 1</b>	<b>Condition 2</b>	<b>Conduit Type</b>	<b>Size (Minimum)<sup>1</sup></b>
Under-Ground	Encased	Bends, over 10 degrees in length	Rigid Galvanized Steel	1 Inch
		Conduit Risers	Rigid Galvanized Steel	1 Inch
		Exposed conduit within 6-inches of exit from encasement	PVC Coated Rigid Galvanized Steel	1 Inch
		Straight Runs	PVC Schedule 40	1 Inch
1 No conduit smaller than 1-inch trade size is permitted unless indicated otherwise on the Contract Drawings.				

**Table 26 05 33.13-2 Conduit System Selection**

Location	Condition 1	Condition 2	Conduit Type	Size (Minimum) <sup>1</sup>
Under-ground	Direct Burial	Classified (Hazardous Areas)	Rigid Galvanized Steel	1 Inch
		Other	PVC Schedule 80	1 Inch
1 No conduit smaller than 1-inch trade size is permitted unless indicated otherwise on the Contract Drawings.				

**Table 26 05 33.13-3 Conduit System Selection**

Location	Condition 1	Condition 2	Conduit Type	Size (Minimum) <sup>1</sup>
Above-Ground	Outside	Exposed to weather NEMA 3R/4 Locations	PVC Coated Rigid Galvanized Steel or Rigid Aluminum Conduit	3/4 Inch
		NEMA 4X Locations	PVC Coated Rigid Galvanized Steel or Rigid Aluminum Conduit	3/4 Inch
		Covered or Protected from weather NEMA 3R/4 Locations	Rigid Galvanized Steel or Rigid Aluminum Conduit	3/4 Inch
	Inside NEMA 1/12	Within 6-inches of floor when exposed	PVC Coated Rigid Galvanized Steel	3/4 Inch
		Within 6-inches of floor when within footprint of floor mounted equipment	PVC Schedule 40	3/4 Inch
		Above suspended ceilings	Rigid Galvanized Steel	3/4 Inch
		Concealed in Open-Cell Masonry Block Wall	Electrical Metal Tubing or PVC Schedule 40	3/4 Inch
		Concealed in Cast-in-Place Concrete Wall or Floor	Rigid Galvanized Steel	3/4 Inch
		Concealed behind Gypsum Board Wall or Ceiling	Electrical Metal Tubing or Rigid Galvanized Steel	3/4 Inch

**Table 26 05 33.13-3 Conduit System Selection**

Location	Condition 1	Condition 2	Conduit Type	Size (Minimum) <sup>1</sup>
		Recess Mounted Lighting Fixtures and Rotating or Vibrating Equipment	Liquid-Tight Flexible Metal Conduit	3/4 Inch
		Exposed within 10'-0" AFF	Rigid Galvanized Steel or Intermediate Metal Conduit	3/4 Inch
		Exposed above 10'-0" AFF	Electrical Metal Tubing or Rigid Galvanized Steel	3/4 Inch
1 No conduit smaller than 3/4-inch trade size is permitted unless indicated otherwise on the Contract Drawings.				

**Table 26 05 33.13-4 Conduit System Selection**

Location	Condition 1	Condition 2	Conduit Type	Size (Minimum) <sup>1</sup>
Above-Ground	Inside NEMA 3R/4/4X	Within 6-inches of floor	PVC Coated Rigid Galvanized Steel	3/4 Inch
		Concealed in Masonry Block Wall	Rigid Galvanized Steel, Intermediate Metal Conduit	
		Concealed in Cast-in-Place Concrete Wall or Floor	Rigid Galvanized Steel	3/4 Inch
		Recess Mounted Lighting Fixtures and Rotating or Vibrating Equipment	Liquid-Tight Flexible Metal Conduit	3/4 Inch
		Exposed	PVC Coated Rigid Galvanized Steel or Rigid Aluminum Conduit	3/4 Inch
		Recess Mounted Lighting Fixtures and Rotating or Vibrating Equipment	Liquid-Tight Flexible Metal Conduit	3/4 Inch
1 No conduit smaller than 3/4-inch trade size is permitted unless indicated otherwise on the Contract Drawings.				

**Table 26 05 33.13-5 Conduit System Selection**

<b>Location</b>	<b>Condition 1</b>	<b>Condition 2</b>	<b>Conduit Type</b>	<b>Size (Minimum)<sup>1</sup></b>
Above-Ground	Inside NEMA 7/9	Within 6-inches of floor	PVC Coated Rigid Galvanized Steel	3/4 Inch
		Concealed in Masonry Block Wall, Cast-in-Place Masonry or Floor above grade	Rigid Galvanized Steel or Intermediate Metal Conduit	3/4 Inch
		Exposed	PVC Coated Rigid Galvanized Steel or Rigid Aluminum Conduit	3/4 Inch
		Recess Mounted Lighting Fixtures and Rotating or Vibrating Equipment	Hazardous Location Flexible Coupling	3/4 Inch
	Outside NEMA 7/9	Exposed to weather NEMA 3R/4 locations	PVC Coated Rigid Galvanized Steel or Rigid Galvanized Steel or Rigid Aluminum Conduit	3/4 Inch
		NEMA 4X locations	PVC Coated Rigid Galvanized Steel or Rigid Aluminum Conduit	3/4 Inch
		Covered or Protected from weather NEMA 3R/4 locations	Rigid Galvanized Steel	3/4 Inch
1 No conduit smaller than 3/4-inch trade size is permitted unless indicated otherwise on the Contract Drawings.				

**1.05 SUBMITTALS**

- A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
  - 1. Product Data:
    - a. To facilitate power utility approval of the items installed from the utility's service poles to the main service panels, submit 4 more copies of the conduit submittals than the number required by Section 01330, Submittal Procedures.
    - b. Rigid Polyvinyl Chloride (PVC) Conduit.

- c. Non-metallic conduit solvent.
  - d. Electrical Metallic Tubing (EMT).
  - e. Intermediate Metal Conduit (IMC).
  - f. Plastic coated rigid galvanized steel conduit.
  - g. Liquidtite flexible metal conduit.
  - h. Rigid galvanized steel conduit (RGS).
  - i. Hazardous location flexible coupling
  - j. Fittings for non-metallic conduit systems.
  - k. Fittings for metallic conduit systems.
  - l. Conduit spacers.
  - m. Heat shrink tubing.
  - n. Wall and floor penetration seals.
  - o. Cold galvanize coating.
2. Shop Drawings:
    - a. Proposed departures from the original design.
  3. Quality Assurance/Control Submittals:
    - a. Qualification Statements:
      - 1) Qualifications of the installer.
      - 2) Qualifications of the Electrical Testing Laboratory (ETL).
    - b. Certificates:
      - 1) Testing agency/quality verification, listing, and labeling.

## 1.06 QUALITY ASSURANCE

### A. Qualifications:

1. Installer Qualifications:
  - a. Employ an installation firm with a minimum of three years documented experience installing conduit and tubing similar in type and scope to that required by this Contract to install the Work of this Section.
  - b. Employ skilled licensed electricians to supervise the Work of this Section.
  - c. Submit information verifying the installer's qualifications.
  - d. To assure correct installation of PVC Coated Conduit Systems and Fittings; submit installers current and unexpired certification provided by the Manufacturer of the products being installed
2. Electrical Testing Laboratory (ETL) Qualifications:
  - a. Employ an independent testing agency, qualified as specified in Section 01400, Quality Requirements, and Section 26 05 00 Common Work Results for Electrical, to perform the testing required by this Section.
  - b. Submit information verifying the ETL's qualifications.

### B. Regulatory Requirements:

1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70 (NEC), and to other applicable state, local, and national governing codes and regulatory requirements.
2. All items installed from utility service poles to the main service panels must be approved by the serving utility, whether electrical service or telephone service, as listed in Section 26 05 00 Common Work Results for Electrical.

C. Certifications:

1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location the product is installed in, and the application intended, unless products meeting the requirements of these nationally recognized testing laboratories are not available or unless standards do not exist for the products.
  - a. Submit evidence with the Product Data that the products represented meet testing agency quality verification requirements, including agency listing and labeling requirements.
    - 1) Such evidence may consist of either a printed mark on the data or a separate listing card.
  - b. Submit a written statement from those product manufacturers that do not provide evidence of the quality of their products that indicates why an item does not have a quality assurance verification.
    - 1) Such statements provided in lieu of quality assurance verification are subject to the acceptance of the Engineer.

1.07 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Pack, ship, handle, and unload products in accordance with the requirements of Section 26 05 00 Common Work Results for Electrical, and as detailed herein.

B. Acceptance at Site:

1. Acceptance products at the Site in accordance with the requirements of Section 26 05 00 Common Work Results for Electrical, and as detailed herein.

C. Storage and Protection:

1. Store products in accordance with the requirements of Section 26 05 00 Common Work Results for Electrical, and as detailed herein.
  - a. Store all products indoors on blocking or pallets.

PART 2 PRODUCTS

2.01 NON-METALLIC CONDUIT

A. Electrical Plastic Tubing and Conduit:

1. Rigid Polyvinyl Chloride (PVC) Conduit:
  - a. Provide high impact PVC conduit conforming to the requirements of NEMA TC 2 at 90 degrees Celsius, and made from compounds conforming to the requirements of ASTM D 1784.
    - 1) Use material that at 78 degrees Fahrenheit has a tensile strength exceeding 5500 psi, a flexural strength exceeding 11,000 psi, and a compressive strength exceeding 800 psi,
  - b. Provide PVC conduits that are UL listed, labeled, or approved for both underground and above ground use.
2. Manufacturers:

- a. JM Eagle,
- b. Queen City Plastics, Inc.,
- c. Prime Conduit Inc.,
- d. Tyco/Allied Tube and Conduit
- e. Or Approved equal.

B. Non-Metallic Conduit Solvent:

1. Provide solvent for non-metallic conduit joints from the same manufacturer as the conduit and conforming to the requirements of ASTM D 2564.

## 2.02 METALLIC CONDUIT

A. Electrical Metallic Tubing (EMT):

1. Provide electrical metallic tubing (EMT) conforming to the requirements of Article 358 in NFPA 70 (NEC) for materials and uses, ANSI C80.3 and UL 797.
2. Provide galvanized steel tubing conduit lengths bearing the manufacturer's trademark.
3. Manufacturers:
  - a. Tyco/Allied Tube and Conduit, [www.alliedtube.com](http://www.alliedtube.com)
  - b. Wheatland Tube Company, Division of John Maneely Company, [www.wheatland.com](http://www.wheatland.com).
  - c. Or Approved equal.

B. Intermediate Metal Conduit (IMC):

1. Provide intermediate metal conduit (IMC) conforming to the requirements of Article 342 in NFPA 70 (NEC) for materials and uses, ANSI C80.6 and UL 1242.
2. Fabricate intermediate metal conduit (IMC) from high strength low alloy sheet steel meeting the requirements for ASTM A 568 piping, galvanized inside and outside, and protected against corrosion by a dichromate rinse or a zinc chromate coating.
3. Provide conduit furnished in 10-foot minimum lengths with both ends threaded and one end fitted with a coupling.
4. Manufacturers:
  - a. Tyco/Allied Tube and Conduit, [www.alliedtube.com](http://www.alliedtube.com).
  - b. Wheatland Tube Company, Division of John Maneely Company, [www.wheatland.com](http://www.wheatland.com).
  - c. Or Approved equal.

C. PVC Coated Rigid Galvanized Steel Conduit:

1. Provide PVC coated rigid galvanized steel conduit bearing the UL label.
2. Provide base conduit of rigid hot-dip galvanized steel conduit as specified in Paragraph 2.02E, and of the type indicated, specified, or scheduled to be coated.
3. Apply PVC coating in accordance with the following:
  - a. Apply a 40-mil thick PVC coating on the outside and a 2-mil thick fusion-bonded urethane coating on the inside, exterior coatings conforming to the requirements of NEMA RN 1.
  - b. Provide PVC coating of one uniform color on all PVC coated rigid galvanized steel conduit provided for the Contract.
4. Provide 40-mil thick PVC sleeves to protect internally threaded conduit openings.

- a. Provide sleeves with an inside diameter equal to the outside diameter of the conduit/pipe protected by it; and extending either one pipe diameter or 2-inches, whichever is less, beyond the opening.
5. Manufacturers:
  - a. OCAL, <http://www.tnb.com/contractor/docs/ocal.pdf>.
  - b. Plasti-Bond [www.plastibond.com](http://www.plastibond.com)
  - c. Perma-Cote [www.permacote.com](http://www.permacote.com)
  - d. KorKap [www.korkap.com](http://www.korkap.com)
  - e. Or Approved Equal
- D. Liquidtite Flexible Metal Conduit:
  1. Provide PVC coated flexible metal conduit conforming to the requirements of Article 350 of NFPA 70 (NEC) for materials and uses and ANSI/UL 360.
  2. Provide conduit with interlocking spiral strip construction capable of bending to a minimum radius of five times its diameter without deforming the spiral strips both inside and outside of the conduit.
    - a. Provide conduit with a flexible, galvanized, interlocking spiral strip steel core jacketed with smooth, liquid-tight polyvinyl chloride designed to withstand temperatures from minus 40 degrees Celsius to plus 60 degrees Celsius.
  3. Finish the interior and exterior of flexible conduit smooth and free from burrs, sharp edges, and other defects that may injure wires; and place the manufacturer's trademark on each length.
  4. Furnish an integral continuous copper ground in 1/2-inch through 1-1/4-inch PVC coated flexible metal conduit.
  5. Acceptable Manufacturers
    - a. Electri-Flex Company, Liguatite®, Type LA, [www.electriflex.com](http://www.electriflex.com).
    - b. ANAMET Electrical, Inc., Anaconda Sealtite®, [www.anacondasealtite.com](http://www.anacondasealtite.com).
    - c. Or Approved equal.
- E. Rigid Galvanized Steel Conduit (RGS):
  1. Provide rigid galvanized steel conduit (RGS) conforming to the requirements of Article 344 of NFPA 70 (NEC) for materials and uses, ANSI C80.1, and UL 6.
  2. Fabricate the RGS from mild steel piping, galvanized or sherardized inside and outside, and protected against corrosion by a dichromate rinse or a zinc chromate coating.
  3. Provide defect free conduit bearing the UL label, and furnished in 10-foot minimum lengths with both ends threaded and one end fitted with a coupling.
    - a. Provide tapered NTP 3/4 inch per foot threads complying with ANSI/ASME B1.20.1.
  4. Acceptable Manufacturers:
    - a. Tyco/Allied Tube and Conduit, [www.alliedtube.com](http://www.alliedtube.com).
    - b. Wheatland Tube Company, Division of John Maneely Company, [www.wheatland.com](http://www.wheatland.com).
    - c. Or Approved equal.
- F. Flexible Coupling for Hazardous Locations:
  1. Provide flexible brass or stainless steel coupling conforming to the requirements of NFPA 70 (NEC) for materials in hazardous rated environments and ANSI/UL 1203.

2. Provide coupling designed to withstand temperatures up to 148 degrees Celsius.
3. Finish the interior of flexible coupling smooth and free from burrs, sharp edges, and other defects that may injure wires; and place the manufacturer's label on each length.
4. Furnish an integral continuous copper ground in all flexible couplings.
5. Acceptable Manufacturers
  - a. EGS/O-Z/Gedney, [www.o-zgedney.com](http://www.o-zgedney.com).
  - b. Or Approved equal.

G. Rigid Aluminum Conduit (RAC):

1. Provide rigid aluminum conduit (RAC) conforming to the requirements of NEC Article 344 for materials and uses, ANSI C80.5, and UL 6A.
2. Rigid aluminum conduit shall be manufactured from 6063 alloy in temper designation T-1.
3. Provide defect free conduit bearing the UL label, and furnished in 10-foot minimum lengths with both ends threaded and one end fitted with a coupling.
  - a. Provide tapered NTP 3/4 inch per foot threads complying with ANSI/ASME B1.20.1.
  - b. Provide threaded aluminum fittings and conduit bodies that meet the requirements of ANSI/UL 514B, ANSI/NEMA FB1, and ANSI/UL 886 for Use in Hazardous (Classified) Locations. Connectors shall have insulated throat. Associated fittings shall meet the requirements of UL and ANSI C80 standards for the applicable raceway system.
4. Acceptable Manufacturers:
  - a. Tyco/Allied Tube and Conduit.
  - b. Wheatland Tube Company, Division of John Maneely Company.
  - c. Or approved equal.

## 2.03 CONDUIT FITTINGS

A. Fittings for Non-Metallic Conduit Systems:

1. Electrical Plastic Tubing and Conduit:
  - a. Provide high impact non-metallic fittings conforming to same requirements as for the plastic tubing and conduit as specified in Article 2.01.
  - b. Non-Metallic Conduit Expansion Fittings:
    - 1) Provide a two-piece nonmetallic, noncorrosive, nonconductive, UL listed expansion fitting.
  - c. Acceptable Manufacturers:
    - 1) Lamson & Sessions, Carlon<sup>®</sup>, [www.carlon.com](http://www.carlon.com).
    - 2) Queen City Plastics, Inc., [www.queencityplastics.com](http://www.queencityplastics.com).
    - 3) Or Approved equal.

B. Fittings for Threaded Metallic Conduit Systems:

1. Construct conduit bodies/fittings from cast malleable iron or cast steel.
2. For PVC coated raceway systems, provide PVC coated fittings of cast malleable iron or cast steel from the same manufacturer that provides the uncoated conduit bodies/fittings.
3. For RAC raceway systems, provide RAC fittings of aluminum from the same manufacturer that provides the uncoated conduit bodies/fittings.

4. Provide hazardous Class 1, Division 1, Group C & D fittings and conduit bodies for NEMA 7 locations.
5. Conduit Outlet Bodies:
  - a. Provide malleable iron threaded entry type conduit outlet bodies with neoprene gaskets and cast steel cover.
  - b. Acceptable Manufacturers:
    - 1) EGS/Appleton Electric, [www.appletonelec.com](http://www.appletonelec.com).
    - 2) EGS/O-Z/Gedney, [www.o-zgedney.com](http://www.o-zgedney.com).
    - 3) Or Approved equal.
6. Conduit Expansion Joints:
  - a. Provide telescoping sleeve type galvanized, weatherproof, and vapor tight conduit expansion joints designed for 4-inch maximum expansion with an insulated bushing and lead-wool packing.
  - b. Acceptable Manufacturers:
    - 1) EGS/Appleton Electric, [www.appletonelec.com](http://www.appletonelec.com).
    - 2) EGS/O-Z/Gedney, [www.o-zgedney.com](http://www.o-zgedney.com).
    - 3) Or Approved equal.
7. Conduit Unions:
  - a. Provide conduit unions capable of completing a conduit run when neither conduit end can be turned.
  - b. Acceptable Manufacturers:
    - 1) EGS/Appleton Electric, UNF and UNY Unions, [www.appletonelec.com](http://www.appletonelec.com)..
    - 2) Thomas and Betts Company, Erickson<sup>®</sup> Coupling., [www.tnb.com/contractor/docs/tbhazardous.pdf](http://www.tnb.com/contractor/docs/tbhazardous.pdf)
    - 3) Or Approved equal.
8. Conduit Outlet Boxes:
  - a. Provide malleable or cast iron conduit outlet boxes conforming to the requirements of UL 886, and having a cover with O-rings to keep out moisture.
  - b. Acceptable Manufacturers:
    - 1) EGS/Appleton Electric, GRF outlets and covers, [www.appletonelec.com](http://www.appletonelec.com).
    - 2) EGS/O-Z Gedney, [www.o-zgedney.com](http://www.o-zgedney.com).
    - 3) Or Approved equal.
9. Conduit Device Boxes:
  - a. Provide malleable iron conduit device boxes with internal grounding screws and conforming to the requirements of UL 498 and UL 514A.
  - b. Acceptable Manufacturers:
    - 1) EGS/Appleton Electric, FD device boxes, [www.appletonelec.com](http://www.appletonelec.com).
    - 2) EGS/O-Z Gedney, [www.o-zgedney.com](http://www.o-zgedney.com).
    - 3) Or Approved equal.
10. Conduit Sealing Fittings:
  - a. Provide, triple coated, malleable iron conduit sealing fittings.
    - 1) Coat the conduit sealing fittings with zinc electroplate, dichromate, and an epoxy powder coat.
  - b. Provide drain fittings in conduit sealing fittings where required.
  - c. Provide sealing covers for junction boxes where required.
  - d. Acceptable Manufacturers:

- 1) EGS/Appleton Electric, [www.appletonelec.com](http://www.appletonelec.com).
  - a) Sealing hubs: ES.
  - b) Sealing fittings: EY, EYS, EYSF, EYSM, EUS, EYD, EYDM
- 2) EGS/O-Z Gedney, [www.o-zgedney.com](http://www.o-zgedney.com).
- 3) Or Approved equal.

C. Fittings for Electrical Metallic Tubing Conduit Systems:

1. Construct conduit bodies/fittings from cast steel.
2. Fittings shall be compression type.
3. Fittings shall be galvanized or zinc electroplated.

## 2.04 CONDUIT SPACERS

A. Provide non-metallic, interlocking type conduit spacers which snap together to join any combination of intermediate and base units together, both vertically and horizontally.

B. Manufacturers:

1. Underground Devices Inc., [www.udevices.com](http://www.udevices.com).
2. The George-Ingraham Corp.
3. Or Approved equal.

## 2.05 HEAT SHRINK TUBING

A. Provide all-weather corrosion resistant vinyl plastic heat shrink tubing designed for application on the exterior of metallic conduit to protect against galvanic action, moisture or other deteriorating contaminants.

B. Manufacturers:

1. Tyco Electronics, Raychem, [www.raychem.com](http://www.raychem.com).
2. Thomas & Betts
3. Or Approved equal.

## 2.06 WALL AND FLOOR PENETRATION SEALS

A. Provide watertight mechanical seals capable of holding up to 20 psig, and sealing against water, soil, and backfill material.

B. Acceptable Manufacturers:

1. Pipeline Seal & Insulator, Inc., Thunderline/Link-Seal, [www.linkseal.com](http://www.linkseal.com).
2. Flexicraft Industries, PipeSeal, <http://flexicraft.com>.
3. Or Approved equal.

## 2.07 FINISHES

A. Cold Galvanize Coating:

1. Provide a cold galvanize coating to provide protection against corrosion by forming an insoluble zinc salt barrier from a cathodic reaction when the coating is damaged by abrasion and exposed to weather.

- a. Provide a single component pre-mixed liquid organic zinc compound producing 95 percent zinc in the dry film.
  - b. Provide a coating that bonds to clean iron, steel, or aluminum through electrochemical action.
2. Acceptable Manufacturers:
- a. ZRC. Worldwide, [www.zrcworldwide.com](http://www.zrcworldwide.com).
  - b. Clearco
  - c. Krylon
  - d. Rustoleum
  - e. Or Approved Equal

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Although the Contract Drawings are generally indicative of the Work, take field measurements to verify actual conditions.
1. Due to the small scale of the Contract Drawings it is not possible to indicate all offsets, fittings, and apparatus required or the minor structural obstructions that may be encountered during the Work.
- B. Inspect the condition of existing conduit that is required for the Work of this Section.

### 3.02 PREPARATION

- A. After carefully investigating structural and finish conditions and other in-place construction work, prepare and submit detailed Shop Drawings showing proposed departures from the original design due to field conditions or other causes.
1. Layout the electrical work according to accepted standard electrical trade practice to suit actual field measurements.
  2. Arrange the electrical work to consider existing conditions and to preserve access to other equipment, rooms, areas, and similar features of the construction.
  3. Include plan and profile views of duct banks.
  4. Indicate the location and details of conflicting utility construction and slopes.
  5. Submit these Shop Drawings to the Engineer prior to performing the Work of this Section.
- B. Submit Product Data and catalog cuts for all products provided under this Section.
1. Clearly indicate the usage of each product on the submittal.
- C. Obtain roughing-in dimensions of electrically operated equipment, including equipment being installed by both electrical and other construction trades.
1. Set conduit and boxes only after receiving approved dimensions and checking such equipment locations.
- D. Remove dirt, debris, and other obstructions from existing conduit required for the Work of this Section by blowing out and mandreling the conduits as applicable.

### 3.03 INSTALLATION

- A. Perform the Work of this Section as specified in Section 26 05 00, Common Work Results for Electrical.
- B. Fabricate and install conduit and wireway systems in accordance with accepted electrical trade standard practice.
  - 1. Layout the electrical work of this Section to suit actual field measurements.
    - a. Record the actual installed elevations and locations of duct banks and the as-found locations of conflicting utility lines on the record drawings specified in Section 01780, Closeout Submittals, and submit the record drawings.
  - 2. Install the electrical Work of this Section in conformance to the wiring methods general requirements of Article 300 in NFPA 70 (NEC), and to all other applicable Articles of NFPA 70 governing wiring methods.
  - 3. Cut conduit and wireway square, and ream the cut ends according to the requirements of NFPA 70 (NEC) to deburr the openings so that they are not restricted more than cuts made by the material manufacturer.
  - 4. Avoid bending conduits as much as possible and practical; but if bends are made, use an approved conduit bending tool or machine to make the bends.
  - 5. Do not install crushed or deformed conduit, and remove crushed or deformed conduit from the Site.
  - 6. On conduit that is installed outside, provide a second equipment ground conductor and use fittings with a built-in ground lug for bonding.
  - 7. Provide flexible conduit only to the extent permitted by NFPA 70 (NEC).
    - a. In flexible conduits that do not have an integral ground wire, install a green insulated wire in addition to the neutral wire for grounding purposes.
      - 1) Form a 'J' or 'S' hook with a drip loop to allow flexibility.
      - 2) Provide a second equipment grounding conductor on outside conduit and provide fittings with built-in ground lug for bonding.
    - b. In exposed areas, use PVC coated flexible metal conduit and fittings.
    - c. Use flexible metal conduit or liquid tight flexible metal conduit for final connection to recessed lighting fixtures and rotating and vibrating equipment.
      - 1) Flexible Metal Conduit is only permitted for final connections to lighting fixtures in dry, environmentally conditioned spaces.
      - 2) Liquid tight flexible metal conduit, as herein specified, for final connection to recess mounted lighting fixtures in unconditioned spaces and to all rotating and vibrating equipment including transformers, motors, solenoid valves, pressure switches, limit switches, generators, engine-mounted devices and pipe-mounted devices.
      - 3) Flexible conduit not to exceed 18 inches in length for motor connections, 36 inches in length for equipment connections or 72-inches for lighting fixture connections.
  - 8. Provide fittings and apparatus as required to construct the approved electrical design.
    - a. Running threads on conduit are not permitted.
      - 1) Where couplings and connectors are required for metal conduits, use approved threaded couplings and connectors.

- b. Provide conduit unions where necessary to complete a conduit run when neither conduit end can be turned.
  - c. Where conduit and raceway runs cross building expansion joints, make provision for expansion in the conduit and raceway runs.
  - d. Provide sealing fittings with drain fittings in all lower runs and vertical runs.
  - e. Provide sealing covers for junction boxes where required.
  - f. Provide weatherproof conduit hubs on all conduit connections exterior to the building, and on instruments, process equipment, and pump motors.
9. Installing RGS and PVC Coated Conduit:
- a. Installation of the RGS and PVC Coated Conduit System shall be performed in accordance with the Manufacturer's recommendations.
  - b. To assure correct installation of PVC Coated Conduit System, the installer shall have a current and unexpired certification provided by the Manufacturer to install coated conduit.
  - c. Threading Conduit:
    - 1) Field thread the conduits per the manufacturers instructions.
      - a) For PVC coated conduit, first use a cylindrical guide, oversized to fit over the plastic coating, to neatly cut the coating off at the proposed end of the threads.
      - b) Do not damage or remove the coating beyond the proposed end of the threads.
    - 2) Once the threading operation is complete, protect the newly cut threads against corrosion by applying a "sealing" compound as recommended by the manufacturer.
  - d. Assembling RGS and PVC Coated Conduit Fittings:
    - 1) Use PVC coated conduit bodies, clamps, supports, accessories, and fittings with coated conduit systems.
    - 2) Just prior to assembling each conduit joint, apply the conduit manufacturer's touch-up compound to the end of the conduit in the area normally covered by the fitting sleeve.
    - 3) Use cloth or other material over strap type wrenches to protect the coating while tightening conduits.
10. Breathers and drains shall be provided at the low point(s) of all conduit runs in NEMA 3R, 4, 4X and 7 areas, and where otherwise subject to the accumulation of condensation. Conduits shall be arranged to drain away from dry areas toward damp or wet areas, and away from equipment and enclosures.
- C. Exposed Work:
- 1. In exposed work, run conduit and raceway parallel to centerlines and structure surfaces; or perpendicular to centerlines where required, with right angle turns consisting of symmetrical bends or fittings.
  - 2. Maintain at least 6 inches clearance between conduit and raceway runs and pipes, ducts, and flues of mechanical systems.
  - 3. If a portion of a metallic conduit run, whether plastic-coated or not, extends above grade or is otherwise exposed to personnel, ensure that the conduit is properly bonded to an equipment grounding conductor at both ends.
    - a. Install the equipment grounding conductor either inside or outside the box.

D. Concealed Work:

1. When performing electrical work in concealed spaces, provide the same quality workmanship as in exposed work.
2. Conceal conduits and raceways in the structure's construction where practicable unless otherwise indicated on the Contract Drawings or required by the Engineer.
  - a. Group conduit and raceway runs in concealed work as much as practical to avoid congesting the concealed spaces.
  - b. Do not weaken the structure by excessive or unnecessary cutting.
    - 1) Only make cuts into the structure's construction in conformance to the applicable building codes.
3. Conduits and Raceways Embedded in Concrete Slabs:
  - a. Separate multiple conduits encased together by not less than two inches of concrete.
  - b. Locate conduit installed in floor slabs within the reinforced area of the slab.
  - c. Where conduit crosses expansion joints, provide weather tight expansion and deflection fittings and bonding jumpers.
4. Install below grade conduit in conformance with the requirements of Section 33 71 19, Electrical Underground Ducts and Manholes.
  - a. For conduits that pass under building support walls, provide a minimum of 3 inches of concrete encasement all around.
  - b. For underground and concrete encased duct banks, provide non-metallic conduit spacers.
    - 1) Provide sufficient space to allow pouring the concrete envelope without displacing or shifting the individual conduits.
    - 2) Install conduit spacers at intervals not exceeding five feet.

E. Hangers and Supports:

1. Install auxiliary support structures, anchors, and fasteners as specified in Section 26 05 28, Hangers and Supports for Electrical Systems.
  - a. Mount or suspend conduit and wireway systems directly on structural members of the structures and walls.
  - b. Do not attach conduit or raceway systems to suspended ceiling members or to the suspending mediums.
  - c. Securely attach anchors into walls.
2. At all conduit attachments, allow space between the mounting surfaces and the conduit by providing U-channel supports, clamp-backs, or spacers.
  - a. Attach wall-mounted conduit runs close to the walls following the contour of the walls, parallel to the walls and other building lines except at bends.

F. Structure Penetrations:

1. Make penetrations in existing concrete structures by core-drilling.
  - a. Drill the penetrations true, clean, and free from spalling.
2. At penetrations through fire rated floors, walls, and similar assemblies, provide firestopping as specified in Section 07840, Firestopping.
3. Make floor penetrations as detailed on the Contract Drawings.
  - a. Seal all conduit penetrations through floor slabs on grade in buildings with a floor penetration seal.

4. Install a wall penetration seal at all wall penetrations.
  - a. Size wall penetrations to accommodate the conduit outside diameter plus either 1/4 inch or a hole allowance to allow the installation of the wall penetration seal.
5. For conduits that enter rooms from concrete floors or masonry, provide corrosion protection by using an RGS or PVC coated conduit that extends from 12 inches inside the concrete or masonry to at least 6 inches into the room.

**G. Hazardous Locations**

1. Within the areas labeled as “hazardous” on the Contract Drawings, only provide equipment, fittings, and wiring as indicated which are approved for Class 1, Division 1, Group D or Class II, Division 1, Group F locations as required by NFPA 70 (NEC) for the type of area in question and as specifically designed for this type of hazardous use.
2. In hazardous locations, engage at least five full threads on conduit connections to couplings and fitting hubs.
  - a. Coat the threads with a sealing compound that makes the connections gas tight
3. Properly install sealing fittings at all required locations in accordance with code regulations.

**H. Wiring:**

1. Install wiring in conduit as indicated.
2. Prior to the installation of any wire, verify that the conduit is clean and free of debris.
3. Install a separate ground conductor within every conduit.

**3.04 FIELD QUALITY CONTROL**

**A. Inspection:**

1. Inspect installed conduit runs for obstructions, proper support, proper grounding, and completeness.
2. Record the actual installed elevations and locations of conduit and tubing on record drawings.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

26 05 33.23

## BOXES FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 SUMMARY

A. Section Includes:

1. Requirements for furnishing, installing, connecting, cleaning, and protecting electrical pull and junction boxes.

B. Related Sections:

1. General Provisions and Supplementary General Provisions
2. Section 26 05 00 – Common Work Results for Electrical.
3. Section 26 05 26 – Grounding and Bonding Electrical Systems.
4. Section 26 05 28 – Hangers and Supports for Electrical Systems.
5. Section 26 05 63 – Acceptance Testing of Electrical Systems.
6. Section 26 05 33.13 – Conduits for Electrical Systems.

#### 1.02 REFERENCES

A. National Electric Manufacturer's Association (NEMA):

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
3. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

B. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code (NEC).

C. American National Standards Institute (ANSI):

1. ANSI Z55.1 - Gray Finishes for Industrial Apparatus & Equipment (*withdrawn 1990, no replacement*).

D. Underwriters Laboratories, Inc. (UL):

1. UL 886 - Standard for Outlet Boxes and Fittings for Use In hazardous (Classified) Locations.

#### 1.03 DESIGN REQUIREMENTS

A. Product Data:

1. Submit a list of the materials proposed to satisfy the requirements of this Section.
2. Submit the manufacturer's comprehensive calculations used to determine size requirements for the boxes.
3. Submit Product Data and catalog cuts of the materials and equipment proposed to be used to satisfy the requirements of this Section.

#### 1.04 SUBMITTALS

- A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
1. Product Data:
    - a. List of the proposed materials.
    - b. Catalog cuts of steel outlet boxes for general purpose applications used with steel conduit systems.
    - c. Catalog cuts of cast outlet boxes for general purpose applications used with steel conduit systems.
    - d. Catalog cuts of cast outlet boxes for general purpose applications used with coated conduit systems.
    - e. Catalog cuts of sheet metal boxes for general purpose applications in dry locations.
    - f. Catalog cuts of outlet boxes for hazardous locations.
    - g. Catalog cuts of pull boxes for hazardous locations.
    - h. Catalog cuts of equipment and control device enclosures for all areas except outdoor and corrosive locations.
    - i. Catalog cuts of equipment and control device enclosures for outdoor locations.
    - j. Catalog cuts of equipment and control device enclosures for corrosive locations.
  2. Quality Assurance/Control Submittals:
    - a. Design Data.
      - 1) Manufacturer's comprehensive calculations.
    - b. Test Reports.
      - 1) Factory test reports.
    - c. Certificates.
      - 1) Testing agency/quality verification, listing, and labeling.
    - d. Qualification Statements.
      - 1) Qualifications of the licensed electricians.
      - 2) Qualifications of the Electrical Testing Laboratory (ETL).

#### 1.05 QUALITY ASSURANCE

- A. Qualifications:
1. Installer Qualifications:
    - a. To supervise installation of the Work of this Section, employ licensed electricians.
      - 1) Submit the qualifications of the licensed electricians supervising the Work of this Section.
  2. Electrical Testing Laboratory (ETL) Qualifications:
    - a. Employ an independent testing agency, qualified as specified in Section 26 05 63, Electrical Testing, to perform testing required by this Section.
    - b. Submit information verifying the ETL's qualifications.
- B. Regulatory Requirements:

1. Perform the Work of this Section in accordance with the requirements specified in Articles 250, 300, and 370 of NFPA 70 (NEC), and to all other applicable state, local, and national governing codes and regulatory requirements.

C. Certifications:

1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and listed and labeled or approved for the application intended as indicated or specified, unless products meeting the requirements of these testing laboratories are not readily available or unless standards do not exist for the products.
  - a. Provide products that are approved, listed, and labeled for the short circuit currents, voltages, and currents indicated or specified to be applied.
  - b. Provide service entrance labeled products for all service entrance equipment.
2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data, either by providing a printed mark on the data or by attaching a separate listing card.
  - a. For items without such evidence, submit a written statement from the product manufacturer that indicates why it does not have quality assurance verification.

## 1.06 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Pack, ship, handle, and unload products in accordance with the requirements of Section 26 05 00, Common Work Results for Electrical.

B. Acceptance at Site:

1. Accept products at the Site in accordance with the requirements of Section 26 05 00, Common Work Results for Electrical.

C. Storage and Protection:

1. Store products in accordance with the requirements of Section 26 05 00, Common Work Results for Electrical.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Use of Trade Names:

1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

## 2.02 MANUFACTURED UNITS

- A. Steel Outlet and Device Boxes for General Purpose Applications:
1. For general purpose applications in dry, flush (in-wall) locations only, provide UL Listed galvanized steel outlet and device boxes conforming to NEMA OS 1.
    - a. Boxes shall be fabricated from steel not less than 0.062" thickness.
    - b. Boxes shall have standard trade size knockouts to facilitate conduit and cable connector attachments.
    - c. Boxes shall be equipped with one 10-32 tapped hole for ground wire attachment.
  2. Ceiling fan and light fixture bar hangers shall be UL Listed for 35 pound fan and 50 pound fixture.
  3. Manufacturers:
    - a. Appleton Electric
    - b. O-Z/Gedney
    - c. Crouse Hinds
    - d. Thomas & Betts
    - e. Or Approved Equal
- B. Cast Outlet Boxes for General Purpose Applications:
1. For Use with Steel Conduit Systems:
    - a. For use with steel conduit systems, provide UL Listed small cast steel or cast malleable iron outlet boxes with threaded hubs that meet the NEMA 250 requirements for Type 12 enclosures.
    - b. If covers are indicated or specified, provide cast steel or cast malleable iron covers with neoprene gaskets.
      - 1) Provide captive Type 316 stainless steel mounting screws for the covers.
    - c. If fixture hangers are indicated or specified, provide ball type cast steel or cast malleable iron fixture hangers with neoprene gaskets.
      - 1) Provide captive Type 316 stainless steel mounting screws for the fixture hangers.
    - d. Finish:
      - 1) Provide outlet boxes, covers, and hangers with an electroplated zinc coating, followed first by a dichromatic prime, and then by an aluminum polymer finish coating conforming to NEMA FB 1.
    - e. Manufacturers:
      - 1) Appleton Electric
      - 2) O-Z/Gedney
      - 3) Crouse Hinds
      - 4) Thomas & Betts
      - 5) Killark
      - 6) Or Approved equal.
  2. For Use with Coated Conduit Systems:
    - a. When boxes for use with coated conduit systems are indicated or specified, provide cast outlet boxes as specified for steel conduit systems, but having coatings as specified in Section 26 05 33.13, for the system.

- 1) Provide a 40 mils thick PVC coating conforming to the requirements of NEMA RN 1 outside, and a 2 mils thick fusion-bonded blue, red, or green urethane coating inside.
    - a) Insure that the color of the PVC coating is uniform throughout the Work of this Contract.
  - 2) For internally threaded openings in the box, provide a 40 mil thick plastic sleeve extending one pipe diameter or 2 inches, whichever is less, beyond the openings with an inside sleeve diameter equal to the outside diameter of the conduit or pipe used.
    - b. Manufacturers:
      - 1) Thomas & Betts, Ocal
      - 2) Robroy Industries
      - 3) Or Approved Equal
- C. Sheet Metal Junction and Pull Boxes for General Purpose Applications:
1. For general purpose applications in dry locations, provide small sheet steel pull and terminal boxes and covers that meet the NEMA 250 requirements for Type 12 enclosures with continuously welded and ground smooth seams, and having no holes or knockouts.
    - a. Cover:
      - 1) Provide overlapping sheet steel screw covers with captivated screws for each box.
      - 2) Provide a means of bonding on the cover.
    - b. Gasket: Provide an oil resistant cover gasket for each box.
    - c. Mounting Brackets:
      - 1) Provide 12 gauge steel wall-mounting brackets.
    - d. Finish:
      - 1) Provide polyester powder coating applied over phosphatized surfaces.
      - 2) Color: ANSI Z55.1 Number 61 gray.
  2. Manufacturers:
    - a. Pentair, Screw Cover SC Junction Boxes
    - b. Rittal Corp
    - c. Milbank Manufacturing
    - d. Or Approved Equal
- D. Outlet Boxes for Hazardous Locations:
1. For hazardous locations, provide junction boxes and covers that comply with the requirements of UL 886, and are sized according to the installation and NFPA 70 (NEC) requirements.
  2. For suspended type or surface mounted conduit runs in hazardous locations, provide outlet boxes having a threaded cover and the proper size and number of tapped conduit hub openings.
    - a. Outlet Box Body:
      - 1) Fabricate outlet box bodies from iron alloy, electrogalvanized and coated with aluminum acrylic paint.

- 2) Provide threaded access openings that can either accommodate threaded covers that create a seal against the hazard, or that allow the outlet box depth to be increased by using threaded extensions.
  - 3) Provide taper-threaded hubs in the box capable of accommodating threaded rigid or IMC conduit, and having smooth integral hub bushings to protect conductor insulation during wire pulling.
  - 4) Provide an internal ground screw.
  - b. Outlet Box Covers:
    - 1) Provide copper-free aluminum threaded covers with cast “ears”, recesses, or other means to facilitate tightening and removing the cover.
      - a) Provide a neoprene O-ring with the cover.
    - 2) If required, in lieu of providing standard covers provide threaded sealing covers having a removable threaded plug to allow the enclosure to be filled with sealing compound.
    - 3) If required, in lieu of providing standard covers provide threaded covers or canopies capable of mounting pendant type lighting fixtures.
  3. Manufacturers:
    - a. Cooper Crouse Hinds Company, GUA and GUR Series Outlet Boxes
    - b. Appleton Electric
    - c. O-Z/Gedney
    - d. Thomas & Betts
    - e. Or Approved equal.
- E. Pull Boxes for Hazardous Locations:
1. For hazardous locations, provide pull boxes and covers that comply with the requirements of UL 886, and are sized according to installation and NFPA 70 (NEC) requirements.
    - a. Pull Box Body:
      - 1) Provide copper-free aluminum or iron alloy bodies capable of being factory or field drilled and tapped for conduit entries of the proper size and number.
      - 2) Machine enclosures to accommodate field installed mounting plates.
      - 3) Provide an internal ground lug.
    - b. Pull Box Cover:
      - 1) Provide threaded, bolted, or hinged and bolted covers, fabricated from copper-free aluminum or iron alloy, as required.
        - a) Provide bolts for attaching bolted covers.
        - b) Provide hinges for hinged covers.
      - 2) Provide a neoprene gasket with each cover.
    - c. Manufacturers:
      - 1) Cooper Crouse Hinds Company, GUB and EJB Series Junction Boxes
      - 2) Appleton Electric
      - 3) O-Z/Gedney
      - 4) Thomas & Betts
      - 5) Or Approved equal.
- F. Equipment and Control Device Enclosures:

1. For all areas except outdoor and corrosive locations, provide enclosures with hinged doors that meet the NEMA 250 requirements for Type 4 or 12 enclosures, depending on Contract requirements.
  - a. Enclosure Cabinet:
    - 1) Provide sheet steel boxes having continuously welded seams, ground smooth.
    - 2) Provide enclosures having no holes or knockouts.
  - b. Enclosure Door:
    - 1) Provide overlapping sheet steel hinged doors, having a continuous hinge with a removable heavy gauge hinge pin and door clamps with screws to provide a watertight seal or to exclude liquids and contaminants.
    - 2) Provide a means of bonding on the door.
  - c. Door Gasket:
    - 1) Provide an oil resistant door gasket for each box.
  - d. Security:
    - 1) Provide a mechanism for padlocking the enclosure.
  - e. Finish:
    - 1) Provide polyester powder coating applied over phosphatized surfaces.
    - 2) Color: ANSI Z55.1 Number 61 gray.
  - f. Manufacturers:
    - 1) Pentair, Single-Door Type 4 Enclosures or Type 12 and Type 13 Enclosures
    - 2) Rittal Corp
    - 3) Milbank Manufacturing
    - 4) Or Approved Equal
2. For corrosive locations, provide enclosures that meet the NEMA 250 requirements for Type 4X enclosures, and as follows:
  - a. Enclosure Cabinet:
    - 1) For wall mounted enclosures, fabricate enclosure bodies from 14 gauge Type 304; and having continuously welded seams, ground smooth.
    - 2) For floor mounted enclosures, fabricate enclosure bodies from 12 gauge Type 304 stainless steel sheets and enclosure backs from 10 gauge Type 304 stainless steel sheets; and having continuously welded seams, ground smooth.
      - a) Provide stainless steel floor stands, if required.
      - b) Provide stainless steel lifting eyes.
    - 3) Provide a grounding stud on the enclosure body.
    - 4) Provide enclosures having no holes or knockouts.
  - b. Enclosure Doors:
    - 1) For wall mounted enclosures, provide a removable hinged door fabricated from 14 gauge Type 304 stainless steel sheets; and having a rolled lip on three sides and a continuous stainless steel hinge with a removable hinge pin on the fourth side.
      - a) Provide a stainless steel door clamp assembly that assures a watertight seal.

- 2) For floor mounted enclosures, provide either doors similar to those specified for wall mounted enclosures, or 14 gauge Type 304 stainless steel sheets hinged doors with concealed die-cast hinges that allow 180 degree door opening and easy door removal.
  - 3) Provide a means of bonding on the door.
  - c. Door Gasket:
    - 1) Provide a seamless, foam-in-place, oil-resistant door gasket for each enclosure.
  - d. Security:
    - 1) Provide a mechanism for padlocking the enclosure.
  - e. Finish:
    - 1) Provide enclosures with unpainted, Number 4 brushed finish surfaces.
  - f. Manufacturers:
    - 1) Pentair, Type 4X Enclosures and General Purpose Two-Door Floor-Mount Type 4X Enclosures
    - 2) Rittal Corp
    - 3) Milbank Manufacturing
    - 4) Or Approved Equal
- G. Ground Lug/Bus Bar:
1. Provide a copper ground lug or a 1/4-inch by 2-inch copper bus bar in large pull and junction boxes.

## 2.03 SOURCE QUALITY CONTROL

- A. Tests:
1. Submit factory test reports to the Engineer as specified for the products in this Section.

## PART 3 EXECUTION

### 3.01 INSTALLERS

- A. Install the work of this Section only under the supervision of licensed electricians.

### 3.02 EXAMINATION

- A. Verify that conduit stub-ups to be mated with electrical boxes and enclosures are the correct type and size, and are at the proper location.

### 3.03 INSTALLATION

- A. Junction Boxes and Pull Boxes for General Purpose Applications:
1. For general purpose applications in dry locations, provide small sheet steel pull and terminal boxes that meet the NEMA 250 requirements for Type 12.
  2. Provide boxes that are fabricated from the same type of material as the conduit with which the boxes are used.

B. Junction Boxes and Pull Boxes for Hazardous Locations:

1. Provide junction boxes rated for the hazard classification of the area where they are installed, whether explosionproof, dust-ignitionproof, raintight, wet locations, watertight, or other classification.

C. Equipment and Control Device Enclosures:

1. For all areas except outdoor and corrosive locations, provide enclosures that meet the NEMA 250 requirements for Type 4 or 12 enclosures, depending on Contract requirements.
2. For outdoor locations, provide enclosures with covers that meet the NEMA 250 requirements for Type 3R enclosures.
3. For corrosive locations, provide enclosures that meet the NEMA 250 requirements for Type 4X enclosures.

D. Installing Boxes for Electrical Outlets and Devices:

1. Install boxes level and plumb within 1/16-inch of vertical or horizontal over the length of the box.
2. Unless otherwise indicated on the drawings, devices boxes for interior or exterior wiring devices of buildings shall be recessed within the wall construction. The installation of surface mounted device boxes is prohibited.
3. Install device boxes at a uniform height as indicated on the Contract Drawings.
  - a. Mount all adjacent boxes in alignment at the same mounting height.
  - b. Mount outlet boxes for equipment within 18-inches of the equipment power connection.
4. Do not install flush mounting boxes back-to-back in walls.
  - a. Provide a minimum separation of 6 inches (150 mm).
  - b. Provide a minimum separation of 24inches (600 mm) s in acoustic rated walls.
5. When installing boxes outside or to exposed conduit, provide cast boxes.
  - a. For interior unfinished locations mount these boxes on spacers to be 1/8-inch from wall unless box has built-in raised pads to perform the same function.
6. When installing boxes for single devices, two devices, or wall outlets, install 4-inch square boxes with appropriate plaster rings.
  - a. Space boxes on opposite sides of the wall 6 inches apart.
  - b. Set plaster rings flush or to protrude less than 1/16-inch from the wall.
  - c. Openings for boxes in finished walls must be within 1/16-inch of the box.
    - 1) Correct all oversize openings in accordance with the specifications for the wall material.
7. Outlet boxes must be of the one-piece type, the use of expandable sheet metal boxes is prohibited.
8. Support cast boxes for outlet and device using one of the following methods:
  - a. Mount the boxes directly to the structure using 4 or more anchors.
    - 1) Attach mounting screws to feet located outside of the box interior.
    - 2) Provide 1/4-inch spacers behind the boxes unless the box has raised pads.
  - b. Attach the box to two 1-inch or larger conduits which are supported within 12-inches of the box.

- c. Attach the box to two 1-inch or larger conduits which exit from a poured concrete floor no further than 18-inches from the box.
- E. Installing Boxes for Other than Electrical Outlets and Devices:
1. Accurately punch holes for conduit openings using a hydraulic punch and punches sized for the conduit to be installed.
  2. Install a conduit breather in the top of the box and a conduit drain fitting in the bottom of all boxes not located in bone-dry areas that are at least 100 feet from a hose-bib.
  3. Support boxes for other than electrical outlets and devices using one of the following methods:
    - a. Mount the boxes directly to the structure using 4 or more anchors.
      - 1) Attach mounting screws to feet located outside of the box interior, or seal the screw holes to prevent water penetration.
      - 2) Provide 1/4-inch spacers behind the boxes unless the box has raised pads.
    - b. Attach the box to two 1-inch or larger conduits which are supported within 12-inches of the box.
    - c. Attach the box to two 1-inch or larger conduits which exit from a poured concrete floor no further than 18-inches from the box.
    - d. Mount the box on U-channel and structural supports conforming to Section 26 05 28, Hangers and Supports.
- F. Make up all conduit connections to boxes in accordance with the requirements of Section 26 05 33.13, Conduit and Tubing.
- G. Install wiring in boxes in accordance with the requirements of Section 26 05 19, Low-Voltage Wire, Cable, and Accessories.
- H. Ground boxes in conformance with Section 26 05 26, Grounding and Bonding.

### 3.04 REPAIR/RESTORATION

- A. Touch up damaged coatings on electrical boxes and enclosures.

### 3.05 FIELD QUALITY CONTROL

- A. Site Tests:
  1. Test all boxes to verify that they are properly connected to the grounding system.
- B. Inspection:
  1. Inspect flush boxes to verify that the opening between the box and the wall finish is less than 1/16-inch.
  2. Inspect flush boxes to verify that each box is flush with the wall, or protrudes less than 1/16-inch, and is not set behind the wall surface.
  3. Inspect surface mounted boxes to verify that they are level and plumb within 1/16-inch as specified.

4. Record the actual installed elevations and locations of pull and junction boxes on record drawings specified in Specific Provisions SP-26, Closeout Submittals.

### 3.06 CLEANING

#### A. Waste Management and Disposal:

1. Clear and dispose of waste materials in accordance with the requirements of Section 26 05 00, Common Work Results for Electrical.

### 3.07 PROTECTION

- A. Except for surfaces to be painted, mask electrical boxes to protect them from paint overspray or over-brushing during painting operations.
- B. Protect boxes against damage from other work.

### END OF SECTION

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
0	4/14/2017		All	Final Submittal

SECTION 26 05 63  
ACCEPTANCE TESTING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: The work specified in this Section consists of materials to performance test electrical systems and equipment.
  - 1. Items Supplied Under This Section:
    - a. Electrical System Testing
    - b. Thermographic Testing
    - c. Ground System Testing
    - d. Insulation Testing
    - e. Equipment Testing
    - f. Performance Test
    - g. Test Procedure
    - h. Test Report
  
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Division 26 Sections, As Applicable

1.02 REFERENCES

- A. Applicable Documents and Testing Requirements of:
  - 1. America National Standards Institute (ANSI): as applicable, including:
    - a. ANSI C2, National Electrical Safety Code.
    - b. ANSI Z244.1 American National Standards for Personnel Protection.
  - 2. National Electrical Manufacturer's Association (NEMA): as applicable, including:
    - a. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation and Maintenance of Motor Control Centers.
    - b. NEMA ICS 7.1 - Safety Standards for Construction and Guide for selection, Installation, and Operation of Adjustable Speed Drive Systems.
    - c. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
    - d. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
  - 3. American Society for Testing and Materials (ASTM), as applicable.
  - 4. Institute of Electrical and Electronics Engineers (IEEE), as applicable, including:
    - a. IEEE C.57.13, IEEE Standard Requirements for Instrument Transformers.
  - 5. National Fire Protection Association (NFPA), as applicable, including:
    - a. NFPA 70 - National Electrical Code (NEC).
    - b. NFPA 70E - Electrical Safety Requirements for Employee Workplaces.
    - c. NFPA 72 - National Fire Alarm Code (NFAC).
  - 6. International Electrical Testing Association (IETA) as applicable, including:

- a. Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems.
7. Insulated Cable Engineer's Association (ICEA), as applicable.
8. State and Local Codes and Ordinances as applicable
9. Occupational Safety and Health Administration (OSHA), as applicable, including: Title 29, Parts 1907, 1910 and 1936.
10. International Electrical Testing Association (IETA) as applicable, including:
  - a. ATS-2013: Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems.
  - b. MTS-2013: Maintenance Testing Specifications for Electric Power Distribution Equipment and Systems.

### 1.03 SUBMITTALS

- A. Submit documentation as required to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions, and Section 26 05 00, Common Work Results for Electrical:
- B. Submission to include the following:
  1. Field inspection report as required for each item of material and/or equipment outlined herein.
  2. Manufacturer's directions for use of ground megger with proposed method indicated.
- C. Test Reports:
  1. Each test report prepared by the respective testing firm(s) comply, where applicable, to all stipulations specified in Section 26 05 00 for Operation, Maintenance and Installation Manuals with reference to preparation, paper requirements, indexing and binders. Include in each test report the following:
    - a. Summary of project.
    - b. Description of equipment tested.
    - c. Description of test.
    - d. Test results.
    - e. Conclusions and recommendations.
    - f. Appendix, including appropriate test forms.
    - g. Identification of test equipment used.
    - h. Signature of responsible test organization authority.
    - i. Furnish five copies of each completed report to the Design Electrical Engineer no later than 30 days after completion of each test. Assemble and certify the testing firm each final test report, which must be submitted to the Design Engineer for review, comments and subsequent approval.

### 1.04 QUALITY ASSURANCE

- A. Qualifications of Testing Laboratory: Select an independent nationally recognized testing laboratory that is independent from electrical contractor that either is a member

of The International Electrical Testing Association or meets the following qualifications:

1. Is nationally recognized as an electrical testing laboratory.
  2. Has been regularly engaged in the testing of electrical systems and equipment for at least 2 years.
  3. Is independent from the electrical contractor, the City, and all other contractors on the job.
  4. Has at least one Professional Engineer on staff that is licensed in the State where the project site is located.
  5. Derives more than 75 percent of its income from electrical testing.
  6. Owns or leases sufficient calibrated equipment to do the testing required.
  7. Has a means to trace all test instrument calibration to The National Institute of Standards and Technology.
- B. Membership in the International Electrical Testing Association (NETA) shall be considered evidence of meeting items A. 1. through and including A. 5
- C. Testing shall be done under the supervision of a technician certified by International Electrical Testing Association or by technicians that are both certified by the National Society of Professional Engineers and experienced in electrical testing with 5 years of testing experience.
- D. The testing laboratory shall supervise or perform all testing of equipment and oversee setting of all circuit breakers and calibration of all instruments.
- E. The testing firm used must be approved by the Engineer.
- F. Include the cost of such tests in the Contractors Bid Price for the applicable bid item.

#### 1.05 GENERAL REQUIREMENTS

- A. Field Inspection:
1. This Contractor is responsible for a complete inspection of all equipment, prior to testing and energizing to ascertain that it is free from any damage, scratches, or missing components and that all power connections are correct, and that they are tight in conformance with recommended standard practice. The inspection is to also include a check of control wiring, terminal connections and all bolts and nuts.
  2. Perform field inspection by this Contractor during a time when the Field Engineer and the Design Engineer are present to witness each inspection and its performance.
  3. Correct any deficiencies found during the inspection by this Contractor prior to the energizing and testing of the equipment.

#### 1.06 SCHEDULING

- A. Schedule all testing with work of other contractors to ensure an orderly sequence of startup and completion of work.

## 1.07 UNDERGROUND CONDUIT SYSTEM INSPECTION

- A. General Requirements: Perform inspection of the underground conduit systems installation by a representative of the Engineer as the work progresses. Inspect each of the following prior to proceeding to the next phase of the installation.
  - 1. Trench bed.
  - 2. Lower sand bed.
  - 3. Lower concrete protection slab, where indicated or required.
  - 4. Upper sand bed for conduits.
  - 5. Each layer of conduits.
  - 6. Soil backfill.
  - 7. Warning Tape.
  - 8. Soil backfill.
- B. Failure to comply with any of the above, indicated sequential inspection requirements is just cause for the Engineer to request removal of the work and reinstall as per these specifications.

## PART 2 PRODUCTS

NOT USED

## PART 3 EXECUTION

### 3.01 ELECTRICAL INSPECTIONS AND TESTS

- A. Perform, supervise, and furnish all test equipment needed to perform tests and provide safety measures, procedures and equipment required for each test.
- B. Schedule all testing with the Engineer. Perform testing in the presence of the Engineer except when the Engineer approves in writing conducting a specific test without the Engineer's presence.
- C. Notify all involved parties including the Engineer prior to tests, advising them of the test to be performed and the scheduled date and time.
- D. Coordinate the tests with others involved.
- E. Prepare written test procedures and forms used in the test reports and submit to the Engineer prior to commencement of testing.
- F. Include in each test report the following information:
  - 1. Job title.
  - 2. Date of test.
  - 3. Equipment, system or cable identification.
  - 4. Type of test.
  - 5. Description of test instrument and date of latest calibration.



### 3.02 TESTING TO BE PERFORMED BY THE CONTRACTOR

- A. The Contractor is required to obtain copies of NETA ATS-2013 and MTS-2013, and to keep at least one copy of each at the project site, to use as reference for testing requirements.
- B. Continuity Test: Make test for continuity and correctness of wiring and identification on all conductors installed.
- C. Wire and Cable:
  - 1. Test all wires and cables sized No. 2 and larger in accordance with NETA ATS-2013.
  - 2. Perform visual, mechanical, and electrical tests on all No. 4 and No. 6 power cables that operate at voltages exceeding 150 volts to ground in accordance with NETA ATS-2013.
  - 3. Perform visual, mechanical, and electrical tests on all other wires and cables in accordance with NETA ATS-2013.
  - 4. Replace any wires which have been damaged.
  - 5. Correct causes of all readings which do not meet the acceptable minimum insulation readings as stated in NETA ATS-2013. Exceed the nominal expected temperatures for the actual load.
  - 6. Retest items requiring correction.
- D. Surge Protective Device (SPD):
  - 1. Visually and mechanically inspect the SPD unit and connections.
  - 2. Use an AC voltmeter to check all voltages and ensure that normal operating voltages of the power system match the voltage rating on the SPD nameplate.
  - 3. Check LED status indicators on the display panels and suppression modules to confirm normal status.
  - 4. Press the alarm test button to confirm the audible alarm and LED.
  - 5. Operate the alarm silence switch to confirm proper operation.
- E. Test Interim:
  - 1. Contractor's Personnel, without reliance of City's Personnel, are to operate and maintain the equipment in continuous, day to day, 24 hour operation except as otherwise approved by the Engineer until commencement of the Final Mechanical Performance Test.
  - 2. During this interim the Contractor's Personnel are to instruct and train the City's Personnel in their duties.
- F. Final Mechanical Performance Test: Final Mechanical Performance Test is to cover a 48 hour period while the plant is in continuous, normal operation.
  - 1. With equipment in continuous, normal operation, the Personnel of the City are to assume day to day operation of the equipment under the direct supervision of the Contractor's Personnel beginning with the Final Tests.

2. Contractor's Personnel are to demonstrate to the satisfaction of the Engineer that equipment is coordinated and that installation complies with the applicable Drawings and Specifications.
3. Performance Tests are to be considered concluded at the end of the forty-eight hour period designated for the tests if the Engineer is satisfied with the test results or should deficiencies be found as a result of said test, then when the deficiencies have been corrected to the satisfaction of the Engineer.

G. Operating Costs: Costs for Final Mechanical Performance Tests: The City will pay operating costs for the Final Mechanical Performance Tests except those costs for chemicals required to complete Process Performance Tests and Acceptance Tests, if required on equipment.

### 3.03 TESTING TO BE PERFORMED BY THE TESTING LABORATORY

- A. Select, hire and pay an independent nationally recognized electrical testing laboratory to perform all testing specified in this article. Obtain City's approval of the testing laboratory and the testing laboratory proposed test procedure prior to commencement of any tests.
- B. Set all adjustments for all overcurrent protection devices in accordance with the protection and coordination study of Section 26 05 00.
- C. Visually and mechanically inspect and electrically test items as scheduled in attached schedule for equipment in attached schedule equipment as listed in attached schedule in using the procedures of NETA ATS-2013. When a test for a particular item is not called out in ATS, test using the procedures in NETA MTS-2011.
- D. Thermographic Inspection:
  1. Perform thermographic inspection of the electrical equipment and installations as listed below in accordance with NETA ATS-2013, and as detailed below. The following equipment is to be scanned:

a. Switchboards	all ratings
b. Switchgear	all ratings
c. Service Entrance Panelboards	all ratings
d. Distribution Panelboards	50-Ampere and larger
e. Lighting Panelboards	50-Ampere and larger
f. Power Panelboards	50-Ampere and larger
g. Motor Control Centers	all ratings
h. Dry Type Transformers	10 kVA and Larger
i. Individually Mounted Circuit Breakers	100 amp and larger
j. Disconnect Switches	100 amp and larger
k. Elevator Shunt-Trip Fused Disconnect Switches	all ratings
l. Individually Mounted Motor Starters	Size 1 and larger
m. Motors	30 HP and larger
  2. Provide report including the following items:

- a. Items scanned
  - b. Whether item passed or failed
  - c. All items in NETA ATS-2013
  - d. The probable cause
  - e. Severity of defect
  - f. Recommended corrective measures
  - g. Video recording of test.
3. Scan using an infrared camera with video scanner output to a display screen with a range of at least 1 degree C to 75 degrees C with an accuracy of 0.1 degree C and with the following equipment:
    - a. One 7 degree telephoto lens
    - b. One 20 degree wide angle lens
    - c. One 40 degree extra-wide angle lens
  4. Record output of camera during testing onto a DVD or store digital images of each piece of equipment inspected onto a CD as a record of the temperature variations. Record either by order or by digital imprinting the actual equipment being scanned. Turn off recordings during inactive periods or edit DVD to eliminate dead periods.
  5. Display data on a monitor capable of providing both a gray step mode and color monitor. These capabilities allow distinct temperature levels to be shown in black and white and color on the thermogram.
  6. Submit three copies of report and two copies of the DVD or CD.
  7. Include DVD or CD of thermographs of the defective equipment and installations. Also include in report.
  8. Submit both copies of the report to the Engineer who will make the determination of corrective measurements.
- E. Grounding Electrode System Tests:
1. Visually and mechanically inspect and electrically test all made grounding electrode systems in accordance with NETA ATS-2013. For the point-to-point tests of NETA ATS-2013, measurements are only required for equipment conductors run with services, and feeders and branch circuits rated over 400 amperes.
  2. Determine acceptable values as follows:
    - a. Main service entrance ground: 5 ohms.
    - b. Emergency/standby generator ground grid: 5 ohms.
    - c. Panelboards ground bus: 10 ohms.
    - d. Manhole ground rod electrodes: 25 ohms
    - e. Prior to the electric service being energized and prior to the installed products being covered, measure the ground system resistance to earth in the presence of the Engineer.
    - f. Grounds not otherwise covered in this Specification with a maximum of 25 ohms.
    - g. For continuity tests, determine the acceptable value for the equipment grounding conductor by the following formula:

$$R_{EquipGndCond} \leq 0.1x \frac{V_{LineToGnd}}{I_{OverCurrentProtection}}$$

Where the following definitions apply:

$R_{equipGndCond}$  = The measured resistance of the Equipment Grounding Conductor.

$V_{linetoGnd}$  = The Nominal Line to Ground Voltage of the circuit or feeder.

$I_{overcurrentprotection}$  = The Trip, or Melting Current of the overcurrent protective device for the circuit.

F. Low Voltage Panelboard Tests:

1. Visually and mechanically inspect and electrically test all low voltage switchboards in accordance with NETA ATS-2013.
2. Acceptable values are as stated in NETA ATS-2013.
3. Test all components as specified in this Section.

3.04 CORRECTION OF DEFICIENCIES

- A. Report all unacceptable values immediately. Correct all deficiencies found in work of this contract and separately report deficiencies in work of items of other contracts.
1. Retest items requiring correction. Correct or have corrected any remaining deficiencies and retest until work is acceptable.

3.05 RETESTING

- A. After equipment has been in service for a period of nine months repeat the following tests:
1. Thermographic testing. Correct all causes of readings above the nominal expected reading for the load encountered.
  2. Insulation tests of all motors over 100 horsepower, switchgear, switchboards, and transformers over 50 kVA.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 26 28 16.13

LOW-VOLTAGE ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting low-voltage enclosed disconnect switches, hazardous location switches, and fuses.

B. Related Sections:

1. General Provisions and Supplementary General Provisions
2. Section 26 05 00 – Common Work Results for Electrical.
3. Section 26 05 28 – Hangers and Supports for Electrical Systems.
4. Section 26 05 63 – Acceptance Testing of Electrical Systems.

1.02 REFERENCES

A. International Electrical Testing Association, Inc. (NETA):

1. ANSI/NETA ETT Standard for Certification of Electrical Testing Technicians.

B. National Electrical Manufacturers Association (NEMA):

1. NEMA 250; Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA KS 1; Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

C. National Fire Protection Association (NFPA):

1. NFPA 70; National Electrical Code (NEC).

D. Underwriter's Laboratories, Inc. (UL):

1. UL 98; Standard for Enclosed and Dead-Front Switches.

1.03 SUBMITTALS

A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:

1. Product Data:
  - a. Enclosed disconnect switches

- b. Enclosed hazardous location switches
- c. Fuses
- 2. Shop Drawings:
  - a. Enclosed disconnect switches
  - b. Enclosed hazardous location switches
- 3. Quality Assurance/Control Submittals:
  - a. Certificates:
    - 1) Testing agency/quality verification listing cards, if required
    - 2) Manufacturers written statement indicating why items do not have quality assurance verification, if required
  - b. Manufacturer's instructions:
    - 1) Enclosed disconnect switches
  - c. Qualification Statements:
    - 1) Electrical testing laboratory's qualifications

#### 1.04 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications:
    - a. Employ licensed electricians to supervise installation of the work of this Section.
  - 2. Electrical Testing Laboratory (ETL) Qualifications:
    - a. Use a NETA accredited electrical testing laboratory, or approved equal, that is accredited according to ANSI/NETA ETT for the region in which the Contract work is performed.
    - b. Submit the electrical testing laboratory's qualifications to the Engineer.
- B. Regulatory Requirements:
  - 1. Conform all work to NFPA 70, the National Electrical Code.
- C. Certifications:
  - 1. Provide products that are either listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the

application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.

## 1.05 MAINTENANCE

### A. Extra Materials:

1. Provide one set of spare fuses for each point of use including all of the ampere sizes indicated for the location.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

#### A. Use of Trade Names:

1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

### 2.02 MANUFACTURED UNITS

#### A. Enclosed Disconnect Switches:

1. Provide enclosed disconnect switches that meet the requirements of NEMA KS 1 and UL 98, and that are as shown on the Contract Drawings.
  - a. Types:
    - 1) Heavy duty fusible type.
      - a) Provide positive pressure fuse clips.
      - b) Provide fuses as specified
    - 2) Heavy duty non-fusible type.
  - b. Provide enclosed disconnect switches rated for the horsepower, voltage, and amperage as indicated on the Contract Drawings.
  - c. Provide enclosed disconnect switches with the number of poles and of the type indicated on the Contract Drawings.
2. Enclosure:
  - a. Provide enclosures consisting of a box and cover conforming to the requirements of NEMA 250 and of the type indicated or scheduled on the Contract Drawings.

- 1) If not otherwise specified, provide enclosures conforming to the requirements of NEMA 250, type 1.
- b. Material:
  - 1) Construct enclosures of code gauge sheet steel per the requirements of UL 98.
- c. Finish:
  - 1) Apply a rust-inhibiting phosphate coating to the enclosure's sheet steel, and then finish the enclosure in gray baked enamel.
- d. Provide a permanent label with the manufacturer's switch type, catalog number, and horsepower rating on the enclosure.
3. Switch Mechanism:
  - a. Provide a quick-make, quick-break operating handle and switch mechanism integral to the box or body, not the cover.
    - 1) Provide dead front construction with permanent arc suppressors and dual cover interlocks to prevent an unauthorized opening of the switch enclosure when the switch is in the ON position.
    - 2) Provide the means to positively padlock the switch in the OFF position.
  - b. Provide a switch designed so that the switch blades are visible in the OFF position when door is open.
  - c. Provide UL-listed switch lugs for front removable copper cables.
  - d. Electroplate the switch's current carrying parts to provide resistance to corrosion.
4. Acceptable Manufacturers:
  - a. Square D Company
  - b. Eaton Electric
  - c. General Electric
  - d. Siemens Industry for LV Power Distribution
  - e. Or Approved Equal

B. Fuses:

1. Provide current limiting type fuses rated for the voltage and amperage as indicated on the Contract Drawings for those low-voltage switches requiring fuses.

- a. For non-motor loads, provide UL Class RK1 single element, fast-acting type fuses.
  - b. For motor, welder, and transformer loads, provide UL Class RK5 dual element, time-delay type fuses.
2. Acceptable Manufacturers:
- a. Cooper Bussman
    - 1) UL Class RK1: Limitron®.
    - 2) UL Class RK5: Fusetron®.
  - b. Gould-Shawmut.
  - c. Or Approved Equal.

### 2.03 SOURCE QUALITY CONTROL

- A. Testing Agency/Quality Verification:
1. Perform the standard low-voltage enclosed switch factory tests specified in NEMA KS 1 and UL 98.
  2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.
    - a. For items without such evidence, provide a written statement from the product manufacturer that indicates why it does not have quality assurance verification.
    - b. Such statements are subject to the approval of the Engineer.

## PART 3 EXECUTION

### 3.01 INSTALLERS

- A. Install the work of this Section only under the supervision of licensed electricians.

### 3.02 PREPARATION

- A. Provide a prime and finish coat of paint for painted surfaces that will be covered by items provided under this Section.
- B. Prior to painting operations, mask all nameplates, plastic parts, push buttons, operating shafts, and other items not to be painted.
- C. Ensure that all indoor areas to receive the items provided under this Section are enclosed from the weather.

### 3.03 INSTALLATION

- A. Install disconnect switches and hazardous location switches in accordance with the switch manufacturer's instructions.
  - 1. Mount enclosures on 1/4-inch (6mm) spacers or U-channel supports to provide a space between enclosures and mounting surfaces.
    - a. Provide supports as specified in Section 26 05 28, Hangers and Supports.
  - 2. Set the top of enclosures 6'-6" above the finished floor or grade unless otherwise indicated or specified.
- B. Install the switch's conduit and wiring:
  - 1. Punch holes in the disconnect switch enclosures for conduit entries, except use the pre-tapped hubs and integral bushings for attaching conduit to hazardous location switch enclosures.
    - a. Connect conduit to disconnect switch enclosures with water-tight hubs except as follows:
      - 1) In dry locations, either the watertight hubs or two locknuts and bushings may be used to connect conduits to the disconnect switch enclosure.
      - 2) In damp locations, either the watertight hubs or a sealing locknut, interior locknut, and grounding bushing may be used on the bottom of the enclosures.
    - b. In wet and/or hazardous areas, install a conduit drain-fitting in a hole punched in the bottom of the enclosure, and install a conduit breather fitting in a hole punched in the top of the enclosure.
  - 2. Remove or protect components installed in the interior of enclosures during wire pulling.
  - 3. Use lugs provided by or approved by the disconnect switch manufacturer to connect wiring to the disconnect switch's line and load terminals in conformance with Section 26 05 19, Low-Voltage Wire, Cable, and Accessories.
- C. Identify low-voltage enclosed switches in accordance with Section 26 05 53, Electrical Identification.

### 3.04 FIELD QUALITY CONTROL

- A. Site Testing:
  - 1. Prior to energizing the low-voltage enclosed switches:

- a. Perform insulation testing and ensure that all load-side wiring is clear of shorts in accordance with the requirements of Section 26 05 63, Electrical Testing.
- 2. Final testing after energizing the circuit breakers:
  - a. Perform the thermographic test in conformity with Section 26 05 63, Electrical Testing, and record the circuit parameters.

**3.05 PROTECTION**

- A. Protect the items provided under this Section during the performance of work provided under other Sections, especially during welding and cutting operations.
- B. Protect the low-voltage enclosed switches against overloads, short-circuits, and improper operation.
  - 1. Pad-lock the low-voltage enclosed switches in the off position when work is being done on downstream circuits.

**END OF SECTION**

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
0	4/14/2017		All	Final Submittal

SECTION 26 28 16.19  
LOW-VOLTAGE ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
  - 1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting enclosed, low-voltage, individually mounted molded-case circuit breakers.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 26 05 00 – Common Work Results for Electrical
  - 3. Section 26 05 28 – Hangers and Supports for Electrical Systems.
  - 4. Section 26 05 63 – Acceptance Testing of Electrical Systems.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM B 258, Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors.
- B. National Electrical Manufacturers Association (NEMA):
  - 1. NEMA 250; Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA AB 1; Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures.
- C. National Fire Protection Association (NFPA):
  - 1. NFPA 70; National Electrical Code (NEC).
- D. Underwriter's Laboratories, Inc. (UL):
  - 1. UL 489; Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.

1.03 DEFINITIONS

- A. AIC: An acronym for ampere interrupting capacity.
- B. AWG: An acronym for American Wire Gage, which is a standard system of designating electrical wire sizes specified in ASTM B 258.

#### 1.04 DESIGN REQUIREMENTS

- A. Design molded-case circuit breakers in conformance with the requirements of both NEMA AB 1 and UL 489.

#### 1.05 SUBMITTALS

- A. Submit the following information to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
  - 1. Product Data:
    - a. Enclosed molded-case circuit breakers
    - b. Circuit breaker enclosures
  - 2. Shop Drawings:
    - a. Enclosed molded-case circuit breakers
  - 3. Quality Assurance/Control Submittals:
    - a. Certificates:
      - 1) Testing agency/quality verification listing cards, if required
      - 2) Manufacturers written statement indicating why items do not have quality assurance verification, if required
    - b. Manufacturer's instructions:
      - 1) Enclosed circuit breakers

#### 1.06 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Employ licensed electricians to supervise installation of the work of this Section.
- B. Regulatory Requirements:
  - 1. Conform all work to NFPA 70, the National Electrical Code.
- C. Certifications:
  - 1. Provide products that are either listed and labeled by Underwriters Laboratory, approved by factory mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Use of Trade Names:
  - 1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
  - 2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

- B. Provide circuit-breaker enclosures from the same manufacturer as the circuit-breaker.
- C. Acceptable Manufacturers:
  - 1. Manufacturers offering products which can meet the requirements of this Section include, but are not limited to, the following:
    - a. Square D Company
    - b. Eaton Electric
    - c. General Electric
    - d. Siemens Industry for LV Power Distribution
    - e. Or Approved Equal

## 2.02 MANUFACTURED UNITS

- A. Enclosed Molded-Case Circuit-Breakers:
  - 1. Provide quick make-quick break, unit type molded-case circuit breakers with a thermal magnetic overload trip and lugs on both ends.
    - a. Equip the circuit breakers with mechanically trip-free toggle handles.
    - b. Equip multiple pole breakers with an internal common trip.
    - c. Provide 15 and 20 ampere circuit breakers with lugs capable of accommodating one wire between 14 AWG and 10 AWG.
  - 2. Provide circuit breakers with the Voltage rating, poles, trip setting, and UL listed AIC rating as indicated on the Contract Drawings.
  - 3. Provide factory-installed accessories as indicated and specified.
- B. Enclosures:
  - 1. Provide enclosures conforming to the requirements of NEMA 250, type 1.
    - a. Provide enclosures of the type indicated or scheduled on the Contract Drawings.
    - b. Unless otherwise indicated or scheduled, provide surface-mounted enclosures.
  - 2. Provide enclosures sized to contain the circuit breaker and all other required items.
    - a. Provide an interlock that prevents opening the enclosure door when the circuit breaker is in the “ON” position.
      - 1) Provide an interlock defeater, which requires a common hand-tool to operate.
    - b. Provide a copper ground-bus or ground-stud rated for 100 percent of the circuit breaker’s capacity.
  - 3. Provide each enclosure with an external operator that positively indicates the “ON”, “OFF”, and “TRIPPED” positions of the enclosed circuit breaker.
  - 4. Provide the capability to pad-lock the circuit breaker in the “ON” and the “OFF” positions by using three padlocks.
  - 5. If the circuit-breaker is connected to a system with a grounded neutral, provide a copper solid-neutral bus or terminal-lug with a 100 percent rating, and suitable lugs for all incoming and outgoing cables.

## 2.03 SOURCE QUALITY CONTROL

- A. Testing Agency/Quality Verification:
  - 1. Perform the standard circuit breaker factory tests specified in NEMA AB 1 and UL 489.
  - 2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.
    - a. For items without such evidence, provide a written statement from the product manufacturer that indicates why it does not have quality assurance verification.
    - b. Such statements are subject to the approval of the Engineer.

## PART 3 EXECUTION

### 3.01 INSTALLERS

- A. Install the work of this Section only under the supervision of licensed electricians.

### 3.02 PREPARATION

- A. Provide a prime and finish coat of paint for painted surfaces that will be covered by items provided under this Section.
- B. Prior to painting operations, mask all nameplates, plastic parts, operating shafts, and other items not to be painted.
- C. Ensure that all indoor areas to receive the items provided under this Section are enclosed from the weather.

### 3.03 INSTALLATION

- A. Install circuit breakers in accordance with the circuit breaker manufacturer's instructions.
  - 1. Mount enclosures on 1/4-inch (6mm) spacers or U-channel supports to provide a space between enclosures and mounting surfaces.
    - a. Provide supports as specified in Section 26 05 28, Hangers and Supports for Electrical Systems.
  - 2. Set the top of enclosures 6'-6" above the finished floor or grade unless otherwise indicated or specified.
- B. Install circuit breaker conduit and wiring:
  - 1. Punch holes in the enclosures for conduit entries.
  - 2. In dry locations, two locknuts and bushings may be used to connect conduits to the circuit breaker enclosure.
  - 3. In damp locations and on the bottom of enclosures, connect conduits to the circuit breaker enclosure with watertight hubs or a sealing locknut.

4. Except in dry areas, install a conduit drain-fitting in a hole punched in the bottom of the enclosure, and install a conduit breather fitting in the top of the enclosure.
  5. Remove or protect components installed in the interior of enclosures during wire pulling.
  6. Use lugs provided or approved by the circuit breaker manufacturer to connect wiring to the circuit breaker's line and load terminals in conformance with Section 26 05 19, Low-Voltage Wire, Cable, and Accessories.
- C. Identify circuit breakers in accordance with Section 26 05 53, Identification for Electrical Systems.

### 3.04 FIELD QUALITY CONTROL

- A. Site Testing:
1. Prior to energizing the circuit breakers:
    - a. Perform insulation testing and ensure that all load-side wiring is clear of shorts in accordance with the requirements of Section 26 05 63, Acceptance Testing of Electrical Systems.
    - b. Set and adjust overcurrent protective devices in conformance with the requirements of Section 26 05 63, Acceptance Testing of Electrical Systems.
    - c. Open all downstream disconnects and the circuit breaker.
  2. Final testing after energizing the circuit breakers:
    - a. Perform the thermographic test in conformity with Section 26 05 63, Acceptance Testing of Electrical Systems, and record the circuit parameters.

### 3.05 PROTECTION

- A. Protect the items provided under this Section during the performance of work provided under other Sections, especially during welding and cutting operations.
- B. Protect circuit breakers against overloads, short-circuits, and improper operation.
1. Pad-lock the circuit breakers in the off position when work is being done on downstream circuits.

### **END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 31 23 33  
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: The work specified in this Section consists of trench and in-line structure excavation, backfilling and compacting for electrical systems, as well as the on-grade surface restoration work associated with trenching.
- B. Contractor shall be solely responsible for surveying the site prior to conducting any digging to verify all underground utilities and structures. Damage to any underground utilities and structures from digging will be at the expense of the contractor.
- C. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 26 05 00 – Common Work Results for Electrical
  - 3. Section 26 05 33 – Conduits for Electrical Systems
  - 4. Section 33 71 19 – Underground Ducts and Manhole/Handholes

1.02 REFERENCES

- A. American Society for Testing and Materials:
  - 1. ASTM D698; Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in. (304.8 mm) Drop.
  - 2. ASTM D1556; Test Method for Density of Soil in Place by the Sand-Cone Method.
  - 3. ASTM D2922; Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.03 DEFINITIONS

- A. Subgrade: Trench bottom prepared as specified to receive conduit, bedding, concrete cradle or concrete encasement or the bottom of excavations prepared to receive conduit line structures.

1.04 SUBMITTALS

- A. Submit documentation as required to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
  - 1. Samples: If used, submit aggregate samples and required submissions to the Engineer. Submit a five pound sample, packaged in container of suitable strength.
  - 2. Supplier Aggregate Data: Submit the aggregate supplier material quality data.

## 1.05 SITE CONDITIONS

- A. **Classification of Excavated Materials:** No consideration will be given to the nature of materials encountered in trenching operations. Therefore, as unclassified trenching, no additional payment will be made for difficulties occurring in excavating and handling of materials.
- B. **Excess Material:** No right of property in material is granted the Contractor of excavated materials prior to backfilling. This provision does not relieve the Contractor of his responsibility to remove and dispose of surplus excavated materials or excavated materials not suitable for use in backfilling.
- C. **Removal of Obstructions:** Remove, realign or change the direction of above or below ground utilities and their appurtenant supports, if such is required in the opinion of the Engineer. Perform such work as Extra Work unless such work is done by the City. However, uncover and sustain the obstruction in-place prior to the final disposition of the obstruction.
  - 1. The Contractor is not entitled to claims for damage or extra compensation due to the presence of such obstruction or delay in the removal or rearrangement of such obstruction.
  - 2. Do not obstruct fire hydrants, if any in the project.
  - 3. Do not interfere with persons, firms, corporations or utilities employing protective measures, removing, changing or replacing their property or structures, but allow these persons, firms, corporations or utilities to take such measures as they may consider necessary or advisable under the circumstances; which shall not relieve the responsibilities of the Contractor.
- D. **Environmental Requirements:** Plan work so as to provide adequate protection during storms with provisions available for preventing flood damage. Protect installed conduit and other work against damage from uplift due to high ground water levels.
  - 1. Do not perform trenching, backfilling or compacting when weather conditions or the condition of materials are such, in the opinion of the Engineer, that work cannot be performed satisfactorily.
  - 2. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
  - 3. Provide effective dust control by sprinkling water, spreading calcium chloride or other method approved by Engineer. Employ dust control when, where and in a manner required by Engineer.
  - 4. When it is necessary to haul wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spilled materials on roadways as caused by hauling operations.
- E. **Accommodation of Drainage:** Manage drainage in the vicinity of trenches to prevent water running into the trenches. Return disturbed surface grading to pre-construction conditions.

- F. Dewatering: Keep excavations free from water during the performance of the work. Provide and operate dewatering equipment of sufficient capacity for dewatering the excavations.
1. Provide for the disposal of the water removed from excavations in such manner as not to cause injury to the public health, to public or private property, to the work of others, to the portion of the work completed or in progress, nor to cause an impediment to the use of streets, roads and highways.
  2. Do not dispose of water in trenches by draining through completed portions of conduit lines.
- G. Protection: Assume the risks attending the presence or proximity of overhead or underground public utilities as well as on-site utilities and other pipelines (including support work for same), existing structures and property of whatever nature.
1. Excavation Condition: The Contractor is solely responsible for the conditions and results of the excavation work.
  2. Responsibility for Damages: Damages, and expenses associated therewith, arising out of the Work, for direct or indirect injury to such structures or to any person or property by reason of them, or by reason of injury to them, whether such structures are or are not shown on the Drawings, rests solely with the Contractor.
  3. Support of Existing Utilities (If Any): Adequately support underground utilities not requiring removal and exposed as a result of excavations. Provide adequate support along their entire exposed length by timber or planking. Install these supports in such manner that backfilling may be performed without dislodging such utilities.
    - a. Place and carefully compact Select Earth Backfill around the supports, and leave such supports in place as a guard against breakage due to backfill settlement.
    - b. No additional payment will be due the Contractor for support material left in place nor for the labor of installing and maintaining supports.
  4. Temporary Protective Construction: Erect and maintain substantial temporary barricades and fences surrounding excavation to prevent unauthorized access.
    - a. Excavation Covers: Cover open excavation when work therein is suspended or left unattended, such as at the end of a work day. For such covers, use materials of sufficient strength and weight to prevent their removal by unauthorized persons.
    - b. Remove temporary protective construction at the completion of work on the Project.
  5. Structure Supports: Where excavations are in the vicinity of buildings or structures, which by their construction or position might exert detrimental pressure on the excavation, provide suitable structure supports for such buildings or structures. Structure supports may be in the form of underpinning or special driven sheeting, or other suitable support systems of the Contractor's choosing. The option is allowed for short lengths of trench be opened at one time.
- H. Erosion Control Work: Implement and maintain erosion control measures in accordance with all local and state laws.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. On-Site Backfill: On-site as-excavated soil or soil-rock mixed materials free of topsoil, vegetation, lumber, metal and refuse; and free of rock or similar hard objects larger than six inches in greatest dimension. Rock to soil ratio shall not exceed one part rock to three parts soil.
- B. On-Site Select Earth Backfill: On-site as-excavated material free of vegetation, lumber, metal and refuse; and free of rocks or similar hard objects larger than one inch in greatest dimension. Rock to soil ratio shall not exceed one part rock to three parts soil.
- C. Conduit Bedding: Native material or sand bedding.
  - 1. Do not use native material for bedding that consist of aggregate base course, crushed aggregate, or other gravel-containing material. If the native material consists of aggregate base course, crushed aggregate, or other gravel-containing material, then only sand may be used for the bedding material.
  - 2. 6-inch deep foundation consisting of native material or sand bedding.
- D. Underground Warning Tape: Printed polyethylene metallic detection tape, six inches minimum width, color coded, one inch minimum lettering, printed with name of utility buried below, and suitable for installation in all soil types.
  - 1. Provide detection tape for the following pipe lines and utilities as installed or encountered:
    - a. Sanitary Sewers - Green.
    - b. Storm Sewers - Green.
    - c. Sewage Force Main - Green.
    - d. Water Line - Blue.
    - e. Gas Line - Yellow.
    - f. Electric - Red.
    - g. Telephone - Orange.
    - h. CATV Conduit - Orange.
    - i. Petroleum Line - Yellow.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Preparation of Surfaces: Do not remove trees and other permanent plantings except by authorization of the Engineer. If any trees and other permanent plantings remain on the site, the City desires these to be left standing and preserved.
  - 1. No additional compensation will be paid for hand excavation or tunneling in the vicinity of trees and other permanent plantings that are not to be disturbed.

### 3.02 EXCAVATING

- A. Trench Shoring: Follow OSHA requirements as applicable for trench shoring to prevent trench wall collapse.
- B. General Requirements: Perform all excavation using hand tools only. Machinery may be used during backfilling provided that all necessary protections are made to avoid disturbance and/or damage of existing structures, utilities or private or public properties. The Contractor is responsible for replacing in-kind any damaged structure, utility and/or service to pre-construction condition and/or function at no additional cost to the City.
  - 1. Begin excavation in trenches at the control point having the lower invert and proceed upgrade.
  - 2. Remove salvageable grass/turf material in squares for replacement after backfilling is done.
  - 3. Remove surface materials of whatever nature over the line of trenches and other excavations, and properly separate and store removed materials as suitable for use in backfilling or other purposes.
  - 4. Remove subsurface materials of whatever nature down to subgrade elevation. Properly separate and store removed subsurface materials as suitable for use in backfilling.
- C. Excavated Material Storage: Perform excavated material storage, as specified herein, at no increase in Contract Price.
  - 1. Where more material is excavated from trenches than can be backfilled or stored next to the excavations, leaving space for the City's access and stormwater drainage, remove and store such excess material. Return this same excavated material for backfilling when required.
- D. Trench Width and Depth: Excavate trenches in conformance to OSHA for both single and banked conduit runs to not less than a minimum nor more than a maximum width required to accommodate the conduit or conduits width plus six inches.
  - 1. Minimum Cover: Excavate trenches for both single and banked conduit runs to depths or elevations indicated, and where not indicated, to the depth required to provide a minimum of two feet of cover.
  - 2. Subgrade Preparation: Prepare the bottom of trenches to provide uniform and continuous bearing and support for the conduit, unless concrete encasement or other type of bedding is shown on the Drawings or required by the Engineer.
    - a. Grade trenches a minimum of four inches per 100 feet. Grade trenches so conduit lines drain away from buildings except for conduit lines from one building to another, in which case grade conduit trenches level.
    - b. Where conduit lines run to underground structures, grade trenches and slope the conduits to drain to such.
    - c. Direct Burial Cable Trenches: Excavate trenches, in both earth and rock, to accommodate both the cable and the Fine Aggregate bedding and cover as indicated on the Drawings.

- E. Excavation Width and Depth for Manholes and In-Line Structures: Make excavations for manholes to a nearly vertical plane beginning at bottom of excavation one-foot beyond manhole base outside diameter (six inches each side) to two-feet beyond manhole base outside diameter for top of excavation limit (one-foot each side).
1. No additional compensation allowed should excavation limits be exceeded. Additionally, should bottom of excavation limit be exceeded, provide without additional compensation, concrete cradle or encasement for conduits entering or leaving manhole.
  2. Where rock is encountered in the excavation, remove rock for manhole installation to one foot outside the exterior lines of the manhole walls and to a depth to allow four to six inches of suitable backfill under the manhole base.
    - a. Seek the Engineer's approval of suitable backfill material prior to performing the work. If aggregate base or crushed stone is required, submit material data and samples if requested.
- F. Excavation below Subgrade: Do not excavate below depths indicated or specified except where unstable or unsuitable material is encountered at subgrade. Excavate such material to the increased depth as may be required by the Engineer and refill to the proposed subgrade with thoroughly compacted Foundation Backfill material or construct timber foundation as required by the Engineer.
1. If excavations are carried below indicated or specified subgrades without written permission, refill excavations to proper subgrade with thoroughly compacted Foundation Backfill material with no additional compensation paid.
  2. The Engineer's written requirement for Excavation below Subgrade as described above shall entitle the Contractor to reimbursement for the quantities of additional excavation in accordance with the General Conditions.

### 3.03 BACKFILLING

- A. Backfill Restrictions:
1. Do not use in backfilling work materials such as house ashes, putrescible refuse and such other materials considered unsatisfactory by the Engineer. Do not permit excavations to be used as dumping areas for refuse.
  2. Should there be a deficiency of proper backfill material, provide acceptable borrow material with no additional compensation paid.
  3. Except for temporary use in backfilling, no permanent bulkheads or retaining walls will be allowed in the trenches over conduit.
- B. Backfilling Trenches: Perform trench backfilling by methods which will result in thorough compaction of backfill material without displacement of the conduit run and minimum settlement of backfilled material. Settlement of backfill shall be considered evidence of improper workmanship or inclusion of unsuitable backfill materials, or both, and will require removing and re-compacting settled material at no increase in Contract Price. Exercise care to carry backfill materials up evenly within the trench.
1. Backfill single and banked conduits, not encased in concrete, using On-Site Select Earth Backfill placed to six-inch's minimum compacted depth to a point six inches above the conduit. Backfill remainder of trench to the level of planned

- subgrade using On-Site Backfill materials placed in layers not exceeding six-inches in thickness after compaction.
2. Backfill concrete encased conduits using On-Site Backfill materials placed in layers not exceeding six-inches in thickness after compaction.
  3. Backfill direct bury cable encased in Fine Aggregate placed to minimum compacted depth indicated. Backfill remainder of trench to the level of planned subgrade using On-Site Select Earth Backfill materials placed in layers not exceeding six-inches in thickness after compaction.
- C. Compacting: During the course of backfilling and compacting work, the Engineer reserves the right to make tests at various locations or depths of trenches, to determine whether the Contractor's compaction operations are meeting specified requirements. Compact trench backfill as follows:
1. Solidly tamp each layer of the required backfill material around the conduit line with proper tamping tools made specially for this purpose.
  2. Use mechanical tampers to compact the various backfill materials in trench backfill operations to produce a density of backfill at the bottom of each layer of not less than 90 percent of maximum density obtained at plus or minus two percentage points of the optimum moisture content, as determined by the ASTM D698 method. Perform field determinations of density, when requested by the Engineer, according to ASTM D1556 or ASTM D2922.
  3. When testing is performed using ASTM D2922 methods, use machines capable of testing to the full depth of the lift being tested utilizing direct transmission methods. Testing machines utilizing backscatter methods are not acceptable.
  4. The use of puddling or jetting for compacting the various backfill materials in trenches is prohibited.
- D. Surface: Replace salvaged grass/turf over backfilled trench and return finished surface to pre-construction grades and slopes.

### 3.04 ANCILLARY WORK

- A. Underground Warning Tape: For the purposes of early warning and identification of buried conduits during future trenching or other excavation, provide continuous identification tapes in trenches. Install in accordance with printed recommendations of the tape manufacturer, and as specified herein:
1. Bury tape at a depth of 12-inches below grade. In pavements measure 12-inches from subgrade of pavement.
  2. Provide warning tape in trenches for utilities specified previously.
- B. Cleanup: After trenches and other excavations are backfilled and work completed, remove surplus excavated materials, rubbish or other materials from work site. Dispose of materials off site in a lawful manner at no increase in Contract Price.
1. Where surplus excavated material is disposed of on-site where directed by the City, spread the material evenly and leave the area in neat, smooth compacted condition.

- 2. In case the Contractor shall fail or neglect to do so or to make satisfactory progress in doing so, within twenty-four hours after the receipt of a written notice from the Engineer, the City may remove such surplus material and clear the roadways, sidewalks and other places, and the expense for such work charged to the Contractor or deducted from any moneys due or to become due under the Contract.
  
- C. Seeding: All grassy areas that are affected by trenching shall be restored to previous conditions. The contractor shall reseed all affected areas and provide erosion-proof matting to aid in seed growth.
  
- D. Maintenance: The Contractor is solely responsibility for injury or damage resulting from lack of trench maintenance during the guarantee period. If trench surfaces are not satisfactorily maintained or repairs begun within three days after written notice from Engineer, repairs may be made by City and the cost charged against Contractor, or deducted from any moneys due or to become due under the Contract.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	5/9/2017		All	Final Submittal

SECTION 31 37 00

RIPRAP

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for furnishing and placing a cover of riprap onto areas subject to erosion in order to stabilize the area.
  - a. Provide the type of riprap indicated on the Contract Drawings; plain riprap only, no grouted riprap.
  - b. Provide riprap to the extents and dimensions indicated on the Contract Drawings.

B. Related Requirements:

1. General Provisions and Supplementary General Provisions
2. Section 01 50 00 – Temporary Facilities and Control
3. Section 01 78 00 – Closeout Submittals

1.02 REFERENCES

A. Definitions:

1. d50: A designation used to specify the size range of a stone mixture used for graded riprap that is based on a hypothetical “spherical design diameter”, d, specified for the stone, and listing a percentage of the stones in the mixture required to have a weight less than the weight of a stone of diameter d.
  - a. For example, d50 refers to a mixture of stones in which 50 percent of the stones would weigh less than the hypothetical stone whose “spherical design diameter”, d, is specified; and d85 refers to a mixture of stones in which 85 percent of the stones would weigh less than the hypothetical stone whose “spherical design diameter”, d, is specified.
2. Riprap: A permanent, erosion-resistant ground cover of large, loose, angular stone.
3. Well-Graded Mixture: A mixture of stones composed primarily of larger stone sizes but which has a sufficient mixture of other sizes to fill progressively smaller voids between the stones. See Table 1 in Article 2.02 for gradation requirements.

B. Reference Standards:

1. American Society for Testing and Materials (ASTM):
  - a. ASTM C 535 - Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

### 1.03 SUBMITTALS

#### A. Action Submittals:

1. Submit the following to the Engineer in accordance with the requirements of Section 3 of the General and Supplementary General Provisions (regarding submittals):
  - a. Samples:
    - 1) Samples of riprap rock at the Site (see also Article 1.04.B).
  - b. Stone Source Report containing:
    - 1) Quarry location and contact information
    - 2) Stone type to be used for this product
    - 3) Specific gravity of stone to be used for this product
    - 4) Gradation results

### 1.04 QUALITY ASSURANCE

#### A. Regulatory Agency Approvals:

1. The Work of this section is subject to approvals before it can be put into service and accepted.
  - a. Florida Pollutant Discharge Prevention and Removal:
    - 1) The Florida Department of Environmental Protection (FDEP) administers the National Pollutant Discharge Elimination System (NPDES) for all construction activity within Florida.
    - 2) Comply with the requirements of all FDEP permits applicable to the Contract.
  - b. If the Contract impacts water bodies, a Clean Water Act, Section 404 permit (or authorization under an existing permit) may be required from the U.S. Army Corps of Engineers.

#### B. Site Samples:

1. Provide one Sample of riprap rock at the Site weighing at least two (2) tons and having the gradation specified for the type of riprap represented by the Sample for inspection by the Engineer prior to placing riprap. Following inspection and acceptance, the Sample may be incorporated into the finished product.
2. Coordinate location of Sample placement with Engineer.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- #### A.
- Contractor shall take into consideration and account for haul distances from the Stone Source to the Site when determining project costs and schedule.

B. Delivery and Acceptance Requirements:

1. Prevent segregation of riprap stone and granular materials during transportation, dumping, and off-loading.
2. Deliveries of riprap stone will be visually inspected to judge the acceptability of the gradation.
  - a. Remove rejected riprap stone from the Site, and properly dispose of it offsite at no additional cost.

PART 2 PRODUCTS

2.01 DESCRIPTION:

- A. Riprap consists of a substantial rock cover placed on top of the prepared subgrade, and is to be located on areas subject to erosion in order to stabilize and/or protect the areas where shown on the Contract Drawings.

2.02 MATERIALS

A. Riprap Stone:

1. Riprap Stone Properties:

- a. Provide sound, hard, field or quarry stone composed of Granitic Material that will not disintegrate on exposure to water and weathering, that has no earthy odor, and that does not absorb water easily.

- 1) Provide riprap rock that only breaks with difficulty; and that is not composed of appreciable amounts of clay.

- a) Shale, mudstones, weathered limestone, and clay stones are unacceptable.

- 2) Provide riprap rock that does not have closely spaced discontinuities, such as seams, joints, or bedding planes.

2. Riprap Shape:

- a. Provide riprap having shapes which will form a stable protection structure of the required depth.

- 1) Angular shaped riprap stone is required for use in riprap having any slope.

- 2) Rounded riprap stone is unacceptable.

- 3) Flat and needle shaped riprap is unacceptable.

3. Riprap Weight:

- a. Minimum unit weight of riprap shall be 165 pounds per cubic foot.

- b. Except for small stones and spalls used to chink interstices in the riprap, provide riprap stones weighing at least 10 pounds, but with the additional

requirement that 50 percent (by count) or more of the riprap stone must weigh 300 pounds or more.

4. Riprap Size and Gradation:
  - a. Provide a well-graded mixture of stones for the riprap structures shown on the Contract Drawings.
  - b. Minimum Size: 1 inch.
  - c. Maximum Size: 2.0 times the d50 size.
  - d. Provide riprap stones that can be placed in a layer of the required depth.

**Table 1 – Riprap Gradation**

<b>Size of Stone</b>	<b>Percent of total weight smaller than the given size</b>
1.5 to 2.0 x D <sub>50</sub>	100
1.3 to 1.8 x D <sub>50</sub>	85
1.0 to 1.5 x D <sub>50</sub>	50
0.2 to 0.5 x D <sub>50</sub>	15

### 2.03 SOURCE QUALITY CONTROL

#### A. Tests and Inspections:

1. Materials specified in this Section require advance examination or laboratory testing according to the methods referenced herein, or as required by the Engineer.
  - a. Notify the Engineer when site samples of the materials intended for the Work of this Section are available for testing and inspection.
2. Testing:
  - a. At the discretion of the Engineer, the Contractor shall perform or provide results of the following tests (on the delivered material):
    - 1) Resistance of Riprap Stones to Degradation Test:
      - a) A prepared test sample of riprap stones tested in accordance with the requirements of ASTM C 535.
      - b) If the loss of the sample by abrasion is 10 percent or less by weight after 100 revolutions and 40 percent or less by weight after 500 revolutions, the riprap represented by the sample is acceptable.

#### B. Non-Conforming Work:

1. At the Contractor's expense, dispose of or otherwise prevent rejected stone at the quarry from mixing with satisfactory stone.

## PART 3 EXECUTION

### 3.01 EXAMINATION

#### A. Verification of Conditions:

1. Examine the locations in dry areas where riprap is to be placed to verify that the area is clean and free of potholes, rills, voids, projections, debris, construction materials, and other foreign objects that could prevent the riprap from being properly placed; and that the underlying soil is satisfactory because it does not have excessive in-place moisture content, is not frozen, and does not have roots, sod, turf clods, brush, or other similar organic materials.
  - a. Satisfactory surfaces include undisturbed native material, excavated and prepared subgrade.
  - b. Unsatisfactory subgrade defined by the Engineer may include loose material, very fine, non-cohesive soils having uniform particle size; gap-graded soils; laminated soils; and dispersive clays.
2. Where riprap is to be placed in underwater areas, dewater the entire footprint area in accordance with Specification Section 01 50 00 – Temporary Facilities and Control.

### 3.02 PREPARATION

#### A. Surface Preparation:

1. Excavate the trenches for the riprap where shown and as indicated on the Contract Drawings.
  - a. If the riprap is to be placed underwater, isolate the work area from water currents by constructing a temporary cofferdam and dewatering the work area.
    - 1) Minimize environmental degradation during construction by implementing such measures as suspending a silt curtain made of plastic sheeting from buoys around the work area.

#### B. Installation of Plain Riprap

1. Placing Riprap Stones:
  - a. Riprap stones may be placed by hand or placed and spread by suitable equipment. Dropping or placement by chute is not permitted.
  - b. Place larger stones in the toe trench, foundation course, and on the outer surface of the riprap.
  - c. Place stones to provide a minimum of voids.
  - d. Chink the interstices between stones using small stones and spalls, but do not allow larger stones to bear on the smaller stones used to chink the voids.
  - e. Place stones with their longitudinal axis normal to the face of the embankment.

- f. Place stones so each stone above the foundation course has at least a 3 point bearing on underlying stones.
- g. Plain Riprap Finished Surface Tolerance:
  - 1) Provide an even and tight surface not varying from the design surface by more than 3 inches per foot of depth.

3.03 SITE QUALITY CONTROL

A. Site Tests and Inspections:

1. Inspections:

- a. Visually inspect the placing operations and the finished plain riprap surfaces to verify that a dense, rough surface of well-keyed graded rock of the specified quality and sizes is provided, that the layers are placed so that voids are minimized, and that the layers are of the thicknesses specified or shown on the Contract Drawings.

B. Non-Conforming Work

- 1. Correct deficiencies noted by inspections as soon as possible at no additional cost.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
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SECTION 33 71 19

ELECTRICAL UNDERGROUND DUCTS AND MANHOLES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for underground electrical work, materials and products and raceway systems.
- B. The Contractor shall also be responsible for re-seeding all disturbed areas with grass seed to match the current site; and provide 6” of topsoil prior to reseeding and grade accordingly; provide protection for the grass seeding with straw or other commercially available means (seed blankets, etc.) that are suitable to the COT.
- C. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 26 05 00 – Common Work Results for Electrical
  - 3. Section 26 05 26 – Grounding and Bonding for Electrical Systems
  - 4. Section 26 05 28 – Hangers and Supports for Electrical Systems
  - 5. Section 26 05 33.13 – Conduits for Electrical Systems
  - 6. Section 26 05 63 – Acceptance Testing of Electrical Systems
  - 7. Section 31 23 33 – Trenching and Backfill

1.02 QUALITY CONTROL

- A. Equipment Manufacturer:
  - 1. In cases where the Contractor contemplates using equipment not made by the first named manufacturer of these specifications, refer to Section 26 05 00 of these specifications for special requirements and/or substitution requirements.

1.03 GENERAL REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical, with the following additions and modifications.
- B. Factory Tests:
  - 1. Determine applicable soil-density relationships for underground electrical installation bedding per applicable soil tests as defined in applicable Division 2 of the Specifications.
  - 2. Determine soil-density relationships for compaction of backfill material as defined in the general conditions of the Specifications.

1.04 SUBMITTALS

- A. Submit the following information to the Engineer:

1. Catalog Information:
  - a. Conduit. (All Types)
  - b. Handholes.
  - c. Precast Polymer Concrete Handhole
  - d. Handhole Frame and Cover.

## 1.05 CERTIFICATES

- A. Material and Equipment: Provide manufacturer's statement certifying that the product supplied meets or exceeds contract requirements.
  1. Precast Concrete Manhole and Handhole and accessories.
  2. Manhole frame and cover.
  3. Precast Polymer Concrete Handhole

## PART 2 PRODUCTS

### 2.01 MATERIALS AND EQUIPMENT

- A. Basic Electrical Materials: Those products such as building wire, connectors, fittings and similar devices as required for work of this Section are as specified in other Sections of these Specifications.
- B. Provide materials and equipment listed by UL, when such equipment is listed or approved.
- C. Conduit and Conduit Spacers: Conform to Section 26 05 33.13.
- D. Wire and Cable: Conform to Section 26 05 13 and 26 05 19.
- E. Grounding Material: Conform to Section 26 05 26.
- F. Hangers and Supports: Conform to Section 26 05 28.

### 2.02 WATERPROOFING OF CONDUIT JOINTS

- A. General: Ensure that equipment and materials for waterproofing conduit joints complies with the following manufacturers for quality, installation procedures and guaranteed end results.
  1. Rigid Metal Conduit:
    - a. Thread sealant: As recommended and approved by the conduit manufacturer.
    - b. Cleaning solvent: As recommended and approved by the conduit manufacturer.
  2. Non-Metallic Conduit:
    - a. All weather, quick-set joint cement: Approved by the conduit manufacturer.
    - b. Cleaning solvent: As recommended and approved by the conduit manufacturer.

### 2.03 CAST JUNCTION BOXES

- A. Provide weatherproof and watertight junction boxes for flush in-ground installation where indicated on the Contract Drawings.
  1. Construction: Cast iron type with necessary boxes, checkered cover and neoprene gasket for flush mounting.

2. Install junction box in concrete pad as detailed on the Contract Drawings.
3. Provide box of minimum size of 8-inches x 8-inches; larger as required by the
4. National Electrical Code, or as indicated on the Contract Drawings and/or required by the field conditions.
5. Acceptable Manufacturers:
  - a. Appleton.
  - b. Crouse Hinds.
  - c. Killark.
  - d. Or Approved Equal

#### 2.04 PRECAST POLYMER CONCRETE HANDHOLES

- A. Provide precast polymer concrete, handholes as indicated on the Contract Drawings. Provide handholes complete with necessary, required and specified appurtenances such as watertight locking type covers, cable racks, ground rods and water drainage provisions.
- B. Provide precast polymer concrete handholes constructed of sand-gravel aggregate bonded together with a matted fiberglass-reinforced polymer concrete. In no assembly can the cover design load exceed the design load of the box. All covers are required to have a minimum coefficient of friction of .50 in accordance with ASTM C 1028 and the corresponding Tier Level embossed on the top surface.
- C. Provide handhole with a standard cover suitable for sidewalk application with occasional non-deliberate light vehicular traffic and a service load of 2270 kg over a 250 mm (5000 pounds over a 10-inch) square .
- D. Provide handhole with the following identification cast into the cover as appropriate for the service: "Communications".
- E. Acceptable Manufactures
  1. Quazite
  2. CDR Systems
  3. Strongwell
  4. Hubbell Enclosures
  5. Or Approved Equal

#### 2.01 WATERSTOP MATERIALS

- A. Surface Applied Hydrophilic Waterstop
  1. Non-bentonite, modified chloroprene rubber which expands to 8 times its original volume when exposed to water. Expansion delay coating to allow concrete cure prior to expansion.
  2. 100 year service life.
  3. Greenstreak Group Hydrotite, or approved equal.

B. Water Swelling Sealant

1. Single component water swelling sealant which increase in volume not less than 50% when exposed to water, while retaining rubberlike elasticity.
2. Adheres to concrete, metal, glass, etc. when applied.
3. Suitable for waterproofing irregular shaped joints, rough surfaces, and odd penetrations.
4. Greenstreak Group Leakmaster LV-1, or approved equal.

2.02 UNDERGROUND WARNING TAPE

A. Metal detectable polyester material, with minimum one-inch high lettering. Overcoated graphics to read, "CAUTION-BURIED ELECTRIC LINE" for electric lines, "CAUTION - BURIED TELEPHONE" for telephone lines and/or "CAUTION - BURIED FIBER-OPTIC CABLES" for fiber-optic lines. APWA color to be red for electric lines and orange for telecommunication or fiber-optic lines.

B. Acceptable Manufacturers:

1. Brady
2. LEM Products, Inc
3. Seton
4. Or Approved Equal

2.03 GROUNDING

A. Ground rods are to be copper clad steel with diameter adequate to permit driving full length of the rod minus 6 inches, which extends above the finished concrete slab. Conform to Section 26 05 26 of these Specifications.

B. Ground Wires: 600Volt, size as indicated or required by code minimum #6.

PART 3 EXECUTION

3.01 INSTALLATION

A. General Requirements: (For Underground Work)

1. Install underground conduit systems in accordance with Article 300-5 of the NEC, in accordance with previous requirements of this Section, and the following requirements exceeding NEC:
  - a. Perform earthwork for buried conduit as specified previously for electrical work under Trenching: Section 31 23 33.
  - b. Where detailed on the Contract Drawings, underground conduits, both single and banked, concrete encase and reinforce using steel reinforcing rods as indicated on the Contract Drawings.
  - c. Bank concrete encased conduits to the extent indicated and secure same in place with install separators at 5-foot intervals. Provide separators with sufficient strength to prevent displacement of conduits when placing backfill or pouring concrete encasement.

- d. Use of separators for direct buried conduits is prohibited. Maintain required separation of direct buried conduits with screening materials and removable placement forms.
  - e. Lay conduit lines to grade a minimum of three inches per 100 feet. Grade conduit lines away from buildings, except conduit lines running between buildings, without intervening handholes or manholes shall be level.
  - f. Where conduit lines run to manholes, handholes or similar underground structures, grade conduits to drain to such.
  - g. Construct underground conduit lines to be watertight. Stagger conduit couplings in banks of conduits.
  - h. Unless otherwise indicated on drawing or details, where conduits change direction or turn up at equipment, transformers, buildings, terminal poles, etc., use long sweep PVC coated rigid galvanized steel conduit elbows.
  - i. Provide two feet minimum cover over conduits and over concrete encasement of conduit, unless indicated otherwise or specified.
  - j. Where conduits are to be turned up into equipment or transformer pads, extend the concrete encasement for the conduits up to the top of the concrete pad and provide a 3/4" chamfer around exposed top edges. Isolate the concrete encasement for the conduits from the concrete pad for the equipment or transformer pad. Provide 2" high crushable fiber materials around duct bank encasement.
  - k. Extend conduits 6 inches above concrete slab surface. Install insulating grounding bushing on all conduits. Perform concrete work as specified in Division 3 "Cast-In-Place Concrete".
  - l. Where conduits are to be turned up at terminal poles, extend the concrete encasement for the conduits up pole to grade and be provided with a 3/4" chamfer around all exposed top edges. Perform concrete work as specified in Division 3 "Cast-In-Place-Concrete".
  - m. Provide underground conduit of the types indicated in Section 26 05 33.13.
- B. Underground Duct Bank with Concrete Encasement: Construct underground duct bank lines of individual conduits encased in concrete as indicated. Except where rigid galvanized steel conduit is indicated or specified, use only one kind of conduit in any one duct bank. Use ducts no smaller than 4 inches in diameter unless otherwise indicated. Provide concrete encasement rectangular in cross-section surrounding the bank and provide at least 3 inches of concrete cover for ducts. Separate conduit by a minimum concrete thickness of 2-inches, and maintain a separation, between conduit centerlines, of seven and one-half inches. Separate power conduits from telephone, communication and/or data highway conduits a minimum of 24 inches of earth or concrete thickness of 8 inches, unless otherwise indicated.
- C. Place duct bank lines with a continuous slope downward toward manholes, handholes and away from buildings with a pitch of not less than 3 inches in 100 feet. Except at conduit risers, change direction of bends in runs exceeding a total of 10 degrees, either vertical or horizontal, by long sweep bends having a minimum radius of curvature of 25 feet. Sweep bends may be made up of one or more curved or straight sections or

combinations thereof. Use only manufactured bends with a minimum radius of 18 inches for use with conduits of less than 3 inches in diameter and a minimum radius of 36 inches for conduits of 3 inches in diameter and larger. Terminate conduits in end-bells where duct bank lines enter manholes and handholes as indicated on the Contract Drawings.

- D. Provide separators compatible with the conduit utilized and conforming to those specified in other Sections of these Specifications. Stagger the joints of the conduits by rows and layers so as to provide a duct bank line having the maximum strength. During construction, protect partially completed duct bank lines from the entrance of debris such as mud, sand, and dirt by means of suitable conduit plugs. As each section of a duct bank line is completed from manhole to manhole, from manhole to building or structure and/or from handhole to handhole, draw a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit, through each conduit, after which draw a brush having the diameter of the duct bank and stiff bristles through until the conduit is clear of particles of earth, sand, and/or gravel; immediately install conduit plugs. Provide a plastic pull rope, having a minimum of 3 additional feet at each end, in telephone and spare duct banks.
- E. Underground Conduit for Service Feeders: Indicate underground conduit for service feeders into buildings on the Contract Drawings. Where rigid steel conduit bank is utilized, protect the ends of the conduit by threaded metal caps or brushings; coat the threads with graphite grease or other suitable coating. Clean and plug conduit before conductors are installed.
- F. Conform concrete to that specified in Division 3 of this Specification.
- G. Backfilling: Provide a continuous plastic warning tape centered above the top of the underground duct bank about 12 inches below grade. Conform concrete to that specified in Division 3 of this Contract. Progress backfilling as rapidly as the construction, testing and acceptance of the work permits. Ensure backfill is free from roots, wood, scrap material, and other vegetable matter and refuse. Install and compact backfill as specified in Section 31 23 33 or as indicated in section 26 0533.13.

### 3.02 CONDUIT WATERPROOFING

- A. Non-Metallic Conduit:
  - 1. Plastic PVC Conduit (Schedule 40): Liberally coat the end of the conduit with an approved all weather, quick-set clear cement before joining. Insert joint into the coupling, pushing firmly and rotating conduit until it reaches the pre-formed stopping ridge within the coupling.

### 3.03 HANDHOLE INSTALLATIONS

- A. Where openings into manholes are below final finished grade, extend openings to the required elevation with either concrete or brick suitably arranged to support or anchor

the frames and covers. Obtain engineer approval of the construction method and procedure before any work is done.

- B. Where required for pulling cables, furnish and install in the walls of the manholes and handholes, a sufficient number of inserts for the proper attachment of cable supports.
- C. In general, properly dress and rack cable/or wire on the support arms and insulators around the walls of the manholes and handholes, providing slack where required for future rearrangements. Install cable support brackets, along with the support arms and porcelain insulators, on each wall of the manhole and handhole. Secure cables within manholes and handholes to the insulators by marlin rope. Use proper regard for neat and orderly appearance and location, and provide accessibility for future connections. Take care not to damage the walls of the manholes and handholes during cable pulling.
- D. Provide each manhole with a 1 inch diameter hole in the floor for a ground rod. Provide a 3/4 inch diameter by 10 foot long copper clad ground rod installed in one corner with 6 inches of the ground rod left extended above finished floor. Ground metal work to the ground rod.
- E. Conform manhole frames and covers to requirements as outlined above in these Specifications; and ensure Engineer approval.
- F. Provide a manhole drainage system as indicated on the Contract Drawings.

#### 3.04 CONNECTIONS TO HANDHOLES

- A. Construct concrete encased duct bank lines connecting to manholes or handholes to have a tapered section adjacent to the manhole or handhole to provide shear strength. Construct manholes and handholes to provide for keying the concrete envelope of the duct bank line into the wall of the manhole or handhole. Use vibrators when this portion of the envelope is poured to assure a seal between the envelope and the wall of the manhole or handhole.

#### 3.05 CONDUIT END BELLS

- A. Provide nonmetallic end bells, compatible with the conduit used, where conduits enter and exit manholes.

#### 3.06 EARTHWORK

- A. Excavate to depths as required for manholes and handholes. Excavation for manholes and handholes shall conform to the requirements stipulated in the General Conditions and within this specification and in specification 31 23 33.
- B. Remove waste excavated materials not required or suitable for backfill on the project from the site as directed. Provide sheeting and shoring as necessary for protection of

work and safety of personnel. Remove water from excavation by pumping or other approved method.

3.07 GROUNDING

- A. Provide non-current carrying metallic parts associated with electrical equipment with a maximum resistance to solid "earth" ground not exceeding the values indicated in Section 26 05 63 of these Specifications.

3.08 DISSIMILAR SURFACES ISOLATION

- A. Paint aluminum surfaces at point of contact with wood, concrete or masonry construction with one coat (minimum dry mil thickness - 5.0 mils) of bituminous paint.
- B. Clean away excess or misplaced paint materials from aluminum surfaces and adjoining construction materials.

3.09 TEST

- A. Field Tests: Field test of electrical equipment and conform systems to those specified in Section 26 05 63 of these Specifications.

**END OF SECTION**

REV. NO.	REV. DATE	RFC/CN/CO	Section(s) Affected	Comments
0	4/14/2017		All	Final Submittal

SECTION 35 22 26

SLIDE GATE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Provision for new slide gate, frame, wall thimble, actuator, and accessories. See Drawings for additional information.
- B. Related Sections:
  - 1. General Provisions and Supplementary General Provisions
  - 2. Section 05 50 00 – Metal Fabrication.
  - 3. All Division 25 and 26 Sections

1.02 REFERENCES

- A. American Society for Testing and Materials:
  - 1. ASTM A 240 -Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Service.
  - 2. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.
  - 3. ASTM A193/193M – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
  - 4. ASTM A194/194M – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
  - 5. ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipe
  - 6. ASTM B584 – Standard Specification for Copper Alloy Sand castings for General Applications
  - 7. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications (SAE Recommended Practice J200).
  - 8. ASTM D4020 – Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials.
  - 9. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
  - 10. ASTM F594 – Standard Specification for Stainless Steel Nuts
- B. American Water Works Association:
  - 1. AWWA C542 – Electric Motor Actuators for Valves and Slide Gates
  - 2. AWWA C561 - Fabricated Stainless Steel Slide Gates.
  - 3. AWWA C563 - Fabricated Composite Slide Gates.
- C. ANSI/AWS D1.6/D1.6M – Structural Welding Code – Stainless Steel

1.03 SYSTEM DESCRIPTION

- A. Design Requirements: Provide slide gates and frames of type and size indicated in following schedule.

Table 1.03A

Gate No.	Gate Type	Gate Size (W x H) Inches	Max. Design Head for gate and frame (feet)	Wall Thimble	Operating Speed (inches per minute)
1	Stainless Steel	16x24	23.0	Rectangle	6

1.04 SUBMITTALS

- A. Submit documentation as required to the Engineer in accordance with the requirements of the General Provisions and all Supplementary General Provisions:
1. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings for equipment demonstrating compliance with these Specifications, including:
    - a. Complete description of all materials including the material thickness of all structural components of the frame and slide.
    - b. Installation drawings showing all details of construction, details required for installation, dimensions and anchor bolt locations.
    - c. Submit catalog data and engineering data for the electric-motor actuator
  2. Submit calculations indicating suitability of gates and gate actuators for use.
  3. Submit gate manufacturer’s discharge coefficient and flow rating curve at normal pool.
  4. Submit maximum bending stress and deflection of the slide under the maximum design head.
  5. Submit the plans for supporting and anchoring the slide gate wall thimble, transition, and downstream conduit unit during embedment in concrete and grouting.
  6. Factory generated wiring diagrams for the Rotork Actuator and Remote Hand Station shall be provided; detailed point-to-point customized for this project.
  7. Submit gate testing plan per Article 3.02. The testing plan shall include procedures for the slide gate actuator testing as well as shop drawings and testing procedures for the field flow tests.
  8. Submit operation and maintenance manuals for the gate, actuator, and applicable components.
  9. Submit warranty information.

1.05 QUALITY ASSURANCE

- A. The stainless steel slide gate and wall thimble shall be furnished by a manufacturer having at least 5 years’ experience in the design and fabrication of items of equipment of similar size and pressure.

- B. Manufacturer's shop welds, welding procedures, and welders shall be qualified and certified in accordance with the requirements of ANSI/AWS D1.6.
- C. Basis of Design: Slide Gate specifications are based on Whipps, Inc. slide gate framing and mounting system. Assume responsibility for changes to structure and additional expenses required for products of other named manufacturer's equipment or approved equal, in accordance with the General and Supplementary General Provisions. Submit Drawings to Engineer, showing changes to equipment and structure.

#### 1.06 WARRANTY

- A. Furnish a two year gate warranty: All equipment supplied under this specification section shall be fully warrantied by the Contractor for a minimum period of two (2) years from the date of acceptance by the City. The warranty period will not begin until the gate assembly and all associated equipment are operating within design parameters for 30 days. Any defects of design, workmanship, or materials, that would result in non-compliance with the Contract specifications, shall be fully corrected by the Contractor (including parts and labor) without cost to the City.
- B. Furnish one year manufacturer's warranty for the actuator.

#### PART 2 PRODUCTS

##### 2.01 STAINLESS STEEL SLIDE GATE

- A. Provide a vertically mounted stainless slide gate meeting requirements of AWWA C561 with opening size and shape as indicated on the Drawings.
- B. Gate shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.
- C. Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter in seating head conditions.
- D. The gate shall utilize self-adjusting seals. Due to the difficulty of accessing gates when they are in service, gates that utilize adjustable wedges, wedging devices or pressure pads are not acceptable.
- E. All structural components of the frame and slide shall be fabricated of stainless steel having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
- F. Slide gate frames shall be shipped fully assembled with the invert member welded to the side frames and the slide installed in the frame.
- G. All welds shall be performed by welders with AWS D1.6 certification.
- H. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. All iron and steel components shall be properly prepared and shop coated with a primer.

I. Materials:

<u>Components</u>	<u>Materials</u>
Frame Assembly and Retainers	Stainless Steel, Type 316L
Slide and Stiffeners	Stainless Steel, Type 316L
Gate Stem and Guide Pipe	Stainless Steel, Type 316
Anchor Studs	Stainless Steel, Type 316, ASTM A276
Fasteners and Nuts	Stainless Steel, Type 316, ASTM F593/F594
Invert Seal	Neoprene or EPDM ASTM D-2000
Seat/Seals and Facing	Ultra-High Molecular Wt. Polyethylene ASTM D4020
Lift Nuts	Bronze ASTM B584
Pedestals and Wall Brackets	Stainless Steel, Type 316L
Actuator Housing	Cast aluminum or ductile iron

J. FRAME

1. The frame assembly, including the guide members, invert member and yoke members, shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
  - a. Frame design shall allow for mounting to a wall thimble with stainless steel mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.
  - b. The wall thimble mounted gate shall have a flanged frame. Flat frame gates are not acceptable.
  - c. The structural portion of the frame that incorporates the seat/seals shall be formed into a one-piece shape for rigidity. Guide members that consist of two or more bolted structural members are not acceptable. Guide member designs where water loads are transferred through the assembly bolts are specifically not acceptable.
  - d. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of the guide assembly and shall be positioned to ensure that the load is transferred to the anchor bolts or the wall thimble studs.
  - e. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening gates or downward opening weir gates.
  - f. A rigid stainless steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flush bottom type on upward opening gates.
  - g. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.
  - h. A rigid stainless steel member shall be provided across the invert of the opening on downward opening weir gates.

## K. SLIDE

1. The slide and reinforcing stiffeners shall be constructed of stainless steel plate. All structural components shall have a minimum thickness of 1/4-inch.
  - a. The slide shall not deflect more than 1/720 of the span or 1/16 inch, whichever is smaller, under the maximum design head.
  - b. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement. When required to maintain proper plate stress and deflection intermediate vertical gussets shall be provided. Appropriate safety factors shall be applied to the ultimate tensile and yield strength of the material.
  - c. The stem connector shall be constructed of two angles or plates. The stem connector shall be welded to the slide. A minimum of two bolts shall connect the stem to the stem connector.

## L. SEALS

1. All gates shall be provided with a self-adjusting seal system to restrict leakage in accordance with the requirements listed in this specification.
  - a. All gates shall be equipped with UHMW polyethylene seat/seals to restrict leakage and to prevent metal to metal contact between the frame and slide. Seat contact pressure shall not exceed 600 psi at the design head.
  - b. The seat/seals shall extend to accommodate the 1-1/2 x the height of the slide when the slide is in the fully closed or fully opened position.
  - c. All upward opening gates shall be provided with a resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member or the bottom of the slide and it shall be held in place with stainless steel attachment hardware.
  - d. All downward opening weir gates shall be provided with UHMW polyethylene seat/seals across the invert member.
  - e. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.
  - f. All seals must be bolted or otherwise mechanically fastened to the frame or slide. Arrangement with seals that are force fit or held in place with adhesives are unacceptable.
  - g. The seals shall be mounted so as not to obstruct the water way opening.
  - h. Gates that utilize rubber “J” seals or “P” seals are not acceptable.
  - i. The seal system shall have been factory tested to confirm negligible wear (less than 0.01”) and proper sealing. The factory testing shall consist of an accelerated wear test comprised of a minimum of 25,000 open-close cycles using a well-agitated sand/water mixture to simulate fluidized grit.

#### M. STEM

1. A threaded operating stem shall be utilized to connect the operating mechanism to the slide. On rising stem gates, the threaded portion shall engage the operating nut in the electric-motor actuator.
  - a. The threaded portion of the stem shall have a minimum outside diameter of 1-1/2 inches. Stem extension pipes are not acceptable.
  - b. The stem shall be constructed of solid stainless steel bar for the entire length, the metal having a tensile strength of not less than 75,000 psi.
  - c. The stem shall be threaded to allow full travel of the slide.
  - d. Maximum  $l/r$  ratio for the unsupported part of the stem shall not exceed 200.
  - e. The operating stem shall be designed to transmit in compression at least 2 times the rated hoist output with an effort of 40 lb on the crank or handwheel. The Euler column formula shall be utilized. Where a hydraulic or electric actuator is used, the stem design load shall not be less than 1.25 times the output thrust of the electric actuator at the stalled condition.
  - f. The stem shall be designed to withstand the tension load caused by the application of a 40 lb effort on the crank or handwheel without exceeding 1/5 of the ultimate tensile strength of the stem material.
  - g. The threaded portion of the stem shall have machined or rolled threads of the full Acme type with a 16 microinch finish or better. Stub threads are not acceptable.
  - h. Stems of more than one section shall be joined by bronze couplings. The coupling shall be bolted to the stems.
  - i. The gate stem shall be furnished with a 4-inch diameter, Schedule 80, type 316, stainless steel pipe, 13 feet long. The stainless steel pipe shall be fitted internally with stem guides, to maintain an  $l/r$  ratio of less than 200 for the gate stem.

#### N. STEM GUIDES

1. If required, a stem guide shall be provided to ensure that the maximum  $l/r$  ratio for the unsupported part of the stem is 200 or less.
  - a. Stem guide brackets shall be fabricated of stainless steel and shall be outfitted with UHMW or bronze bushings.
  - b. The bracket shall be adjustable in two directions.
  - c. A separate centering bushing/guide shall be provided within the cored section to meet the maximum  $l/r$  ratio.

#### O. WALL THIMBLE

1. One Type "F" Wall thimble shall be provided as a uniform assembly as depicted on the Drawings.

- a. The wall thimble shall be 16- by 24-inches (inside dimensions) at the mating surface with the slide gate, with the top surface sloping upward to a 16- by 36-inch inside opening at the downstream end.
- b. The wall thimble shall have the downstream, ends prepared for welding to the stainless steel transition (By others). The welding shall be done by full-strength fillet welds, to be performed from outside of the wall thimble.
- c. Wall thimble shall be fabricated stainless steel construction of adequate section to withstand all operational and reasonable installation stresses.
- d. Wall thimble shall be constructed of 3/8-inch minimum thickness stainless steel plates and the front face shall have a minimum thickness of 1/4-inch.
- e. The wall thimble shall be of sufficient structural rigidity to withstand 20 psi grouting pressure on all exterior surfaces, with no permanent deformation or damage. Grouting holes shall be provided on the bottom surface of the wall thimble.
- f. The fabrication process shall ensure that the wall thimble is square and plumb and the front face is sufficiently flat to provide a proper mounting surface for the gate frame.
- g. The face of the wall thimble shall only be machined if recommended by the gate manufacturer. If the wall thimble is to be machined, the front face shall have a minimum thickness of 1/4-inch after machining.
- h. A water stop shall be welded around the periphery of the thimble. Wall thimble and conduit shall be designed to allow thorough and uniform concrete placement during installation.
- i. Studs and nuts shall be stainless steel. Water stop may be stitch welded.
- j. A suitable gasket or mastic shall be provided to seal between the gate frame and the wall thimble.

#### P. ELECTRIC-MOTOR ACTUATOR

1. See Article 2.02

#### Q. PEDESTALS

1. Pedestals shall be constructed of stainless steel. Aluminum pedestals are not acceptable.
  - a. The pedestal height shall be such that the handwheel or pinion shaft on the crank-operated gearbox is located approximately 36-in above the operating floor.
  - b. Floor mounting brackets shall not be bolted within 8-inches of the previous sluice opening footprint.
  - c. Brackets shall be constructed of stainless steel.
  - d. Brackets shall be reinforced to withstand in compression at least two times the rated output of the operator with a 40 lb effort on the crank or handwheel.
  - e. The design and detail of the brackets and anchor bolts shall be provided by the gate manufacturer and shall be approved by the ENGINEER. The gate

- manufacturer shall supply the bracket, anchor bolts and accessories as part of the gate assembly.
2. The electric-motor actuator shall be equipped with fracture-resistant clear butyrate or Lexan plastic stem covers.
    - a. The top of the stem cover shall be closed.
    - b. The bottom end of the stem cover shall be mounted in a housing or adapter for easy field mounting.
    - c. Stem covers shall be complete with indicator markings to indicate gate position in inches, with 1/2-inch graduations.
- R. Hardware: Bolts, nuts, washers of AISI Type 316 stainless steel conforming to ASTM A276
- S. Do not paint stainless steel components.
- T. Manufacturers:
  1. Whipps, Inc.
  2. Approved Equal

## 2.02 ELECTRIC-MOTOR ACTUATOR

- A. Acceptable Manufacturer:
  1. Rotork, no equal.
    - a. Base Design IQ 20 Actuator with IQ 3 remote hand station
    - b. Final actuator model shall be selected and validated for adequacy by the Contractor for submittal in accordance with Section 1.04.A.2.
- B. General Requirements: Electric actuator shall include the electric motor, reduction gearing, valve stem drive nut/bushing, position limit switches, mechanical overload torque switches, ductile iron gear case, and automatic declutchable handwheel. Motor actuators shall be provided by the valve supplier as an integrated assembly. It is the valve manufacturer's responsibility to coordinate initial setup and startup with the motor actuator manufacturer who shall be on-site for installation certification, initial operation, mechanical testing, and operator training.
- C. Motor Operator Components:
  1. Gears: Motor speed reduction shall be by means of a gear train consisting of hardened steel spur gears and self-locking worm and worm gear set. The worm shall be heat treated alloy steel and have worm thread surface rolled or ground. The worm gear shall be cast bronze. All gearing and shafting shall be supported on anti-friction bearings. All thrust components shall be supported by use of tapered roller bearings. Gearing and bearings shall be grease lubricated.
  2. The actuator shall be equipped with a stem nut made of high-tensile bronze or other suitable material compatible with type 316 stainless steel.
  3. The actuator gearing should be designed to operate the slide gate at the rate of approximately 6 inches per minute in both opening and closing directions.

4. Handwheel Drive: The actuator shall be furnished with a handwheel located in a 90-degree plane from the actuator output drive, with a maximum rim pull requirement of 40 pounds for valve travel loads. An external manual declutch lever shall be included to place actuator in the manual mode. The lever shall not require more than a 10- pound force to engage, even when the valve has been tightly seated. The lever shall be padlockable in either handwheel or motor mode. Operation by motor shall not cause the handwheel to rotate, or operation of the handwheel shall not cause the motor to rotate. Handwheel shall operate in the clockwise direction to close.
  5. Motor: Electric motor shall be specifically designed for valve actuator service, and be totally enclosed, nonventilated. The enclosure shall meet NEMA 4 requirements. Motor shall be capable of operation under maximum specified loads when voltage to the motor is plus or minus 10 percent of the nominal voltage. Motor shall have Class F insulation with thermal overload sensors imbedded in the motor windings. Motor shall be 240 VAC, 3 phase, 60 hertz.
  6. Position Indication: Local and remote position indication shall be provided for each motor operator.
    - a. Local Position Indication:
      - 1) Multi-Turn Actuators: Position indication shall be by a dial window indicator located on the limit switch compartment cover and labeled 0 to 100 percent open and graduated in 5 percent increments.
    - b. Remote Position Indication
      - 1) Provide a position transmitter consisting of a precision potentiometer and resistance-to-current converter for remote gate position indication. The potentiometer shall have 0.25% linearity and 0.15% resolution. The potentiometer shall be rated minimum of 3 watts. The resistance-to-current converter shall have a 4 to ma output capable of driving a 1200-ohm load.
      - 2) 4-20 mA signal shall be input to the remote PLC.
- D. Electrical Controls: As a minimum, the actuator shall be furnished with power and control terminal strips, limit switches, torque switches, all housed in a control compartment meeting NEMA 4.
1. Control Compartment: The rectangular enclosure shall have a bonded O-ring seal and hinged cover. Cover bolting shall be captive stainless hex head screws. When built-in controls are specified they shall be an integrated modular package, completely wired and be easily removable or replaceable, as a complete package, by removal of captive screws.
    - a. Motor leads and power supply leads will be terminated to the terminal strips located on the modular package. Power supply terminals and control supply terminal shall be physically isolated from each other to protect against transient voltages. The terminal strips shall be completely shrouded with high impact resistant plastic to avoid accidental terminal contact by personnel.
    - b. The module shall include a snubber circuit to provide control voltage protection for switches and electronic modules from voltage surges.

- c. All electrical components of the modular package, such as reversing contactor, transformer, etc. shall be unidirectional plug connected to provide easy removal and replacement without concerns for proper wiring connections.
- d. Unless otherwise specified, all PC boards must be temperature rated minus 40 degrees to 79 degrees Celsius.
2. Limit Switches: Limit switches shall be geared to the drive mechanism and in step with actual valve position at all times, whether operation is electrical or manual mode. Switches shall be activated by a rotor type design. Contacts shall be silver and have a rating of 10 amps at 120 VAC. A minimum of (3) N.O. and (3) N. C. contacts shall be provided for each direction of travel. Provide additional two trains having one N.O. and one N.C. contact per train for a total of 16 contacts per actuator. The limit switch gear mechanism shall be enclosed to prevent entrance of foreign matter or wire entanglement.
3. Torque Switches: The actuator shall include double adjustable torque switches to interrupt the motor power circuit when an obstruction is encountered in either direction of travel or when torque seating of valves is required for tight shut off. The torque switch shall have a calibrated dial for adjustment and have means to ensure maximum actuator rating is not exceeded. Contacts shall be same construction and rating as limit switch. Mechanical torque springs for load control shall be field replaceable without need of actuator dismantling or removal of the worm assembly.
4. Reversing Contactor: Control voltage shall be 120 volts, 60 Hz. Provide N.O. seal-in contacts for monetary contact pushbutton control and N.C. contacts for electrical interlock. The contactor shall be both electrically and mechanically interlocked, and it shall be completely wired as an assembly and plug connected to the modular package. Provide N.O. and N.C. auxiliary contacts on the open coil and on the close coil.
5. Control Power Transformer: The transformer assembly shall provide 115, 24, 18 and/or 12 V ac as necessary. It shall be epoxy impregnated and encapsulated to prevent moisture incursion and shall be completely wired as an assembly and plug connected to the modular package.
6. Pushbuttons: Each actuator shall be supplied with OPEN-STOP-CLOSE pushbuttons furnished integrally mounted. Pushbuttons shall be double O-ring sealed and include a protective silicon boot. Seal material shall be resistant to ozone and ultraviolet light. When integrally mounted pushbuttons are specified, the design shall permit operation of the buttons when the electrical enclosure cover is open.
7. Indicating Lights: The actuator shall include two long life-high intensity LED type pilot lights to indicate open, closed and intermediate valve position (both lamps on). Red shall indicate valve open and green shall indicate valve closed. An additional LED pilot light shall be furnished to indicate power is on. A fourth LED pilot light shall be furnished to indicate torque switch trip.
8. Selector Switch: The actuator shall include a 3-position selector switch, for LOCAL (hand)-OFF-REMOTE (auto) control. The switch shall be padlockable in any position.

<b>ACTUATOR SELECTORS (HIGH PRIORITY)</b>	<b>REMOTE HAND STATION SELECTORS</b>	<b>ACTUATOR CONTROL</b>
LOCAL	LOCAL	ACTUATOR*
LOCAL	REMOTE	ACTUATOR*
REMOTE	LOCAL	REMOTE HAND STATION
REMOTE	REMOTE	FROM PLC VIA HARDWIRED DRY CONTACTS

\*ACTUATOR REMAINS IN CONTROL UNLESS THE LOCAL CONTROL MODE IS ENABLED. WHEN LOCAL MODE IS ENABLED, THE RHS SHARES CONTROL DESPITE THE ACTUATOR SET FOR LOCAL CONTROL.

9. Computer Remote Manual Control: provide dry contact inputs (from the remote PLC) into the local Actuator for remote OPEN, remote CLOSE, and remote STOP; these shall be momentary (“jog”) or maintained as directed by the City in final startup and configuration.
10. Remote Hand Station (located in the existing Control Building) shall be connected to the Actuator by a 5 wire CAN Bus using a proprietary Belden Cable( # 3084A T5U500); provide an Open/Close/Stop pushbuttons and Local/Remote Switch and display showing “%” Open. Unit shall be IP66/IP68( NEMA 4/4X) rated, wall mountable, double sealed, powered via the actuator( within 100 meters):
  - a. Temperature Range: -22 to + 158 degrees F
  - b. Provide Rotork Bluetooth Setting Support Tool Pro, Insight 2
  - c. Lockable
  - d. Vandal Proof Cover
  - e. Polyester Powder Coated
  - f. Power derived from Actuator-24VDC
  - g. Supplier shall provide 100 Meters of the Belden #3084A cable.
  - h. Supplier shall set up and program the Actuator and Remote Hand Station per the City’s requirements.
11. Provide Surge Protection for the CAN Bus in the Valve Operator, supplied and engineered and integrated by the manufacturer to protect against switching and/or higher voltage transients and lightning on the incoming serial bus.
12. The actuator shall be supplied with a startup kit comprising installation instructions, electrical wiring diagram, and sufficient spare cover screws and seals to provide for losses during the commissioning period.
13. The actuator shall be performance -tested and a test certificate shall be supplied. The test equipment should simulate a typical gate load, and the following parameters shall be recorded:
  - a. Current at maximum torque setting
  - b. Torque output at maximum torque setting
  - c. Actuator output speed or operating time

- d. In addition, the test certificate should record details of the specification, such as gear ratios for both manual and electric operation, closing direction, and wiring diagram code number.
- 14. The electric-motor actuator shall have the manufacturer's standard coating for outdoor service.

## 2.03 FABRICATION

- A. The slide gate disc and frame shall be fully assembled in the shop to ensure that the components fit together properly, with proper clearances and alignment.

## 2.04 SHOP TESTING

- A. Notify the City in writing a minimum of 14 days in advance of beginning shop tests.
- B. Operating Tests:
  - 1. The slide gate shall be opened and closed at least two times in the shop to demonstrate that the disc moves freely, and there is no binding or unusual noise. The slide may be operated manually by some shop means to prevent overloading the gate frame prior to installation.
  - 2. The slide gate frame shall be test-fit to the wall thimble to ensure that the gate frame and wall thimble flanges and bolt holes match.
- C. The City or City's representative may make visits to the gate manufacturer's facilities to review progress of the work. Shop testing shall be performed in the presence of the City or the City's representative, unless waived.

## 2.05 SHIPPING

- A. The slide gate frame and disc shall be shipped fully assembled. The Wall thimble, electric-motor actuator, pedestal, gate stem and appurtenances shall be shipped separately.
- B. All components of the slide gate shall be crated, wrapped, and otherwise protected from damage during shipment. Any repairs required, including coatings, shall be at no cost to the City.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install the slide gate and appurtenances in accordance with the manufacturer's shop drawings and approved submitted written installation instructions.
- B. The Contractor shall furnish all necessary bolts, anchor bolts, sealants, gaskets, fasteners, and other hardware for a complete installation.
- C. Wall Thimble Installation

1. Prior to encasement in concrete, the wall thimble shall be welded to the rectangular-to-round transition and downstream conduit to form a continuous conduit.
  2. The downstream end of the wall thimble and the upstream end of the transition are prepared for full strength fillet welds, to be performed from the outside of the components.
  3. The welding shall be in accordance with ANSI/AWS D1.6. Any weld spatter on the wall thimble -to-transition joint shall be ground smooth.
  4. The alignment of the wall thimble and transition shall be carefully maintained to provide a smooth fluidway through the interior of the components.
  5. Provide extreme care when handling the assembled wall thimble, transition, and outlet conduit, placing the components in place, and embedding in concrete.
  6. The wall thimble-transition-conduit shall be installed with the wall thimble flange face vertical and plumb for a true vertical alignment of the slide gate and gate stem. Provide suitable supports, leveling devices, and anchors to prevent movement of components during concrete embedment. Submit a construction and embedment plan to Engineer, prior to placing concrete.
  7. Provide a recessed pocket under the gate frame for the flush-bottom seal bar arrangement, in accordance with the gate manufacturer's instructions.
  8. After the appropriate curing time, any voids between components and concrete shall be filled by placing non-shrink grout around the wall thimble, transition and conduit as necessary, at 20 psi maximum. The wall thimble is provided with grout holes, so that the grout can flow under the bottom surface. The grout can be troweled off flush with the inside of the wall thimble.
- D. After the wall thimble installation has been completed, the slide gate frame and disc shall be attached to the wall thimble with appropriate fasteners and sealant. The flush-bottom seal pocket shall then be filled with grout to provide a flush fluidway surface.
- E. Gate Stem Installation
1. A 6-inch diameter hole shall be core drilled through the concrete operating deck (approximately 6 inches) for installation of the gate stem and 4-inch, schedule 80, stainless steel guide pipe, as shown on the Drawings. The guide pipe contains internal stem guides.
  2. The guide pipe shall be grouted in place, with the centerline of the pipe vertical and plumb, and centered over the stem connection to the slide gate disc connection.
  3. The guide pipe shall be a continuous piece, or joined with sufficient rigidity to maintain position and stem support during gate operation.
  4. The guide pipe shall be anchored to the concrete at the lower end.
  5. When installing the gate stem, use caution when inserting the stem through the guide pipe and stem guides to prevent damage to the guides.
  6. Connect the gate stem to the slide gate disc with the bronze stem nut provided.

- F. The pedestal shall be installed on the operating deck, centered over the gate stem and gate stem connection, with appropriate anchor bolts, on a grout pad approximately 1 inch thick. The electric -motor actuator shall be rotated for proper operating personnel access and to avoid any obstacle of the operating deck.
- G. Perform all necessary electrical connections to operate the slide gate.

### 3.02 FIELD TESTING

#### A. SLIDE GATE

1. New slide gate is to be tested through full stroke with hydrostatic loading equal to the lake's normal pool elevation applied to the upstream side and atmospheric pressure on the downstream side conditions.
2. Flow test the installed slide gate at three separate open positions (for three separate flow rates). The contractor shall select (or design) and use a flow measurement apparatus.
  - a. The minimum slide gate opening position shall be 2-inch open.
  - b. The additional slide gate open positions shall be greater than 1-inch from any other test position.
  - c. Obtain a minimum of three (3) flow rate measurements for each opening position. Additional tests may be necessary to obtain a credible average and/or eliminate outlier results. The gate testing plan submittal shall detail the flow rate measurement approach.
  - d. The flow testing plan shall comply with flow instrumentation manufacturer's recommendations and specification for installation and operation to provide optimal performance (if used).
  - e. The flow testing plan shall include means for recording flow rates to an accuracy of 1% or better.
  - f. The flow testing plans shall include an approach for capturing steady state flow conditions (i.e. excluding ramp up of flow, stabilization of upstream head, and other applicable considerations).
3. Demonstrate that the leakage thru the gate is less than the allowable leakage. Slide gate leakage to be a maximum of 0.05 gallon per minute per lineal foot of seal perimeter.

#### B. SLIDE GATE ACTUATOR

1. In addition to the flow testing, the slide gate actuator is to be tested by satisfactorily opening and closing the slide gate first in the dry and then again through two full cycles under seating head. The head to be used under this testing is the operating head as Specified in Table 1.03 A in this Section. At minimum, one full cycle under seating head shall be performed without the cofferdam. During the testing, the Contractor shall consider potential head-cutting and the resulting discharge of sediment.
2. In addition to demonstrating that the gate opens and close satisfactorily, the controls and safety devices for the actuator shall be demonstrated to operate in accordance with the control descriptions. The actuator shall be controlled and tested under all control modes (local and remote).

3. Operate the slide gate approximately 10 percent of gate travel by using the handwheel on the electric-motor actuator.

### 3.03 FIELD QUALITY CONTROL

- A. System Performance Evaluation:
  1. General Commissioning Requirements:
    - a. Provide 2 days of field service during initial operation.
    - b. Provide 1 day of field service during final mechanical performance testing.
- B. Manufacturer's Field Services:
  1. Demonstration and Training:
    - a. Provide 1 day of operator training for the slide gate and gate actuator.

### **END OF SECTION**

<b>REV. NO.</b>	<b>REV. DATE</b>	<b>RFC/CN/CO</b>	<b>Section(s) Affected</b>	<b>Comments</b>
0	5/9/2017		All	Final Submittal